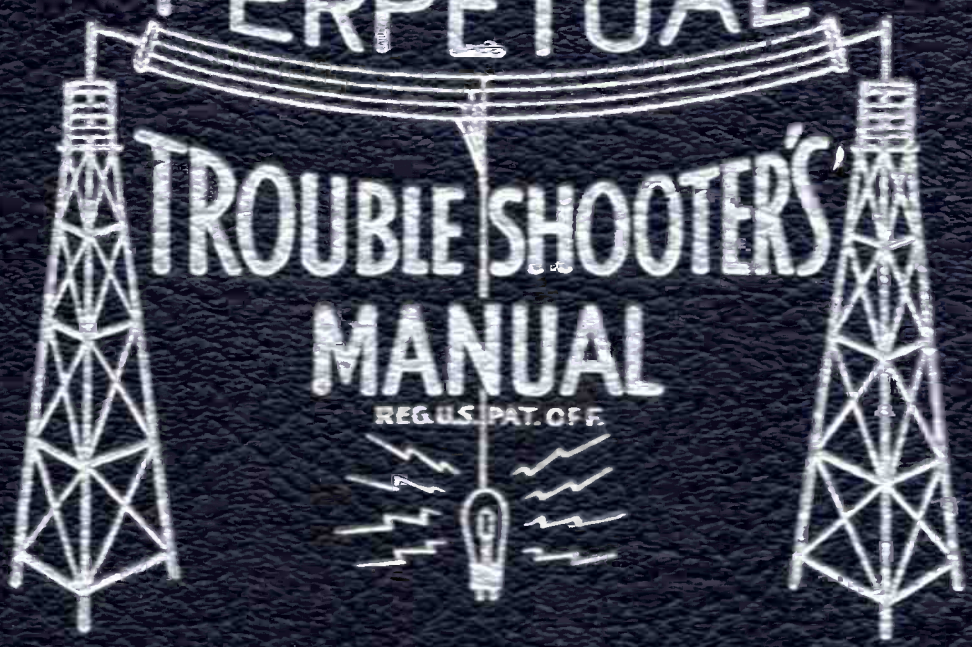
VOLUME XX

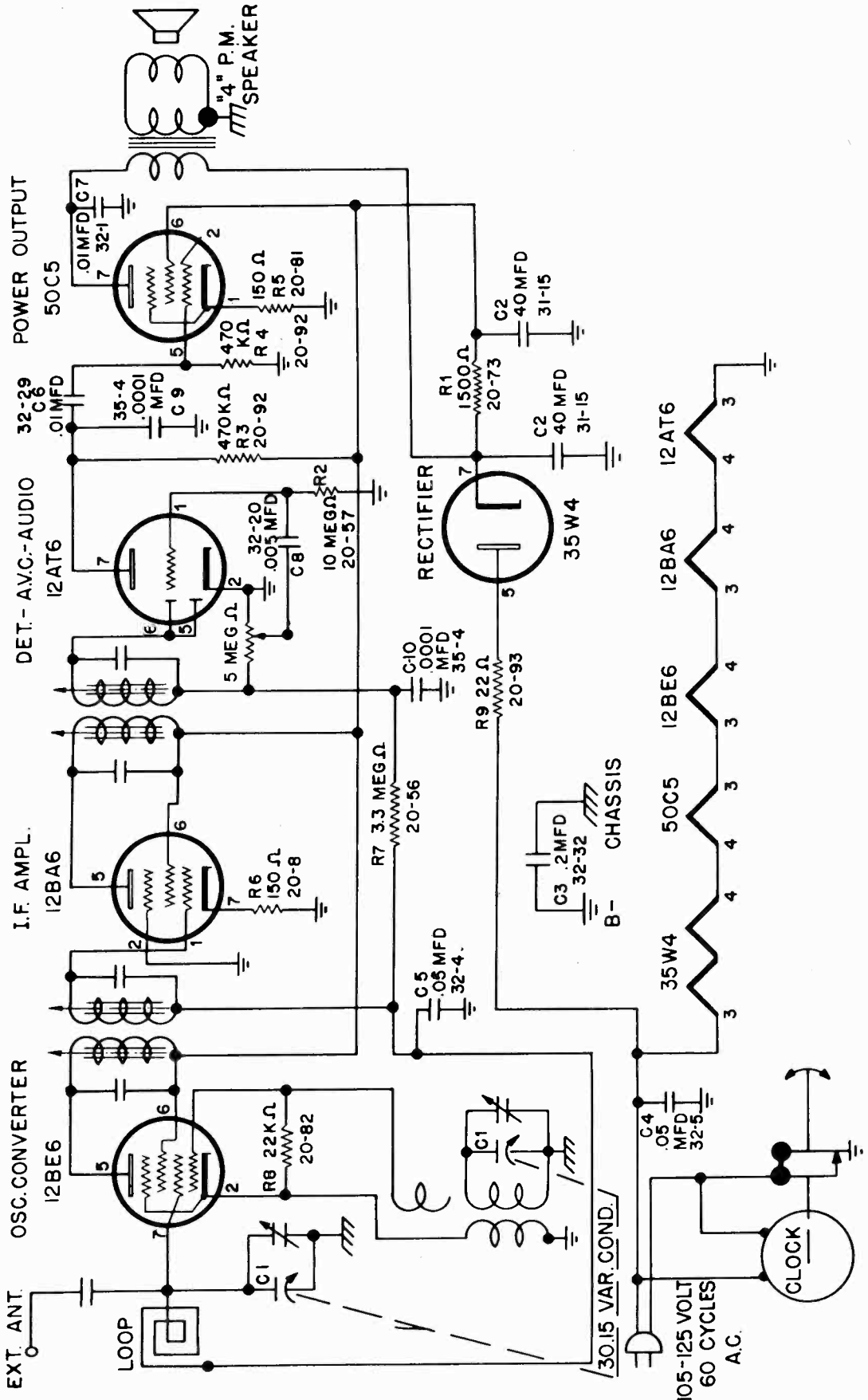
PERPETUAL TROUBLE SHOOTER'S MANUAL

REG. U.S. PAT. OFF.

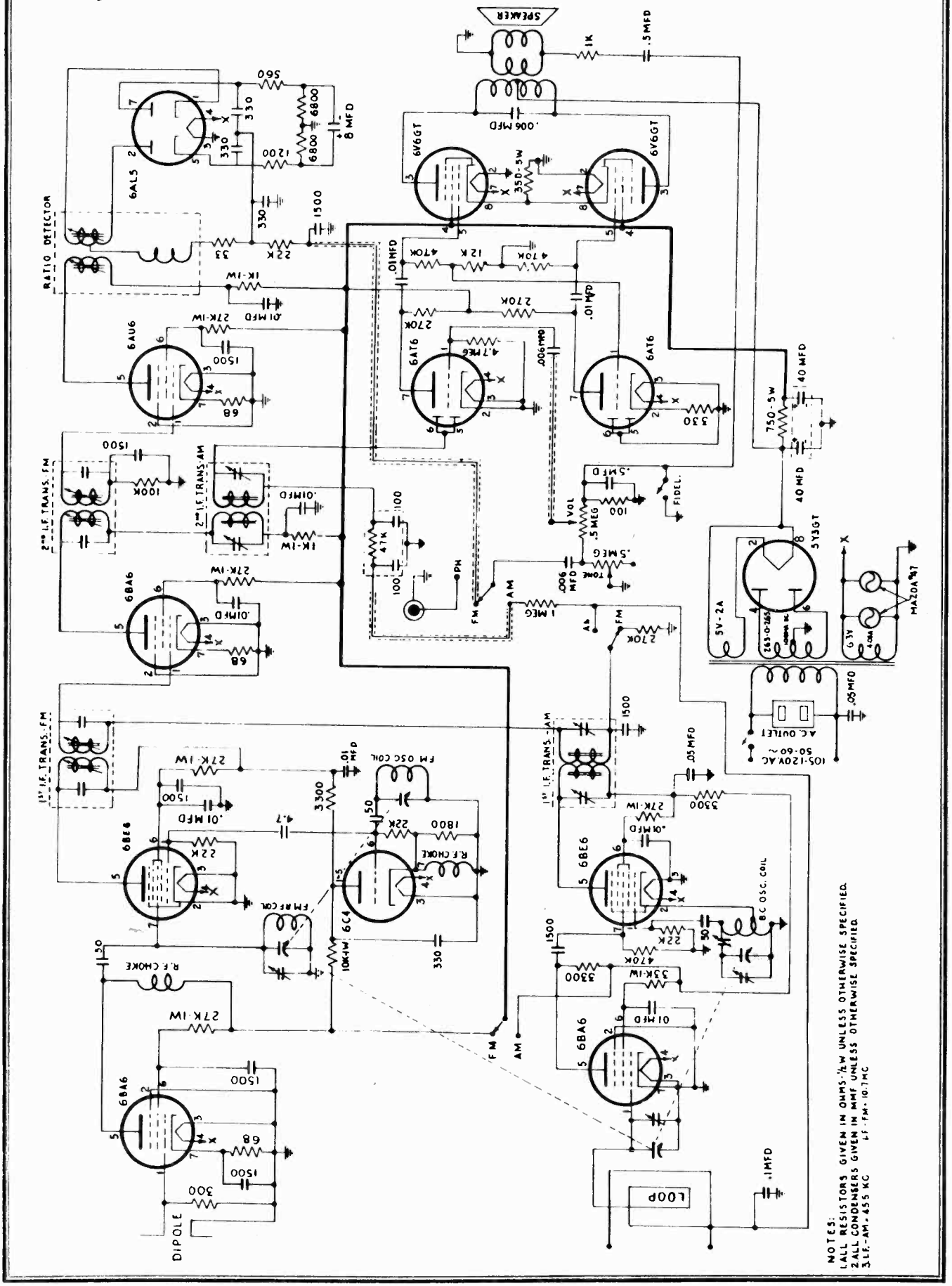


JOHN F. RIDER

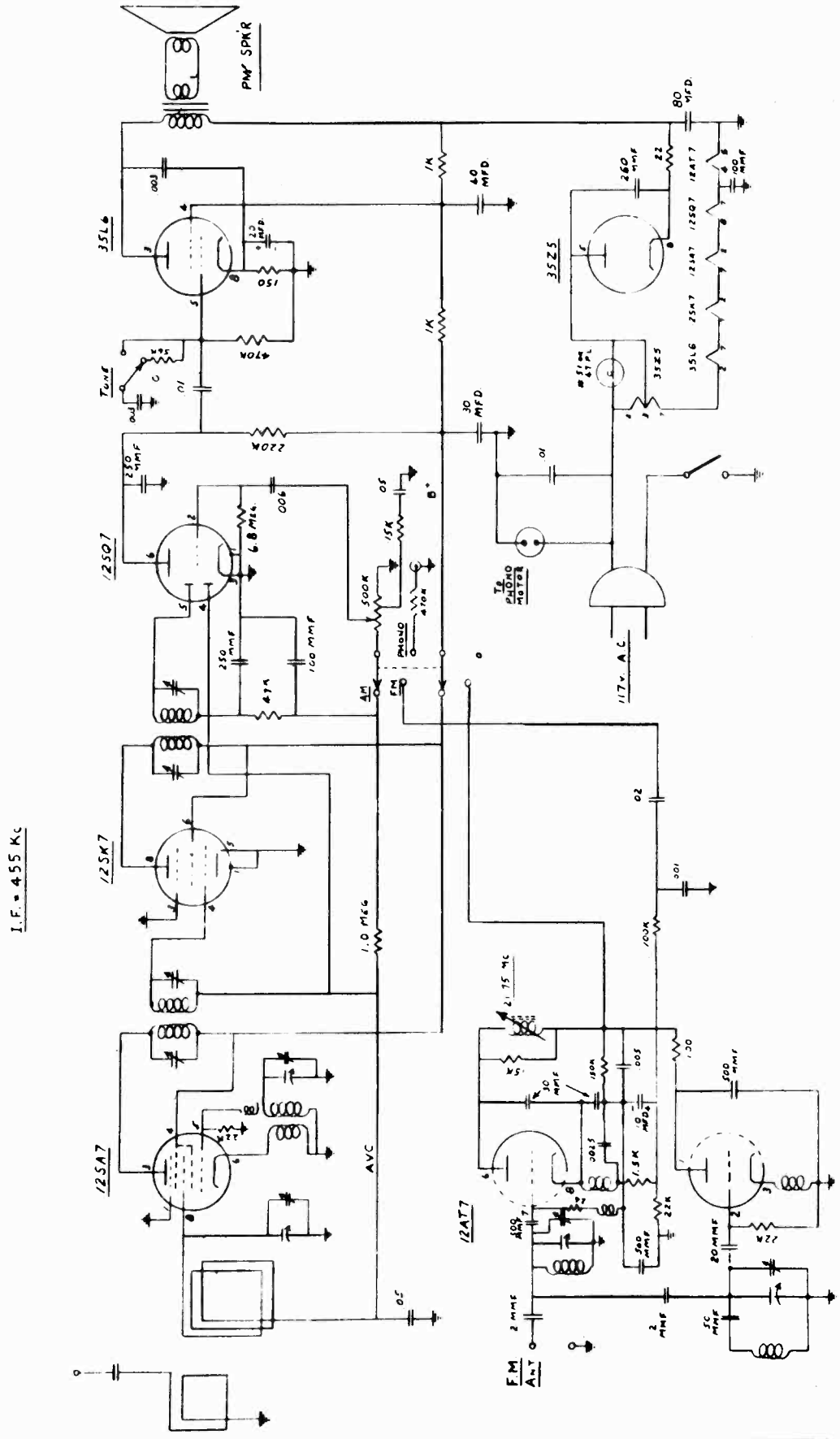
MODEL AR-920-A



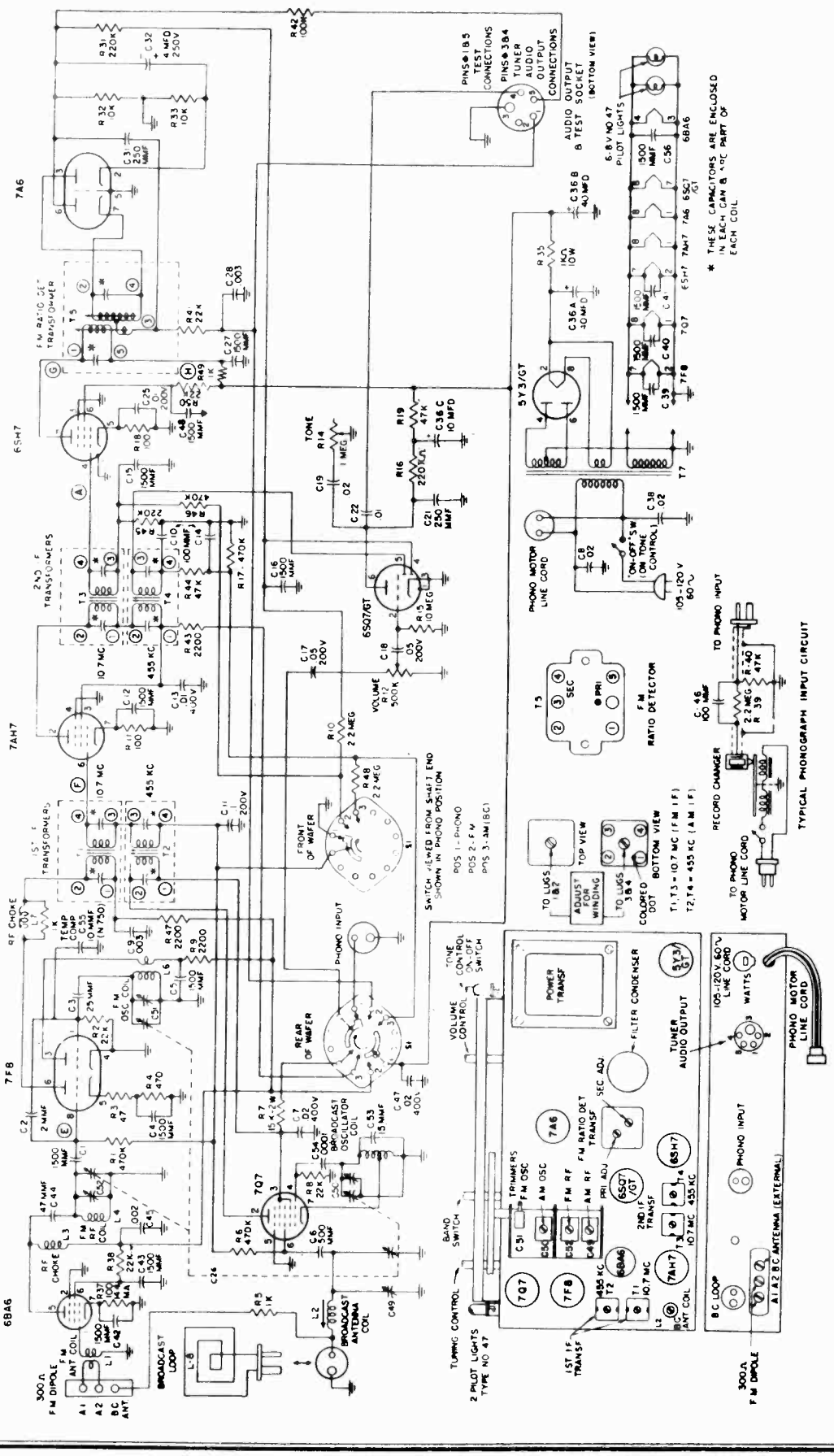
MODELS 707, 708;
Ch. 113



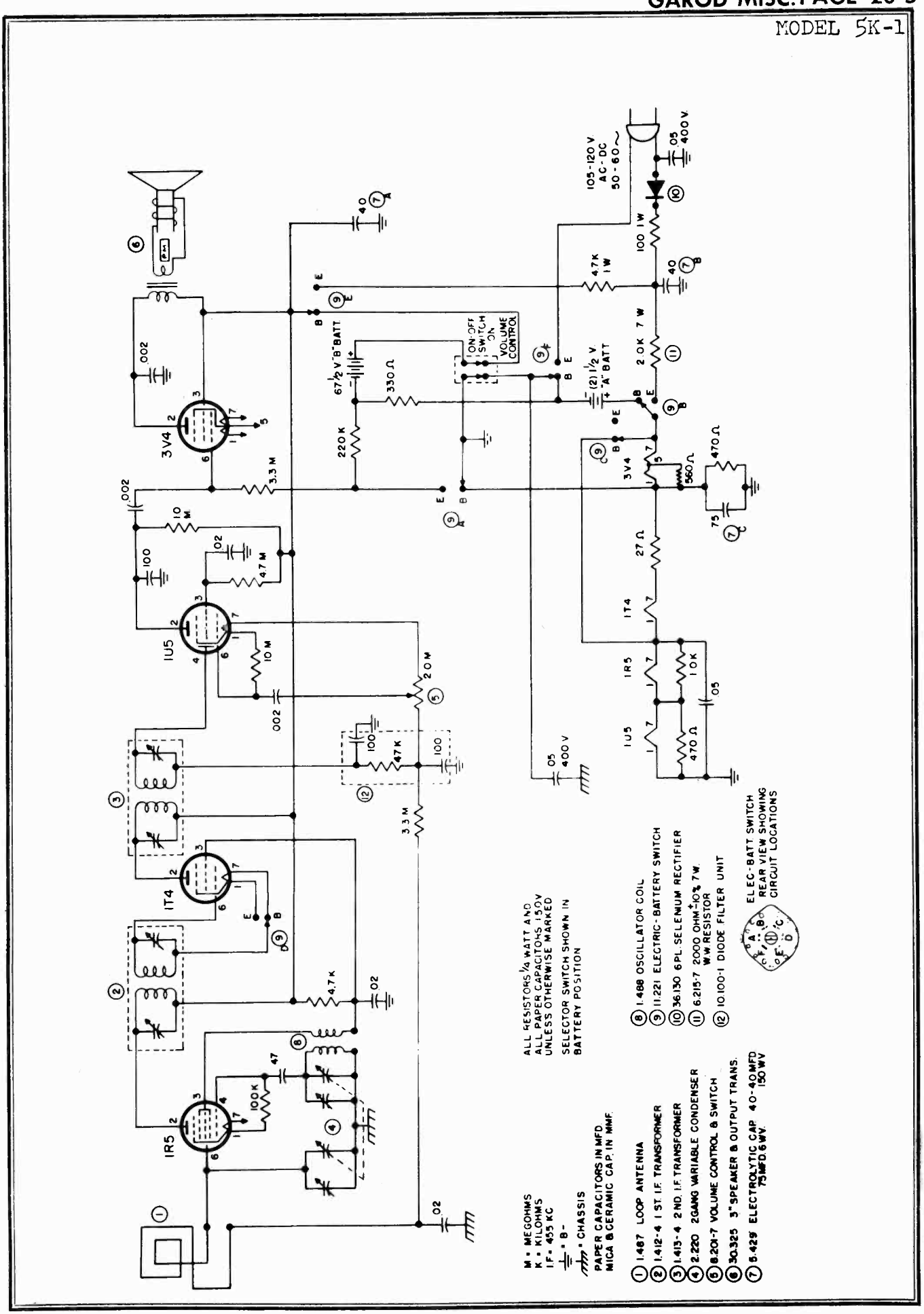
MODELS 4810, 4820

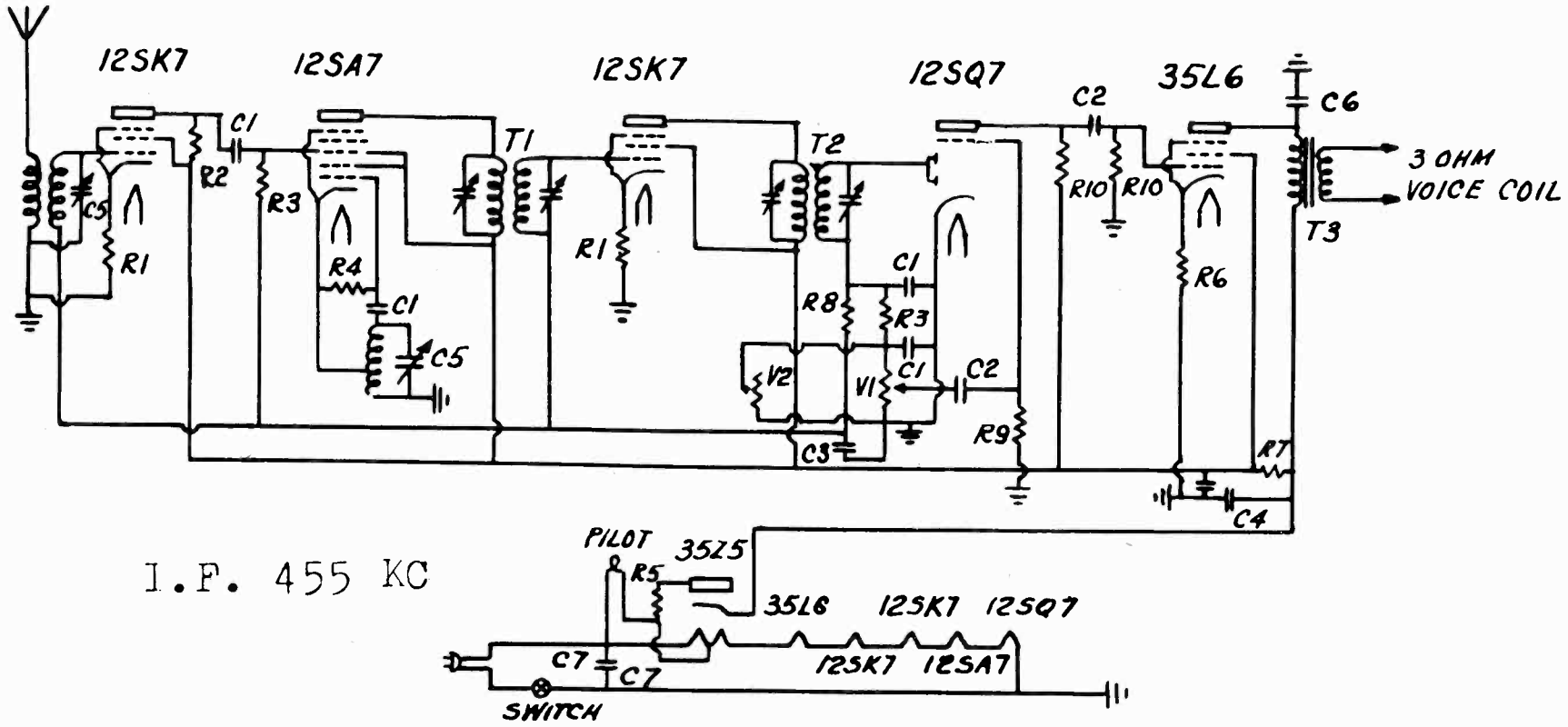


MODEL 7B-1T



MODEL 5K-1

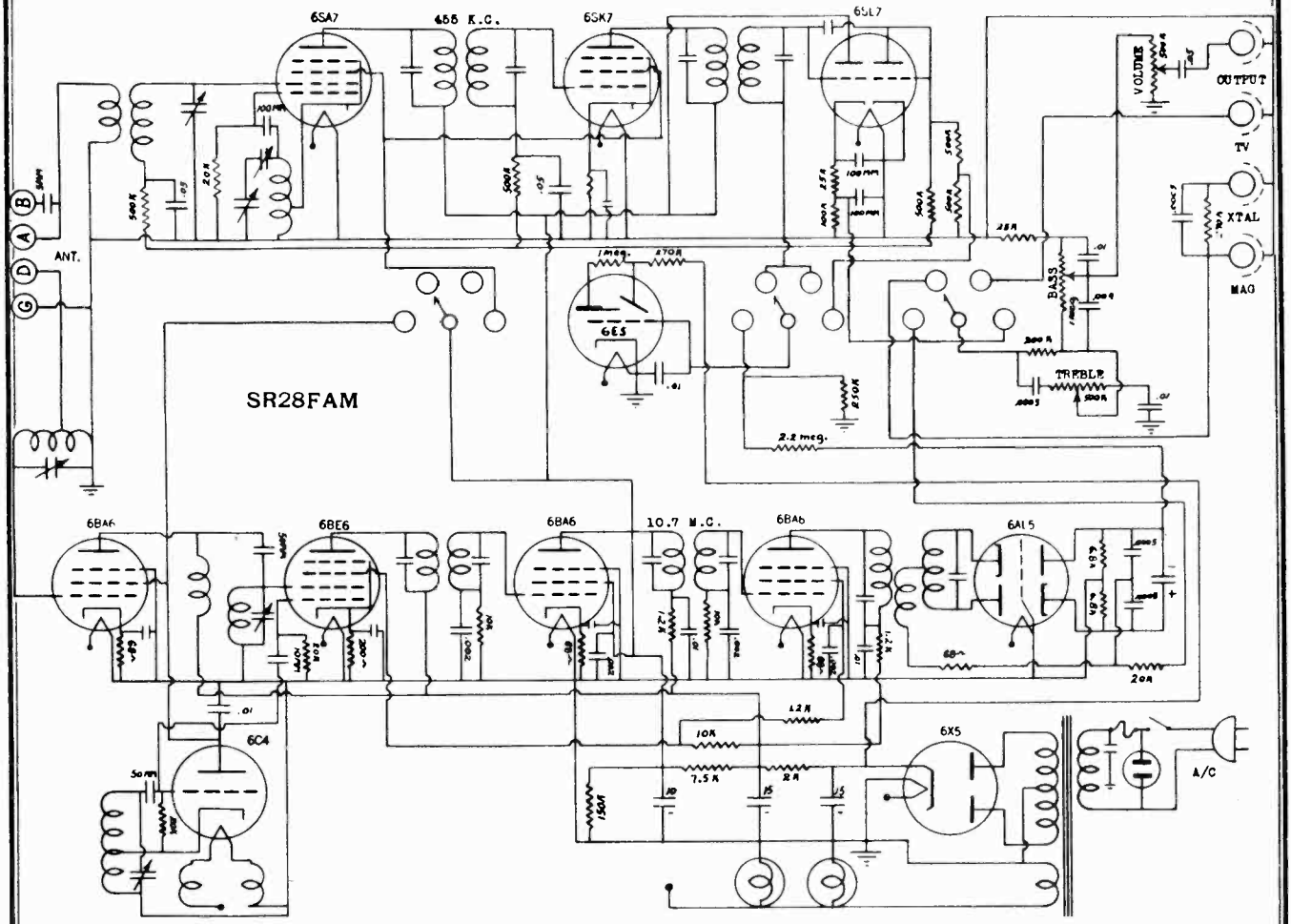




I.F. 455 KC

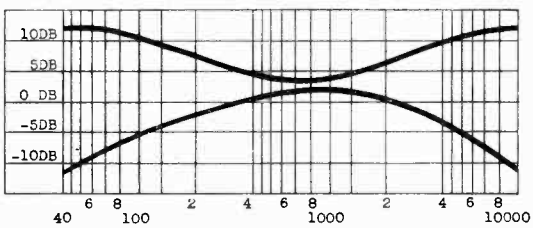
PART #	DESCRIPTION	PART #	DESCRIPTION
R1	200Ω 1/2 W	C1	.001 Mfd.
R2	4700 " "	C2	.01 "
R3	43000 " "	C3	.05 "
R4	22000 " "	C4	30-50 "
R5	30 " "	C5	Var. Cond.
R6	150 " "	C6	.02 Mfd.
R7	1500 " "	T1	I.F. Input
R8	2.2 Meg. "	T2	I.F. Output
R9	3 " "	T3	Output TRAN
R10	500000" "	V1	500000 VC & SW
C7	.25 Mfd.	V2	500000 VC

MODEL SR28FAM



The electronic circuit is a dual Superhet designed to operate into an amplifier adjusted for acoustically flat response.

Full range bass and treble controls make it possible to diminish or augment any major portion of the audible scale allowing for an unsurpassed flexibility of tone pattern (Fig. 1.)



SR28FAM embodies such features as tuned Infinite Impedence type AM detection.

Electron ray tuning indicator as a visual tuning aid.

Complete shielding for the elimination of strays.

Input jacks for Magnetic phono pickup, Crystal pickup, and TV audio channel on selector Control Switch.

Average output: .4 volts.

Licensed under patents of Hazeltine Laboratories, Inc., and others.

Tubes: 3, 6BA6; 1 each 6BE6; 6C4, 6AL5, 6SL7GT, 6SA7, 6SK7, 6E5, 6X5.

Power Consumption: 50 watts, 110-125 volts, 50-60 cycles.

CAUTION

VENTILATION IS EXTREMELY IMPORTANT. No multi-tube unit should be housed in an insufficiently ventilated cabinet. Damage to the unit and the cabinet will result.

USE ONLY 1 AMP. FUSE.

ANTENNA REQUIREMENTS.

For best non-directional standard AM broadcast results a single wire five to ten feet in length connected to antenna terminal "A" will be sufficient. Additional selectivity to this efficient input circuit would tend to restrict the wide band reception capabilities of the Infinite Impedence type detector.

For best F.M. results a 100 M.C. dipole should be installed well above surrounding obstructions. The twisted 300 ohm line from the dipole should be connected to antenna terminals "D" and "G". ("G" also grounds unit.)

A console type folded dipole is supplied with the tuner and will prove a satisfactory substitute in most cases where an external dipole is impractical.

INPUT JACKS.

All phono or TV audio signals as well as the AM and FM radio are subject to the volume and tone controls of the tuner.

The jack marked MAG is the phono input for the new variable reluctance cartridge with its properly compensated pre-amplifier.

XTAL is the phono input for a standard crystal pickup.

The TV jack makes it possible to channel the audio of a television tuner thru the radio's amplifier and speaker.

The OUTPUT jack should be connected to the high impedence input control (250,000 to 500,000 ohms) of a quality audio amplifier. Use the prepared shielded lead supplied with the tuner. Choose a speaker capable of wide range reproduction.

A.C.POWER. SR28FAM is completely powerized for 110-125 volts 50-60 cycles. The power switch (on the Volume Control) also controls the A.C.recepticle on the back of the chassis for convenience in amplifier installation.

MODELS 171, 172

TUNING RANGE

This receiver is designed to operate over the standard broadcast band which extends from 535 to 1620 Kilocycles (KC) (185 to 560 Meters).

ALIGNMENT PROCEDURE

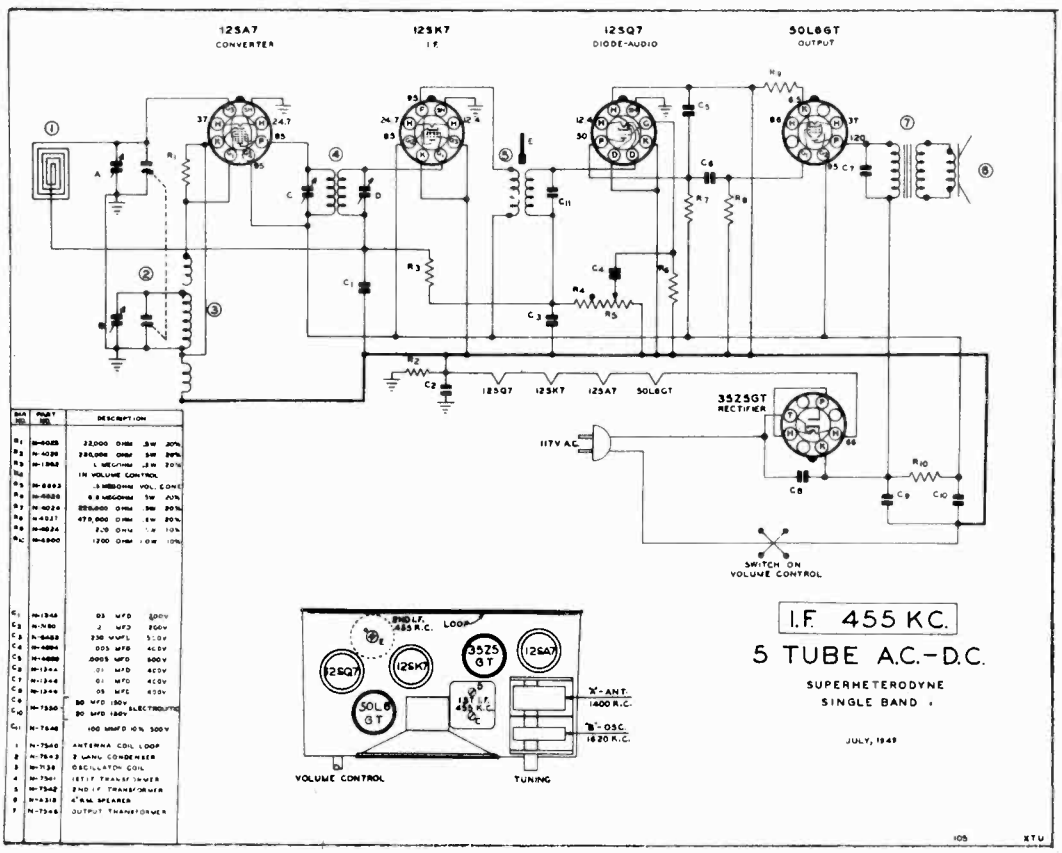
GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455, 600, 1400 and 1620 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the broadcast band should be adjusted.

I.F. ALIGNMENT. Remove the chassis and loop antenna from the cabinet and set them up on the bench so that they occupy exactly the same respective position on the bench as they did in the cabinet. Care should be taken to have no iron or other metal near the loop. Do not make this set-up on a metal bench. With the gang condenser set at minimum, adjust the test oscillator to 455 KC and connect the output to the grid of the first detector tube (12SA7) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the ground buss, indicated on the circuit diagram. Align all three I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. Connect the test oscillator to a dummy loop which can be made by coiling 2 turns of hookup wire about 6" in diameter. Place this dummy loop about a foot from the loop on the receiver and in the same plane as the receiver loop. With the gang condenser set at minimum capacity, set the test oscillator at 1620 KC, and adjust the oscillator (or 1620 KC trimmer) on the gang condenser. Next—set the test oscillator at 1400 KC, and tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.

POWER SUPPLY. This receiver is designed to operate on any alternating current supply (AC) ranging from 110 to 120 volts, 50 to 60 cycles; or on any direct current supply (DC) ranging from 110 to 120 volts.



SCHEMATIC AND PARTS LIST INCLUDING CHASSIS LAYOUT AND TUBE POSITIONS

Bendix 69 Series

This model appears on *pages 19-1 through 19-8 of Rider's Manual Volume XIX*. The location of trimmer C3c on gang capacitor in Figure 8, Trimmer Location Diagram, should be on terminal 4, rather than terminal 3.

Air King A400, Minstrel; Ch. 470

This model appears on *page 16-1 of Rider's Volume XVI*. The following material should be added to that which appears in the Manual. The voltage and resistance measurements follow.

TUBE	PIN	VTVM	20,000 OHM/V	1,000 OHM/V	RESISTANCE
	1	0	0	0	0
12SA7	2	AC	AC	AC	25
Converter	3	+76	+76	+76	OVER 500K
	4	+76	+76	+76	OVER 500K
	5				
OSC.	550 KC	-3.1	-3.2	-0.3	17K
VOLTAGE	1600 KC	-3.9	-5.2	-0.3	17K
	6	0	0	0	0.6
	6	AC	AC	AC	14
	8	-1.5	-0.7	0	6.5 MEG
	1	0	0	0	0
12SQ7	2	-1.3	-0.8	-0.6	5.2 MEG
DET. AVC	3	0	0	0	0
1st AF	4	-1.0	-0.6	-0.3	2 MEG
	5	-1.6	-0.8	-0.4	6.5 MEG
	6	+48	+48	+23	OVER 500K
	7	AC	AC	AC	14
	8	0	0	0	0
	1	0	0	0	0
50L6	2	AC	AC	AC	26 OHM
AUDIO	3	+110	+110	+110	OVER 500K
OUTPUT	4	+75	+75	+75	OVER 500K
	5	-3.8	-1.1	-0.4	340K
	6	---	---	---	---
	7	AC	AC	AC	80
	8	0	0	0	0
1	1	+1.6	+1.6	+1.6	6.5 MEG
35Z5	2	AC	AC	AC	140
RECT.	3	---	---	---	130
	4	---	---	---	---
	5	AC	AC	AC	155
	6	AC	AC	AC	80
	7	AC	AC	AC	105
	8	+122	+122	+122	OVER 500K

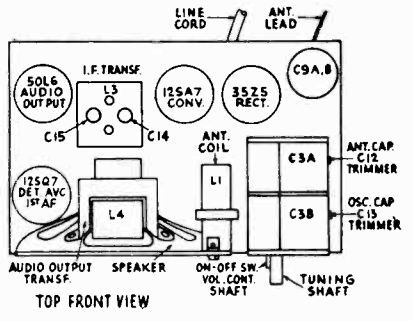
ALL RESISTANCES IN OHMS UNLESS OTHERWISE NOTED.
ALL VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND WITH 166 V AC LINE V VOLTAGE.

I-F Alignment

Connect an output meter across the voice coil. Connect the signal generator to the primary of the antenna transformer through a 100-$\mu\mu$f capacitor.

Set the signal generator to 455 kc and fully mesh the receiver tuning capacitor.

Keep the receiver volume control at maximum and the output of the signal generator sufficient to give a readable deflection on the output meter and adjust i-f trimmers C15 and C14 for maximum.



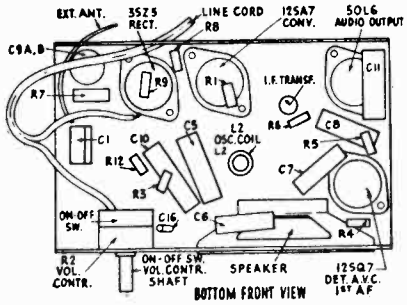
The top front view of the Air King A400, showing tubes and trimmer locations.

R-F Oscillator Adjustment

Keeping the same setup as used for i-f alignment, set the signal generator for 1600 kc and adjust oscillator trimmer C13 for maximum output.

Set signal generator and receiver for 1400 kc and adjust antenna trimmer C12 for maximum output.

The parts layout and alignment points are shown in the accompanying diagrams.



The bottom front view of the Air King A400, showing parts layout.

Bendix 1217B, 1217D

Model 1217B appears on *pages 19-9 through 19-19 of Rider's Manual Volume XIX* and Model 1217D appears on *pages 19-20 through 19-33 of Rider's Manual Volume XIX*. Hum can be corrected by removing the shielded lead between the two chassis from the plug assembly and running it in through a separate connector. All of the hum pickup is taking place at the eight-prong plug on the radio chassis. With the cable running in through the chassis about two inches away from the plug assembly, the hum level is so low as to be almost unmeasurable.

Crosley 9-212B

This model is the same as Model 9-209 appearing on *pages 19-19 through 19-21 of Rider's Volume XIX*.

Espey 509

This model is the same as Model 7B1, appearing on *pages 18-1,2 of Rider's Volume XVIII*, except for the following changes Capacitor C55 (10 $\mu\mu$f) connected from pin 1 of the 7F8 tube to ground has been removed. The 0.003-μf capacitor C9 has been changed to 1500 $\mu\mu$f.

The position of the trimmers has been changed. Looking at the front of the set, they are: C49 (broadcast trimmer), C51 (f-m oscillator), C50 (broadcast oscillator), and C52 (f-m r-f trimmer).

A coil has been placed in the cathode lead of the 7Q7 tube before this lead is connected to C50. Capacitor C53 (15 $\mu\mu$f) has been changed to a variable capacitor and is now connected between L5 and ground, instead of across L5. The junction of C50 and the cathode lead of the 7Q7 tube is connected to the ground side of this capacitor.

The 22,000-ohm resistor, R51, connected between R13 and ground has been eliminated. The side of C19 that is not connected to R13 is grounded directly. The side of the tone control, R14, previously connected to C19 has been left open. R20 has been changed from a 470,000-ohm resistor to a 1-megohm variable resistor. The movable arm of R20 is now connected to pin 5 of the 7F7 tube, and one side of R20 is connected to the junction of C21, C22, and C23. C56, the 1500-$\mu\mu$f capacitor across the filaments of the 6BA6 tube, has been removed.

Farnsworth K-084, K-086, K-289

The first two models appear on *pages 18-6 through 18-12 of Rider's Volume XVIII*. The following changes have been made in production. Model K-289 incorporates these changes.

A 3-gang tuning capacitor is used, necessitating changes in the r-f amplifier circuit. The 100,000-ohm resistor connected to the grid (pin 1) of the 6AG5 r-f amplifier has been changed in value to 1 megohm. The lead which was formerly connected from the bottom of this resistor to the junction of resistors 7 and 8 (1 megohm and 4.7 megohms, respectively) is now connected directly to resistor 4 (100,000 ohms) and to D5 of switch section 2 rear. Resistors 7 and 8 have been eliminated.

The band-pass coil and the 470-$\mu\mu$f capacitor which were connected between the plate (pin 5) of the 6AG5 tube and the third grid (pin 8) of the 6SB7Y oscillator convertor tube have been removed. A connection has been made from the plate of the 6AG5 tube through a 100-$\mu\mu$f capacitor to D3 of switch section 2 rear. The third grid of the 6SB7Y is still connected to D2 of switch section 2 rear. The 100,000-ohm resistor, which was formerly connected between D1 of switch section 2 rear and the junction of D4 of the same switch section and the 1000-ohm resistor, has been removed. There is a connection from D1 of switch section 2 rear and C1 of switch section 2 front, indicated on the schematic by the black dot on these connections.

The 0.005-μf capacitor connected to C7 of switch section 2 front has been removed, as has the wave trap and 100-$\mu\mu$f capacitor connected to C1 of the same switch section. The third section of the ganged tuning capacitor is connected between C1 and ground, and is shunted by the f-m converter trimmer, and also by a band-pass coil (49) in series with a 0.05-μf capacitor. A 100,000-ohm resistor is connected from the junction of this capacitor and coil to D4 of switch section 2 rear. A 0.01-μf capacitor in series with a coil is connected from this common ground point to the junction of the 4700-ohm resistor and the r-f choke in the plate circuit of the 6AG5 r-f amplifier. A 47,000-ohm resistor has been connected in the line going between A3 of switch section 1 front and the junction of the 47,000-ohm resistor, the 470,000-ohm resistor, and the 100-$\mu\mu$f capacitor in the filter circuit of the a-m detector.

The following step should be included in the a-m alignment table on *page 18-1* between steps 6 and 7.

Step	*Connect Generator*	*Set generator At*	*Set Gang At*
6A	Ex. Ant. Binding Post	1500 kc.	1500 kc.

Adjust	*To Obtain*
BC R-F Trimmer	Maximum Output

The following additions should be made to the parts list.

Ref. No.	Part No.	Description
27	25456	60-$\mu\mu$f ceramic capacitor
34	25182	0.1-μf tubular capacitor, 200 volts
39	26277	Tuning capacitor
46	13766	Loop antenna (GK-084, -088; K-084)
46	13784	Loop antenna (GK-086, -087; K-086, -289)
47	38932	F-m antenna coil
50	25181	0.05-μf tubular capacitor, 200 volts
51	38933	F-m converter coil
52	38934	F-m oscillator coil
69	81175	Speaker
73	42185	Pilot lamp, 250 ma (K-084, -086)
73	42187	Pilot lamp, Mazda 55 (K-289)
	22147	Pickup cable (GK-084, -088; K-084)
	22150	Pickup cable (GK-085, -086, -087; K-086, -289)
	31421	A-m dial glass (K-084, -086)
	31422	F-m dial glass (K-084, -086)
	31453	A-m dial glass (K-289)
	31454	F-m dial glass (K-289)
	31431	Dial escutcheon (K-084, -086)
	31452	Dial escutcheon (K-289)
	92192	Dial drive cord (45 inches)
	17014	Drive drum
	54091	Band switch lever (K-084, -086)
	54310	Band switch lever (K-289)
	59451	Knobs (K-084, -086)
	92228	Dial background (K-084)
	60665	Escutcheon backing (K-289)

H-283-1	Cabinet and carton for K-084 (walnut)
H-283-2	Cabinet and carton for K-084 (blonde)
H-285-1	Cabinet and carton for K-086 (walnut)
H-285-2	Cabinet and carton for K-086 (blonde)
H-315	Cabinet and carton for K-289

Farnsworth Chassis C-170, C-194, C-216, C-201

These chassis are used in Models GK-100, GK-102, GK-103, and GK-104, appearing on *pages 17-3 through 17-10 of Rider's Volume XVII*. These chassis are listed as follows:

Model	*Chassis*
GK-100	C-170
GK-102	C-194
GK-103	C-216
GK-104	C-201

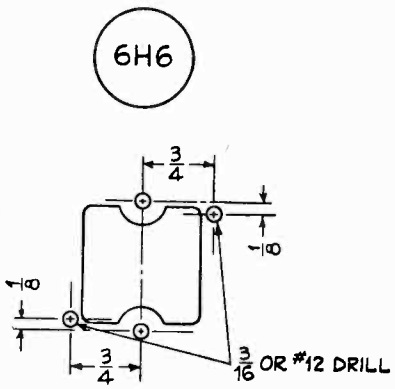
Farnsworth GK140 Series

This model appears in *Rider's Manual XVI, pages 16-6 through 16-11*. The following procedure is conducive to increased sensitivity, noise rejection, broader tuning, and reduced thermal drift of the f-m section of the GK140 series combination instrument.

To reduce drift, change the oscillator grid coupling capacitor (grid of 6C4 to the oscillator coil) from 50 $\mu\mu$f zero temperature coefficient to 40 $\mu\mu$f N-1400 temperature coefficient. The part number of this replacement is 25442. Change the oscillator padder capacitor (oscillator coil to f-m gang section) from 55 $\mu\mu$f N-330 to 55 $\mu\mu$f zero temperature coefficient. This new part number is 25441. These changes will necessitate slight realignment of the f-m converter and oscillator. To make these modifications, use the following procedure:

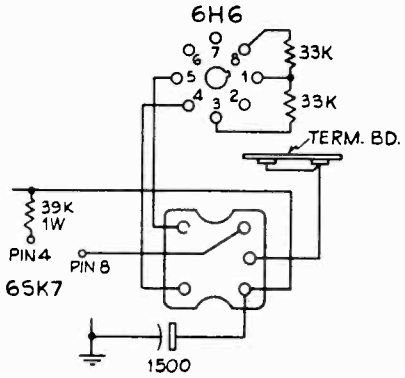
Clip out two 330,000-ohm, ½-watt resistors connected between the ratio detector transformer (next to the 6H6 socket) and the terminal board, one 5,000-$\mu\mu$f mica capacitor between the B-supply for the transformer and ground and two 6,000-ohm, ½-watt resistors connected to the 6H6 socket. Clip four leads connected to the transformer. Remove the ratio detector transformer and replace with the transformer No. 38879. To do this, it is necessary to drill two new holes as shown in the accompanying diagrams.

After the transformer is connected (make leads as short as possible) connect two 33,000-ohm, ½-watt resistors, Part No. 77183, one between pin No. 8 on the 6H6 socket and ground, and the other between Pin No. 3 and ground (short leads). Connect a 1,500-$\mu\mu$f capacitor, No. 25273, between the B-supply to the transformer and ground. Connect a 0.002-μf, 600-volt capacitor, No. 25185, between ground and the point where the 22,000-ohm, ½-watt resistor connects to the shielded lead on the terminal board by the 6H6 socket.



The 3/16-inch holes pointed out here must be drilled to accomodate transformer 38879 in the Farnsworth GK140 series.

This completes the changes. It is now necessary to align the i.f.'s on f.m. Connect a voltohmyst on the AVC line (Pin 3 on 6H6 socket through a 1-megohm resistor).



The circuit of the Farnsworth GK140 series as it appears after modification.

Connect the a-m signal generator, set at 10.7 mc, to the grid of the 6SK7 which feeds the diode transformer. Connect the output meter across the voice coil of the speaker. Turn the bottom slug next to the chassis of the diode transformer out as far as possible. Tune the top slug for maximum output (negative voltage) on the voltohymst. Move the generator to the grid of the second i-f amplifier. Detune the slug under the chassis by turning it out as far as possible. Tune the top slug for maximum voltage, next tune the bottom slug for maximum voltage. In each step do not use an input greater than necessary to give three volts AVC. Move the signal generator to the grid of the first i-f amplifier. Detune the bottom f-m slug (nearest corner of can) by turning it out as far as possible. Tune the top slug (nearest corner of can) for maximum voltage, next tune the bottom slug for maximum voltage. Move the signal generator to the 6AG5 converter grid and tune the first i-f transformer as described previously. With the generator still hooked to the 6AG5 grid and modulated with 400 cycles and with about 200 microvolts input, adjust the slug next to the chassis on the diode transformer for maximum output voltage on output meter, which is across the voice coil.

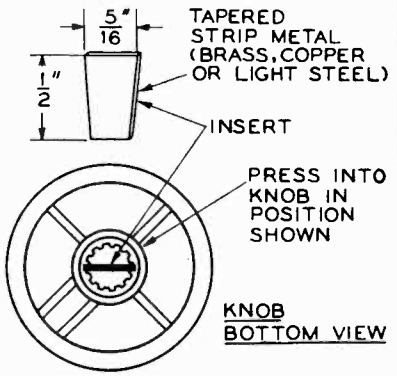
Farnsworth GK-266, K-699, Chassis C-152, GK-267, K-267 Chassis C-153

These models are the same as Models EK-263 and EK-264, which appear on *pages 15-7 through 15-9 of Rider's Volume XV*, except for the cabinets. The parts list should be amended to include the following:

Ref. No.	*Part No.*	*Description*
39	94235	Output transformer, GK-266, GK-267, K-267, K-669
41	38533	Loop antenna, EK-264, GK-267, K-267
41	38997	Loop antenna assembly, K-669
41	38894	Loop antenna assembly, GK-266
47	81169	Speaker, K-669
47	81170	Speaker, GK-266, GK-267, K-267
	31318	Dial glass, EK-264, GK-267, K-267
	31280	Dial glass, EK-263, EK-265, GK-266, K-669
	59211	Dial escutcheon, EK-264, GK-267, K-669, K-267
	59199	Dial escutcheon, EK-263, EK-265, GK-266
	58587	Dial background, GK-266, K-669
	58586	Dial background, GK-267, K-267
	H-278-1	Cabinet and packing, GK-267, walnut
	H-278-2	Cabinet and packing, GK-267, blonde
	H-277-1	Cabinet and packing, GK-266, walnut
	H-277-2	Cabinet and packing, GK-266, blonde
	H-317	Cabinet and packing, K-669
	59134	Knob for walnut cabinets
	59450	Knobs for GK-266, GK-267, blonde

Farnsworth P7, P9, P10, Capehart

These models appear on *pages 19-19 through 19-33 of Rider's Volume XIX*. The program control knob on these models turns a switch with detent contacts. If this knob is not pushed down to grip a substantial portion of the knurled shaft, the inside of the knob may become reamed out and in time lose its ability to grip the shaft sufficiently to actuate the switch.



Method of wedging the program control knobs of the Farnsworth P7, P9, P10, so they grip the shaft.

If such a condition occurs and there is no replacement knob handy, refer to the accompanying diagram and the following:

A piece of metal strip 5/16" × 3/8" or ½" should be wedged tightly into the center of the knob. When the knob is placed over the shaft, the metal insert will engage the shaft slot.

Improved knob gripping can sometimes be obtained by slightly spreading the shaft slot. Care must be exercisied in doing this however. If the shaft slot is spread too far, it is likely to break or be spread unevenly, thereby imparting an undesirable "wobbly motion" when turned.

If hum is encountered in the 35P7 or in any instrument using the P7, P9, or P10 chassis, it may be due to either a gaseous or aged 6T8 that is used as the 1st audio amplifier, or a signal that is being picked up on the power line because of a faulty 0.005-μf, 600-volt capacitor, Part No. 25031, located between the unbuffered side of the line and ground.

Farnsworth P71

This model appears on *pages RCD. CH. 19-1 through 19-10 of Rider's Manual Volume XIX*. The following changes should be noted in the parts list:

Part No.

07594 Turntable assembly, changed to 15241

64437 Tone arm counterbalance spring, changed to 64343.

Part number 44064, phono motor, has been deleted. This is shown on *pages RCD. CH.19-5*. It is available as Part Number 11437 only. Motor parts, Numbers 15237, 37241, 54308, 64471, and 92335, are no longer available as separate parts. If any of these are required, a complete motor assembly, No. 11437, must be ordered.

Farnsworth P72 Record Changer

This record changer may be found on *pages RCD.CH. 18-25 through RCD.CH. 18-9 of Rider's Volume XVIII*. A production change has been made in the Surfa-Sonic Control. The 0.02-μf capacitor has been changed to 0.1 μf. The 3,300-ohm resistor has been changed to 2,200 ohms.

The following have been deleted from the parts list:

Part No.	*Description*
25276	0.02 μf, 200 v
77240	3,300 ohms, ½ w

The following have been added to the parts list:

25182	0.1 μf, 200 v
77184	2,200 ohms, ½ w

Farnsworth P71, P72, P73

Model P71 appears on *pages RCD.CH.19-1 through 19-10 of Rider's Manual Volume XIX*, and Models P72 and P73 appear on *pages RCD. CH. 18-1 through 18-9 of Rider's Manual Volume XVIII*. There appears to be some misunderstanding concerning the correct nomenclature of parts numbers 58854 and 64467. Part 58854 is correctly titled "Starting Lever Spring". The function of this part is to exert the proper amount of tension on part 58853, starting reset lever, which in turn performs the dual purpose of transmitting the motion of the trip mechanism to the starting lever, thus setting the starting lever in the proper position for starting the change cycle and also resetting the starting and reject levers, after the change cycle has started, to their proper positions. Part 64467 performs the operation of transmitting the motion from the reject button mechanism to the reject lever, thus starting the change cycle. Part 64467 is referred to in the parts list as the "Trip Spring". In order to avoid future misunderstanding, the nomenclature of this part has been changed to read—Part #64467, Reject lever spring.

Farnsworth 41E Capehart Record Changer

This record changer may be found on *pages RCD.CH. 18-25 through RCD.CH. 18-46 of Rider's Volume XVIII*. The change cycle is placed into operation when the trip finger releases the mercury switch dog (part number 561222). If, for any reason, a changer should fail to cycle properly and, upon checking, the trip mechanism is found to be operating normally, it is suggested that the top of the mercury switch Reset Lever (part number 561221) be examined to make sure that it is smooth. Many hours of operation may tend to wear a groove in the top of the Reset Lever which would tend to hold the dog in place, thus resisting the action of the trip mechanism. This condition is caused by normal wear due to friction between the two parts.

When this condition is found, it is recommended that the mercury switch Reset Lever be replaced by a new one. The new stock has been hardened to provide longer operating life.

In an early production run, a mercury switch with a metal shell or housing was used. Due to the slow action and greater angle of drop necessary to actuate this switch, it has since been replaced by one using a glass housing or bulb. Changers employing the metal-housed mercury switch should be checked for positive switch action, especially if it has been reported that the changer cycles continuously, or more than once for a single tripping action.

In such cases, it is recommended that the metal switch be replaced with the more positive glass bulb type (part number 90147). The contacts of the Play Control switch must be set so that positive contact is made when the play control knob is set in OFF position. In this position the contact points must be OPEN.

It is not necessary to remove the play control to adjust these contacts on the majority of the Model 41-E changers now in use. A 5/16" diameter observation hole has been added to the back of the play control housing directly in line with the contact points. With the changer on the service bench, it is an easy matter to insert a screwdriver or a pair of long nose pliers and bend the contact springs slightly.

This operation is a little more difficult with the changer in the cabinet, as there is only about a 3-inch clearance between the back of the play control housing and the side of the cabinet. A small inspection mirror, a "knob" type screwdriver and a penlite will be helpful in making these adjustments when the changer is in the cabinet.

Federal 1021, 1031, 1032, and 1540

These models are the same as Model 1030T, appearing on *pages 16-5 through 16-8 of Rider's Volume XVI*, except for the cabinets.

Federal 1024TB

This model appears on pages *17-1 through 17-3 of Rider's Volume XVII*. Some sets have been equipped with a 12SK7 tube as an i-f amplifier instead of the 6SS7. This gives better performance.

Federal 1027, 1035

These models are the same as Model E1025TB, appearing on *pages 16-1 through 16-4 of Rider's Volume XVI*, except for the cabinets.

Federal 1028TB, 1029

These models are the same as Model 1024TB, appearing on *pages 17-1 through 17-3 of Rider's Volume XVII*, except for the following changes. A 12SK7 tube is used as the i-f amplifier instead of the 6SS7. The cathode resistor (R2) of the i-f amplifier can be either 1500 ohms or 750 ohms. C17 can be either 470 $\mu\mu$f or 1000 $\mu\mu$f. R13 (in filament lead) has been eliminated, and pin 2 of the 50L6GT tube connected to pin 7 of the 35Z5GT tube.

Federal 1034

This model is the same as Model 1024TB, appearing on *pages 17-1 through 17-3 of Rider's Volume XVII*, except for the cabinet.

General Electric 41, 42, 43

These models appear on *pages 17-12 through 17-15 of Rider's Volume XVII*. To increase the sensitivity at certain points on the broadcast and shortwave bands, a 470-$\mu\mu$f capacitor, C111, catalog number UCU-544, has been added between terminals 3 and 5 on the first i-f transformer. On early production sets without this capacitor, the following should be done:

1. This capacitor should be added between terminals 9 and 10 of wafer #6 on the band switch.
2. The orange, green, and black leads from terminals 5, 3, and 8 of the first i-f transformer to the band switch should be grouped together and pressed to chassis.
3. C108, a 0.02-μf bypass capacitor, ground end, should be removed and grounded under the mounting lug of the first i-f plate coil.

General Electric 50

This model appears on *pages 15-1 through 15-4 of Rider's Volume XV*. Add to the description of catalog number RAU-009 Cabinet—plastic cabinet, the color "Brown Mottle." Also, add the following to the parts list:

Cat. No.	*Description*
RAU-017	Cabinet—plastic cabinet (black)
RAU-018	Cabinet—plastic cabinet (dark ivory)
RAU-019	Cabinet—plastic cabinet (ivory and red)
RAU-024	Cabinet—plastic cabinet (white urea)

General Electric 118, 119

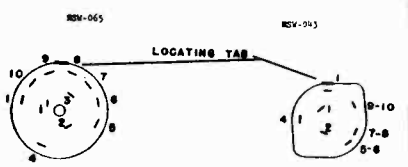
These models appear on *pages 19-8 through 19-10 of Rider's Volume XIX*. The green grid lead and blue plate lead of the first i-f transformer must be dressed as far as possible to the rear of the chassis and against the chassis. Coupling capacitor C24 should never lie against either of these leads. This will eliminate any possibility of r-f leakage into the phono-preamplifier which causes stations to be heard while operating the phonograph.

The following changes should be made in the parts list. Add P2 under symbol for RJP-003. Delete: RCN-014, C26, Capacitor—phenolic, for Model 118. Add to UCC-045: C26, Capacitor, 0.05 μf, 600 v., paper, for Model 118.

General Electric 118, 119M, 119W

These models appear on *pages 19-8 through 19-10 of Rider's Manual Volume XIX*. The phono radio switch S1, catalogue number RSW-043 has been changed to RSW-065 and the new switch is wired as follows:

Connect terminals 1 and 3 together. Connect terminals 5 and 6 together. Connect terminals 7 and 8 together and then connect terminals 9 and 10 together. The leads may then be transferred from the old switch to the corresponding terminals on the new switch RSW-065, as shown in the accompanying diagram.



General Electric 118, 119.

General Electric 145

This model appears on *pages 19-13 through 19-16 of Rider's Volume XIX*. The B battery minus connection is made to the dummy lug 5 on the switch shown in Fig. 2.

General Electric 150

This model appears in *Rider's Manual Volume XIX on pages 19-10 through 19-12.*

If a condition of parasitic oscillation with strong signals and high volume setting, characterized by whistles and distorted output is reported on late production models in the gray cabinet the following change will correct the condition:

Change the grid return of the i-f amplifier by moving bus wire lead on #2 lug of first i-f transformer to pin #5 of the r-f amplifier (1T4), instead of pin #5 of the i-f tube. This changes the bias of the i-f amplifier from zero volts to minus 1.4 volts.

The following replacements should be made in the catalogue numbers:

Delete the following parts:

Old Cat. No.	*New Cat. No.*	*Symbol*	*Description*
URD-009	URE-009	R1	Resistor - 330 ohms, 1 w., carbon*
RCE-069	RCE-087	C2A,B,C	Capacitor - Electrolytic capacitor
RCW-3013	RCW-3015	C11	Capacitor - Electrolytic capacitor*
RHB-004	RHB-009		Monogram Button**
RLL-029	RLL-034		Loop - Antenna loop
SJS-068	RJC-016		Speaker Contact and Lead
		RAB-080	Cabinet Back - Plastic (ivory)
		RAU-041	Cabinet - Plastic (ivory)

Add the following parts:

RAB-081		Cabinet Back - Plastic (gray)
URD-045	R5	Resistor - 680 ohms, ½ w., carbon*
RHS-010		Tube shield*
UCC-625	C12	Capacitor - 0.005 μf, 600 v., paper*
UCC-635	C9	Capacitor - 0.05 μf, 600 v., paper*
RHM-052		Clip - Clip for loop antenna

*Applies to receivers with chassis number greater than 100,000.
**The new button is attached to the cabinet by means of glue.

For chassis numbers up to 55,000 the capacitors C10, 100 μμf, and C12, 0.005 μf, were not connected according to the schematic diagram. Their B- connections were made to the left side of the switch S1B, together with the capacitors C2A and C2B. This was done to prevent a howling sound when the power switch S1 is turned off.

For chassis numbers from 60,000 to 70,000 the capacitors C10 and C12 were wired according to the schematic diagram. However, the wiring of the capacitors C2A and C2B has been changed. It was found that, under certain circumstances, these capacitors added their charge to the peak of the line voltage, causing a current surge which was capable of damaging any tube Therefore, the negative sides of the two capacitors (C2A and C2B) were connected to the right side of the switch S1B (B- line) and the positive side of C2B was connected to the terminal of the S2A switch which is connected to the B+ line of the receiver. Now the charge can leak off after the set is disconnected from the power supply. The following replacement has been made in the parts list:

Connecting pin SJS-008 for the loop antenna has been changed to RJC-001.

General Electric 160

This model appears on *pages 19-17 through 19-21 of Rider's Manual Volume XIX*. The following change in parts list should be noted:

Change catalogue number RTO-003 to read RTC-003 T5 Transformer-charging transformer.

GE 201, 202

Since there are electrically identical, these models have been added to the listing for Models 200, 208, and 205 which appears in *Rider's Volume XVIII, pages 18-19 and 18-20.*

The following items have been added to the parts list:

RAU-001 Cabinet—ivory (plastic), model 201

RAU-023 Cabinet—brown (plastic), model 202

The Beam-a-Scope cabinet back listed as RAB-003 also applies to models 201 and 202

General Electric 230, Kaiser-Frazer

This model appears on *pages 18-26 through 18-28 of Rider's Volume XVIII.* When rough manual tuning action is experienced, it is usually traced to insufficient spacing between the end of the center shaft of the turret assembly and the guide rod bracket near the tuning shaft. Production requirements call for one or more (as required) brass shim washers at this point for smooth tuning action. Where rough tuning is experienced, a thin "C" washer slipped onto the end of the center shaft of the turret in addition to the brass shim washers will relieve binding and result in smoother tuning action.

GE 230, 233

Model 230 appears in *Rider's Volume XVIII on pages 18-26 through 18-28* and Model 233 in the same Volume, *pages 18-29 through 18-36*. To the replacement parts list for these two models add RMX-120, Coil Cap Retaining Spring and Screw.

A quantity of these are used to service the antenna r-f or oscillator-converter coil and shield assemblies where the tabs have been broken. The spring is placed upon the assembly to form a bridge. Bearing upon the coil and held by the small self-tapping screw through the hole in the shield, the bridge retains the coil within its shield in lieu of tabs.

While early production receivers of Model 233 were wired as shown in the schematic, late production changes revise the power supply circuit as follows:

R24 has been deleted and the circuit for C30 is completed by connecting its free end to the secondary winding lead going to pin 5 of the rectifier, V8, so that C30 appears across the secondary of T4. Resistors R26 and R27 are connected in series with one another and across the primary winding of T4. The junction of the resistors is grounded.

To conform with these production changes, Cat. Part URE-073, R24 is deleted from the replacement parts list and item URD-023, R26 and R27, 82 ohms, ½ w., carbon resistor is added.

Cat. No. RMX-123, pushbutton locking screw is also added. This screw locks the pushbutton device for automatic station tuning and has a knurled head and threaded end

Cat. No. RCY-028 for C1 has been changed for an improved antenna trimmer, 8-480 μμf, used in late production, listed RCY-052. This item allows knob adjustment of the antenna trimmer for which a knob is available under Cat. No. RDK-158.

General Electric 233, Kaiser-Frazer

This model appears on *pages 18-29 through 18-36 of Rider's Manual Volume XVIII.* In cases where the volume and tuning control shafts appear too short to accomodate the shaft parts and knobs, a formed lip which is bent forward in the escutcheon opening of the instrument panel will be found to obstruct receiver installation. This lip may be removed by either filing or bending it back.

In instances where the hole for the receiver mounting bracket has not been accurately located, it is possible that the receiver is positioned a bit too far toward the front of the car to allow the receiver control shafts to come through instrument panel holes to their maximum extent. If the "knock out" hole for the mounting brackets screw must be drilled, make certain it is accurately positioned.

In case of pushbutton sticking, check for and remove any burrs from the bottom of the cast grille for pushbutton openings. A binding tuning shaft will also cause the pushbottons to stick or fail to return to their normal positions. To clear shaft from binding, enlarge the tuning shaft opening using a reamer, or a rat tail file.

If the receiver is dead, check installation wiring to make certain the correct lead is connected to the ignition and instrument light switch respectively. If the receiver lead that should go to the instrument light control is connected to the ignition switch, the receiver will not operate though pilot lamps will light.

Check the loudspeaker plug connection. Though the plug pin receptacles in the speaker lead connector are arranged in such a manner to be polarized, it is often that the operator neglects to align the receptacles with respect to the male plug pins at the speaker. Forcing together of the incorrectly aligned parts is liable to cause the male pins to break through into the thin walls of the non-conducting adjacent holes of the speaker plug, resulting in open circuit wiring to the loudspeaker.

Exposure of the radio receiver to such dampness as water drain-leaks upon the receiver components and wiring, results in voltage breakdown at tube sockets (especially the 6V6 output tubes), or the shorting of capacitors and resistors. The r-f trimmer strip at the center of the receiver will also be affected, causing the radio to become weak or dead. Water leaks around the windshield, and screw head holding the set mounting bracket to the cowl should be well sealed against water draining upon the receiver. A thorough check for probable leaks and the necessary steps taken to prevent their occurrence should be taken at the time of the initial radio receiver installation.

A lower than normal battery voltage can be the cause of the radio to be weak or fail to operate. The receiver will not function properly if the battery voltage measures less than 5.8 volts.

The following changes in production wiring should be noted in the schematic diagram:

Capacitor C28 has been changed to the left side of switch, S1, at the junction of C27 and the switch connection. The ground lead of C28 is connected to chassis ground.

GE 210, 211, 212

These models appear in *Rider's Volume XVIII, pages 18-21 through 18-25.* In the schematic diagram C12 is shown as 22 μμf. This should be corrected to read 20 μμf. C12 is listed correctly in the replacement parts list as Cat. No. RCW-3016, 20 μμf.

The following items should be added to the replacement parts list:

RII-021—Insulator — Textolite (to insulate the volume control from chassis)

RII-022—Insulator — Textolite (to insulate the band switch from chassis)

In the tube and trimmer location shown on page 18-25, the secondary tuning slug of T6 is available through the top of the can, while the primary tuning slug of T6 is available through the holes in the bottom of the can.

General Electric 219, 220, 221

These models appear on *pages 15-28 through 15-31 of Rider's Volume XV.* In the parts list, catalog number RLL-003 should be identified as a replacement loop assembly only for Models 219 and 220. Catalog number RLL-025 should be added as the loop assembly for Model 221.

General Electric 250, 260

Model 250 appears on *pages 15-32 through 15-36 of Rider's Volume XV.* Model 260 appears on *pages 16-6 through 16-12 of Rider's Volume XVI.* The following should be added to the parts list for both models: Hinge pin for cover, catalog number RMP-011.

General Electric 321A

This model is the same as Model 321 Late, appearing on *pages 15-46 and 15-52 of Rider's Volume XV.*

General Electric 356, 357, 358

These models appear on *pages 18-40 through 18-44 of Rider's Volume XVIII.* The following changes should be made in the parts list. Under UCC-025, remove symbols C43, C65, C70. Add to UCC-026 symbols C43, C65, C70.

General Electric 356, 357, 358; 376, 377, 378

Models 356, 357, and 358 appear on *pages 18-40 through 18-44 of Rider's Volume XVIII.* Models 376, 377, and 378 appear on *pages 19-36 through 19-41 of Rider's Volume XIX.* When an old type construction 6BE6 (date coded 8/17 or before) is replaced with a new type construction 6BE6 (dated 8/22 or later) it is necessary that the f-m oscillator choke coil L8 be a 13½-turn coil (catalogue number RLF-012) instead of the 17-turn coil that was used in early production models.

General Electric 376, 377, 378

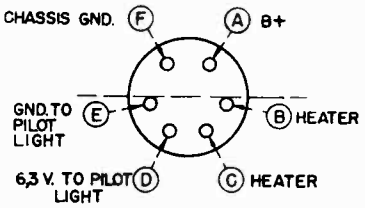
These models appear on *pages 19-36 through 19-41 of Rider's Volume XIX.* The f-m choke, L8, in the cathode circuit of the 6BE6 oscillator converter tube, V2, was listed under catalog number RLF-007. Due to a production change, this choke now becomes RLF-012.

Delete URD-033, R12, Resistor—220 ohms, ½ w., carbon. Add URD-037, R12, Resistor—330 ohms, ½ w., carbon. Add RCW-3009, C37, Capacitor—20.5 μμf. ±5%, ceramic. Delete UCW-2011, C37, Capacitor—20 μμf, ceramic. Add symbol number P4 to RJP-003. Delete P3 and P4 (Plug—preamplifier power plug) from RJP-004. Add RJP-005, P3, Plug—preamplifier power plug.

General Electric 417, 417A

Model 417 appears on *pages 16-16 through 16-19,* and *pages 16-21 through 16-24 of Rider's Volume XVI.* Model 417A appears on *pages 17-27,28 through 17-38 of Rider's Volume XVII.* These changes are in reference to the wiring of Phono Preamp Plug RJP-005.

Since some of the plugs supplied are inconsistent with specifications regarding the identification notch often referred to in wiring guides, this notch must be disregarded for indentification purposes to avoid confusion. While in some receiver productions the position of this key notch will differ from others, nevertheless, all receiver productions are wired the same in respect to the polarized system of prong arrangement.



Phone Preamp Plug RJP-005 in the GE 417, 417A should be wired as shown.

When replacing the plug RJP-005, it is only necessary to follow the simple wiring rule as used in all receiver production where the cluster of four prongs is first located within one-half the area of the plug base as determined by the imaginary center line. Next, locate the two remaining prongs as viewed from the prong end of the plug and begin the wiring in a clockwise direction as indicated by the letter designations in the accompanying diagram. The letters A, B, C, etc., in the diagram, are keys to wiring points, as referred to in the various published receiver circuit diagrams.

Magnavox AMP-101C

This model is the same as Model AMP-101A on *pages 17-1 and 17-2 of Rider's Volume XVII,* except for the following changes in parts values.

Ref. No.	*Description*	*Part. No.*
2-1	Capacitor, paper, 0.1 μf 600 v.	250152G33
2-2	Capacitor, paper, 0.1 μf, 600 v.	250152G33
8	Resistor, composition, 15,000 ohms, ±10%, ½ w.	230084G76
9	Resistor, composition, 100,000 ohms, 10%, ½ w.	230084G86

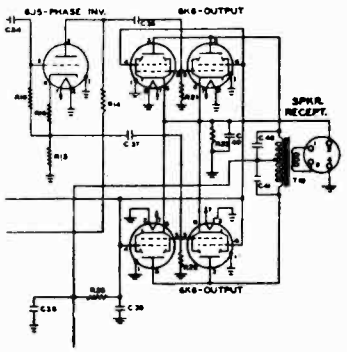
Magnavox AMP 111D, AMP 111E

These models are the same as Model AMP 111, appearing in *Rider's Volume XVIII, pages 18-4 through 18-7,* except for the following parts value changes:

Ref. No.	*Description*	*Part. No.*
9	Capacitor, paper, 0.03 μf, 400 V	250152G25
22	Resistor, composition, 22,000 ohms, ±10%, ½W	230084G78

Hoffman C501 and C511, Chassis 108

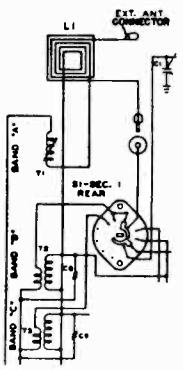
These models are the same as Model A501, Ch. 108S, appearing on *pages 15-6 through 15-10 of Rider's Manual Volume XV,* except that four 6K6 beam-power tubes are used in push-pull parallel in the output stage instead of the two push-pull 6V6's. The change is indicated in the accompanying diagrams. The alignment is still the same as given on *page 15-9.*



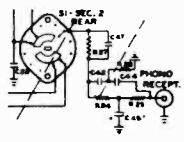
6K6 tubes for Hoffman C501 and C511.

The parts list should be changed to read as follows:

Symbol	*Description*	*Hoffman Number*
C47, C23, C24, C25	100μμf, ± 20%, mica	4000
C28, C32	0.005μf, 600 volt, tubular paper	4102
C29, C30	10μf, 450 volt, tubular electrolytic	4203
C31, C33, C34	0.01μf, 400 volt, tubular paper	4112
C41, C46	0.001μf, 600 volt, tubular paper	4104
C43	0.01μf, 600 volt, tubular	4103
C42, C44	330μμf, ± 10%, mica or ceramic	4010
C45	650μμf, ± 10%, mica or ceramic	4011
L1	Loop antenna	55210
LS	12" speaker, electrodynamic	9044
R2, R17	22,000 ohm, ± 20%, ½ w	4501
R3, R27	2.2 megohm, ± 20%, ½ w	4502
R4	10,000 ohm, ± 10%, 2 w	4503
R11	4,700 ohm, ± 20%, ½ w	4543
R12, R18	47,000 ohm, ± 20%, ½ w	4504
R23	500 ohm, ± 20%, 3 w	4550
R28	1,500 ohm, ± 5%, 6 ½ w	4701
R13, R14, R24, R25	47,000 ohm, ± 5%, ½ w	4537
R26	22,000 ohm, ± 5%, ½ w	4538
T10	Output transformer	5108



Antenna connection changes for Hoffman C501 and C511.



Circuit changes for Hoffman C501 and C511.

Ketay RP570T

This model appears in the *Miscellaneous section, page 15-8 of Rider's Manual Volume XV.* This model is listed in the Indexes as RP507T. It should read RP570T.

Magnavox AMP-109B, AMP-109C, AMP-109D

These are the same as Model AMP-109 on *pages 18-1,2 through 18-3 of Rider's Volume XVIII*, except for the following changes. In Model AMP-109D, only, the 4-ampere, 250-volt fuse has been removed from the a-c line. Pin number 1 of the changer motor receptacle is now connected to the bottom of the primary of the a-c transformer. A 4-ampere, 250-volt fuse is connected from the bottom of the primary of the a-c power transformer to the high side of the a-c power socket. This side of the a-c power socket is also connected to pin 1 of the speaker socket.

The following parts have been substituted:

Ref. No.	*Part No.*	*Description*
3	250152G33	Capacitor, tubular, 0.1 μf, 600 v.
4	250152G33	Capacitor, tubular, 0.1 μf, 600 v.
22	230084G21	Resistor, composition, 22,000 ohms, ½ w. (AMP-109B only)
22	230084G18	Resistor, composition, 6,800 ohms, ½ w. (AMP-109C & D only)

Magnavox CR197 Series

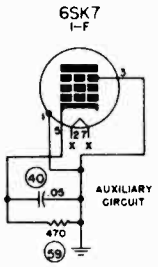
Models CR197, CR197A, and CR197B appear on *pages 16-1, 2 through 16-7 of Rider's Manual Volume XVI*. The schematics and parts lists for Models CR197C, CR197D, and CR197E are similar to those listed above except for the following changes:

Part No. 8 is now connected from ground to the junction of 24, 83, and 99, in all models.

Part No. 9 is now connected from ground to the junction of 25, 85, and 99, in all models.

The value of Part No. 13 has been changed from 20 $\mu\mu$f to 13 $\mu\mu$f in all models.

Resistor 61 has been deleted in Models CR197D and CR197E, as shown in the accompanying diagram.



Circuit changes for the Magnavox CR197D and CR197E.

Part No. 106, a 6-volt socket, has been added between the filament connections and the lamps in Model CR197E only.

The supplement to the parts list is as follows:

Part No.		*Magnavox Part No.*
	CR197A	
32	Capacitor, paper, 0.02 μf, 600 v	250152G37
49	Omitted	
61	Resistor, composition, 2,200 ohms, ½ w	230084G15
65	Resistor, composition, 10,000 ohms, ½ w	230084G19
88, 89, 90, 91	Omitted	
99	Switch, rotary band selector	160172G1
106	Omitted	
	CR197B	
32	Capacitor, paper, 0.02 μf, 600 v	250152G37
49, 88, 89, 90, 91, 106	Omitted	
	CR197C	
19	Capacitor, molded mica, 680 $\mu\mu$f, ±10%	250159G131
32, 49, 65	Omitted	
88	Resistor, composition, 680,000 ohms, ±10%, ½ w	230084G90
99	Switch, rotary band selector	160172G1
106	Omitted	
	CR197D	
19	Capacitor, molded mica, 680 $\mu\mu$f, ±10%	250159G131
32, 49, 61, 65	Omitted	
88	Resistor, composition, 680,000 ohms, ±10%, ½ w	230084G90
89	Resistor, composition, 150,000 ohms, ±10%, ½ w	230084G88
90, 91, 106	Omitted	
	CR197E	
19	Capacitor, molded mica, 680 $\mu\mu$f, ±10%	250159G131
32, 61, 65	Omitted	
88	Resistor, composition, 680,000 ohms, ±10%, ½ w	230084G90
89	Resistor, composition, 150,000 ohms, ±10%, ½ w	230084G88
90, 91	Omitted	
106	Socket, 6 volt	189788G1

Magnavox CR198 Series

Chassis CR198, CR198A, and CR198B appear on *pages 16-5 through 16-11 of Rider's Manual Volume XVI*. The schematic diagrams and the parts lists for Chassis CR198C, CR198D, CR198E, CR198F, CR198H, and CR198J are the same as those for CR198, CR198A, and CR198B except for the changes that are noted below.

Item No. 13 has been changed from 20 $\mu\mu$f to 13 $\mu\mu$f.

Section 1 front of item 99 is the same for all models except for J. This wafer is shown in Figure 1.

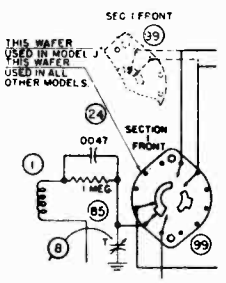


Fig. 1. Wafer used in Magnavox CR198 Series.

The position of item 12 has been changed for model J only. Capacitor 12 for model J has been removed from across item 4 and inserted in the wafer lead to the junction of items 4 and 43. In all other models, it remains in parallel with item 4.

Resistor 91 has been inserted from the tap of item 97 to item 91. Its value is shown in the accompanying table.

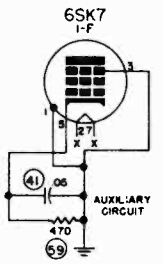


Fig. 2. Auxiliary Circuit for Magnavox CR198 Series.

Resistor 62 has been deleted from all models except CR198A, CR198B, and CR198C. The auxiliary circuit is shown in Figure 2.

The connection from item 99, section 2 rear, to the cathode and grid leads of the 6J5, 1st a-f stage, has been deleted. Resistor 83 is now connected between pins 1 and 5 of the 6J5, in all models except CR198A. The values are given in the accompanying table.

Table of electrical values for Magnavox CR198 Series.

ITEM NO	ELECTRICAL VALUES						
	CR 198 A	CR 198 B	CR198D	CR198E	CR198F	CR198H	CR198J
16	000068	0001	0001	0001	0001	OMIT	OMIT
24	01	005	005	005	005	005	005
31	02	015	015	015	015	015	015
21	00033	00068	00068	00068	00068	OMIT	OMIT
83	OMITTED	680K	680K	680K	680K	820K	820K
72	4700	22K	22K	22K	22K	22K	22K
89	OMITTED	OMITTED	150K	150K	150K	OMIT	OMIT
106	OMITTED	OMITTED	OMITTED	USED	USED	USED	USED
62	2200	2200	OMITTED: SEE AUXILIARY CIRCUIT				
90	OMITTED	OMITTED	OMITTED	OMITTED	6.8 MEG	330K	330K
91	OMIT -	OMIT	OMIT	OMIT	OMIT	10K	10K

Items 48, 90, and 89 have been added as shown in Figure 3. Item 48 appears

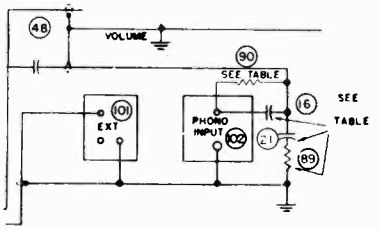


Fig. 3. Circuit changes for Magnavox CR198 Series.

in Models CR198H and CR198J only. Its value is 0.001 μf.

The 6-volt socket, item 106, has been inserted across the filament leads in models CR198E, CR198F, CR198H, and CR198J.

The positions of items 8 and 9 for all models have been changed from the transformer side of the *R-C* filter to ground, to the wafer side and to ground.

Magnavox CR-202 Series

These models appear on *pages 18-16 through 18-25,26 of Rider's Manual Volume XVIII*. Two resistors, R143 and R144, have been added to Ch. CR-202C. R143 is connected between C41 and the junction of R118 and C64. R144 is located between the junction of R142, R113, and C40, and the rotary band switch 153.

The parts list should be amended to include the following:

Ref. No.	*CR-202A*	*Part No.*
34	Capacitor, mica 510 $\mu\mu$f, ± 5%	250159G64
40	Capacitor, mica 300 $\mu\mu$f, ± 10%	250159G88
41	Capacitor, mica, 510 $\mu\mu$f, ± 5%	250159G64
113	Resistor, comp, 82,000 ohms, ½ w, ±10%	230084G85
124	Resistor, comp, 220,000 ohms, ½ w, ±10%	230084G27
142	Omitted	
143	Omitted	
144	Omitted	
	CR-202B	
142	Resistor, comp, 3.3 megohm, ½ w	230084G34
	CR-202C	
40	Capacitor, mica, 0.002 μf, ±10%	250160G68
41	Capacitor, mica, 0.0015 μf, ±10%	250160G66
124	Resistor, comp, 470,000 ohms, ½ w	230084G94
143	Resistor, comp, 33,000 ohms, ½w, ±10%	230084G80
144	Resistor, comp, 150,000 ohms, ½w	230084G26
	CR-202D	
124	Resistor, comp, 470,000 ohms, ½ w	230084G94

Magnavox CR-208C

This model is the same as Model CR-208 appearing on *pages 17-13 and 17-25,26 through 17-31 of Rider's Volume XVII*, except for the following changes. Capacitor 15 has been changed in value from 510 $\mu\mu$f to 150 $\mu\mu$f. A 150,000-ohm resistor (80) has been connected in series with capacitor 15. Capacitor 16 and resistor 72 in series with it have both been omitted. Capacitor 17 has been changed from 510 μf to 150 μf. A 33,000-ohm resistor (79) has been connected in series with capacitor 17. Resistor 71 has been changed from 220,000 ohms to 470,000 ohms.

The following changes have been made in the parts list:

Ref. No.	*Description*	*Part No.*
15	Capacitor, fixed mica, 220 $\mu\mu$f, 500 v	250160G68
16	Omitted	
17	Capacitor, fixed mica, 1500 $\mu\mu$f, 500 v	250160G66
71	Resistor, composition, 470,000 ohms, ±10% ½ w.	230084G94
72	Omitted	
79	Resistor, composition, 33,000 ohms, ±10%, ½ w.	230084G80
80	Resistor, composition, 150,000 ohms, ±10%, ½ w.	230084G88

Majestic 6FM769, 6FM783, Ch. 6C14D

Model 6FM783 is a 1949 styled, 6-tube, using Oak and Milwaukee record changers, console combination using a cabinet similar to Model 8FM783, which appears on *pages 17-17, 18 through 17-22 of Rider's Manual Volume XVII* and on *page C18-4 of Rider's Manual Volume XVIII*. Model 6FM769 is a 1949 styled, 6-tube, console combination using the Aero record changer.

For voltages, alignment, and chassis parts refer to data on Model 6FM773 which appears on *pages 18-3 through 18-4 of Rider's Manual Volume XVIII*. The output transformer, T3, is located on the speaker instead of on the chassis. The parts list remains the same except for the following changes:

Symbol	*Part No.*	*Description*
L1	S-2017	Loop antenna assembly (BC only)
	117-108	Dial scale, glass
	117-109	Dial scale, background
	129-65	Dial scale clips, (6 req'd)
	133-34	Dial pointer
	15-91	Socket, speaker
	115-61	Cabinet, console-Model 6FM783
	115-70	Cabinet, console-Model 6FM769-mahogany
	21-24	Oak record changer (6FM783)
	21-31	Milwaukee record changer (6FM783)
	21-36	Aero record changer (6FM769)
	22-63	Speaker, 8" PM
	122-57	Escutcheon plate
	128-63	Knob, tuning
	128-68	Knob, tone
	128-69	Knob, volume
	128-80	Knob, bandswitch
	120-60	Spring, for knobs
	123-39	Cabinet back Model 6FM783
	123-40	Cabinet back Model 6FM769

Motorola CR7

This model is the same as Model CR6, appearing on *pages 16-9 and 16-10 of Rider's Volume XV* and *pages 16-1 through 16-8 of Rider's Volume XVI*.

Noblitt-Sparks Chassis RE-202, RE-231

These chassis are used in Models 555, 555A, 552N, and 552AN, appearing on *pages 16-1 through 16-4 of Rider's Volume XVI*.

Meck Chassis 4D7

Chassis 4D7 is used in models DA-601, DB-602. This chassis is similar to model DA-601, which appears on *page 19-5 of Rider's Manual Volume XIX*. The 4D7 differs from the 6B8 in the following ways: Capacitors C1, C2 and C7 have been deleted. A capacitor, designated as C2, has been inserted in place of C7. Resistor R1 has been removed from across the junctions of R2 and R3, and L1 and C2, and is now located in the cathode lead of the pentode (12BA6, 12SG7). Capacitor C5 is connected from the plate lead of the tetrode (50B5, 50L6) to ground. The parts list is given below, with the exception of those parts that are identical to those for the DA-601.

Symbol	*Part No.*	*Description*
C2	CP-14203	Capacitor, paper, tubular, 0.02μf, 400v
R1	RC-10680	Resistor, carbon, 68 ohms, ½w
R2	RC-11003	Resistor, carbon, 100,000 ohms, ½w
R4	RC-11005	Resistor, carbon, 10 megohms, ½w
R5, R6	RC-14703	Resistor, carbon, 470,000 ohms, ½w
R7	RC-11500	Resistor, carbon, 150 ohms, ½w
R8	RC-32001	Resistor, carbon, 2,000 ohms, ½w
L1	TRF10017-A	Antenna coil
C4	CP-12502	Condenser, paper, tubular, 0.005μf, 200v.
C3	CP-12202	Condenser, paper, tubular, 0.002μf, 200v.

RCA Q109, Ch. RC-602

This model appears on *pages 18-3 through 18-10 of Rider's Volume XVIII*.

On some sets the filter capacitor C44 has two sections of 15 μf and one section of 20 μf at 450 volts and one section of 20 μf at 25 volts. The capacitor specified in the Q109 service data has three sections of 10 μf at 450 volts and one section of 20 μf at 25 volts. Use the specified capacitor (Stock No. 33014) if replacement is required.

RCA Q109, Q109X, Ch. RC-602, RC-602A

These models appear on *pages 18-3 through 18-10 of Rider's Volume XVIII*. The following should be added to the parts list under Chassis Assemblies.

72996 Capacitor—molded paper, 0.05μf, 600 v. (C53)

30787 Resistor—fixed composition, 47,000 ohms, ½ w. (R26)

RCA RP-176 Record Changer

This record changer appears on *pages RCD.CH. 17-1 through RCD.CH. 17-12 of Rider's Volume XVII*. The method of attaching the pivot arm spring (Ref. #75) has been changed. The stud (Ref. #74) is no longer being used. A curved spring which clips into the inside rear of the tone arm is used in its place. The timing notch originally in the rim of the main cam and gear is no longer used. A small metal projection has been added to the inside of the rim of the main cam and gear for the same purpose. The indention in the hub of the main cam and gear into which a projection on the ratchet lever fits may also be used for timing purposes

Add the following stock number to the parts list: 73198—Curved spring for anchoring pivot arm spring.

RCA RP-178 Series

This model appears in *Rider's Manual Volume XVIII on pages RCD.CH. 18-14 through RCD.CH. 18-23*.

The RP-178 record changer is for operation on 105-125 volts, 60 cycles, a.c. A conversion spring (Stock No. 73158) may be used for 50-cycle operation. The RP-178-2 is the same as RP-178 except for a motor (Stock No. S-4283) for 105-125 volts, 25 cycles, a.c. This has been manufactured only for Canadian use. The RP-178-3 is the same as RP-178 except for a motor (Stock No. S-4773) for 105-125 volts or 210-250 volts, 60 cycles, a.c., and a 6 prong plug (Stock No. 11953). A conversion spring (Stock No. S-4774) may be used for 50-cycle operation.

The following should be added to the parts list:

Stock No. *Description*

73158 Spring - Spring sleeve for converting 60-cycle motors to 50-cycle operation

RCA 8BX5, 8BX54, 8BX55: Ch. RC-1059, RC-1059A

These models appear on *pages 19-5 through 19-9 of Rider's Volume XIX*. The position of the battery pack in these models affects the loop inductance. When the battery is removed, the loop inductance will increase and the sensitivity will decrease because of improper electrical tracking of the loop circuit with the oscillator.

When a battery is temporarily unavailable, a sheet of aluminum 8½" long by 3-5/8" wide and from 0.020" to 0.050" thick may be placed in the position occupied by the battery so that it is lying flat on the bottom of the cabinet. This sheet of aluminum has an effect on the loop inductance similar to the effect caused by the battery and will, therefore, return the performance of the loop to approximately the same as obtained when a battery is installed. If aluminum is not available, brass may be substituted with approximately the same performance. DO NOT USE STEEL OR IRON since the performance will be adversely affected. If desired, the sheet of aluminum may be waxed to the inside bottom of the case. DO NOT PLACE ANY WAX, CEMENT, OR OTHER MATERIAL ON THE LOOP WINDINGS.

For the reasons mentioned, the battery as well as the chassis must be properly installed in the case when realigning the oscillator and antenna circuits. Failure to do this will result in extremely poor performance because of improper tracking. It is, of course, necessary to remove the chassis from the case for i-f alignment.

Since the first i-f stage employs neutralization by means of capacitor C7, incorrect alignment of the primary of transformer T2 will result if stage-by-stage alignment procedure is employed. Follow the alignment procedure on *page 19-5* to assure correct alignment.

The following changes have been made in the parts list.

Delete:

73144 Hinge—

Add:

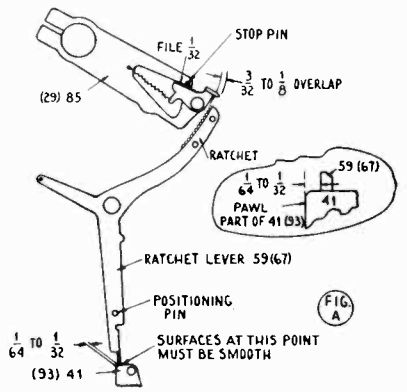
74180 Hinge—cabinet hinge (2 required)

It has been found that the detent used on the original hinge (73144) caused strain ou the cabinet which might result in breakage of the cabinet or back if roughly handled. The new hinge (74180) does not have this detent.

RCA Record Changers RP-176, RP-177 Series

Model RP-176 may be found on *pages RCD.CH. 17-1 through RCD.CH. 17-12 of Rider's Volume XVII.* The RP-177 Series appears on *pages RCD.CH. 18-1 through RCD.CH. 18-18 of Rider's Volume XVIII.* The numbers in the following discussion refer to the item numbers in the service data for Model RP-176. The numbers in parentheses refer to the item numbers of the RP-177 series.

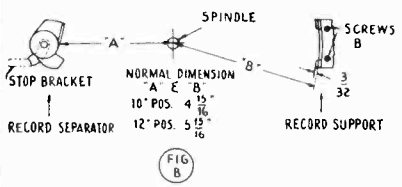
When the changer shows failure to trip, or pre-tripping characteristics, the following should be done: The engagement of items 59 (67) and 41 (93) must be 1/64" to 1/32"—file or bend positioning pin of item 59 (67) to obtain proper engagement. The engaging surfaces of items 59 (67) and 41 (93) must be smooth and free of burrs. Stone the surfaces if required—if the surfaces are rough, the tone arm jumps into the label when the mechanism trips. The overlap between the trip pawl of item 85 (29) and the ratchet of item 59 (67) must be 3/32" to 1/8".



Tone arm travel over the record label can be corrected by following these instructions.

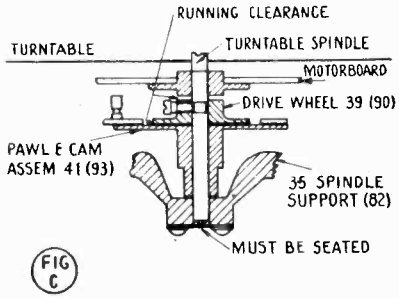
If the tone arm travels over the record label, try the following procedure. While holding the pawl of item 41 (93) disengaged from the ratchet lever 59 (67), place the tone arm in the eccentric groove of a record with the turntable running. The tone arm should swing back and forth freely. Should the tone arm jump the eccentric groove and sweep over the label, more overlap is needed between the pawl of trip lever 85 (29) and the ratchet of item 59 (67). This can be obtained by filing approximately 1/32" from the trip pawl as indicated in Fig. A.

If the spacing between the record posts need ajustment, refer to *page RCD.CH. 17-3 (RCD.CH. 18-6)*, adjustments B and C, and Fig. B accompanying. Set the record separator post, as described in the service data, in the 10-inch position. Adjust the 10-inch position of the record support by means of the screws "*B*," so that



The spacing between the record posts may be adjusted as indicated above.

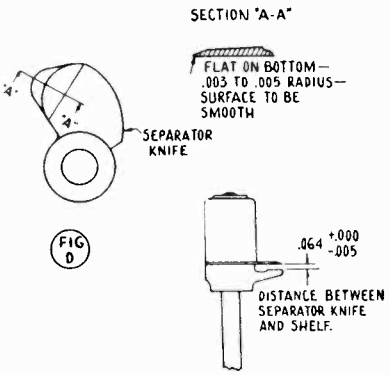
the *A* and *B* dimensions indicated in Fig. B are obtained. Set the record support to the 12-inch position, and adjust by means of the screws "*B*" so that dimension *B* indicated on Fig. B is obtained. Bend the stop bracket so that dimension *A* indicated on Fig. B is obtained.



To prevent binding of the turntable, it should be adjusted as shown.

If the turntable should bind, refer to Fig. C and the following procedure. The spindle must be seated in spindle support 35 (82). The turntable must be parallel to the motorboard. A running clearance must be provided between drive wheel 39 (90) and spindle support 35 (82) and also between drive wheel 39 (90) and pawl and cam assembly 41 (93).

Record damage may be caused by incorrect spacing between the record separator shelf and knife or by an improperly shaped knife edge. Refer to Fig. D.



Adjust the spacing between the record separator shelf and the knife to prevent record damage.

RCA 8BX65, Ch. RC-1040C

This model is the same as Model 8BX6 which appears in *Rider's Volume XVIII on pages 18-11 through 18-14*, except for the finish of the metal case parts. Model 8BX6 has an aluminum finish and Model 8BX65 has a gold finish. Replacement parts are identical except for the following which are used on Model 8BX65 only:

Stock No.	*Description*
73879	Back - Case back complete with center strip, feet, and spring latch
73878	Front - Case front complete less shutter
73875	Link - Carrying handle link group, consisting of two links, two shafts and four drive screws (two groups required)
73876	Screw - No. 8-32 x 5/16" screw to hold case together (Located under carying handle, two required)
73877	Shutter - Case shutter

RCA 8BX6, 8BX65, Chassis RC-1040C

These models appear on *pages 18-11 through 18-14 of Rider's Volume XVIII.* The parts list should be changed as follows:

Add: 71040 Socket—2 contact female socket for external loop

Delete: Speaker assembly 92577-3.
73123 Speaker—4" PM Speaker

Use Stock No. 71058 Speaker (4" x 6") as replacement.

RCA 8BX6, Chassis RC-1040D

This model is the same as the model using Chassis No. RC-1040C, appearing in *Rider's Volume XVIII on pages 18-11 through 18-14*, except that the external loop antenna socket is omitted on RC-1040D.

RCA 8R71, 8R72, 8R74, 8R75, 8R76; Ch. RC-1060, RC-1060A

These models appear on *pages 19-10 through 19-15 of Rider's Volume XIX.* The second i-f transformer (T3) used in these receivers may be stamped 970435-2 or 970435-5. The d-c resistance (8.2 ohms) of the windings indicated on the schematic is for transformer 970435-2. The d-c resistance of the same windings in transformer 970435-5 is 12 ohms.

The number of turns of dial drive cord on the tuning knob shaft has been changed from 3½ turns to 4½ turns.

The following changes have been made in the parts list.

Delete:

73363 Transformer
71033 Washer
71034 Washer

Add:

74019 Transformer—second i-f transformer, dual (T3)
73333 Washer — insulating washer — extruded — for mounting output transformer (2 required)
73332 Washer—insulating washer—flat—for mounting output transformer (2 required)

In some instruments, speakers stamped 92572-4W have been used as a substitute for the specified speaker (92572-2W). For replacement use the specified speaker (stock number 72201).

In some chassis, two 3300-ohm resistors are connected in parallel as a substitute for the 1500-ohm resistor, R22. In other chassis, two 820-ohm resistors are connected in series as a substitute for this resistor.

RCA 8R71 to 8R76, Ch. RC-1060, RC-1060A; 9W101, 9W103, Ch. RC-618B

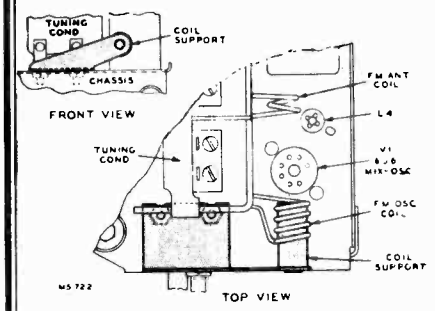
Models 8R71 to 8R76 appear on *pages 19-10 through 19-15 of Rider's Manual Volume XIX* and Models 9W101 and 9W103 appear on *pages 19-35 through 19-44* of the same Volume.

Some ceramic capacitors C11 (5 $\mu\mu$f) have been used which have a color code of black-green-black. The capacitor is correct, but the color code is incorrect. The normal color code of this capacitor is green-black-white.

RCA 8R71, 8R72, 8R74, 8R75, 8R76, 8V90, 8V91

Models 8R71, 8R72, 8R74, 8R75, and 8R76 appear in *Rider's Manual Volume XIX on pages 19-10 through 19-15* and Models 8V90 and 8V91 appear in the same Volume on *pages 19-16 through 19-25.*

To insure greater oscillator stability a support has been added for the f-m oscillator coil as illustrated in the accompanying diagram. Adjustment of the coil is



Coil Support

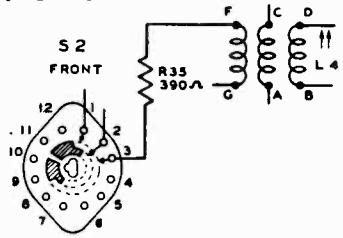
A support has been added to insure greater oscillator stability for the f-m oscillator coil for the RCA Models 8R71, 8R72, 8R74, 8R75, 8R76, 8V90, 8V91.

made as described in the Service Data. After adjustment the coil is cemented to the coil support.

The following is added to the parts list:
74202 Support—Polystyrene coil support complete with mounting bracket.

RCA 8V112, Chassis RC-616

This model appears on *pages 18-17 through 18-24 of Rider's Volume XVIII.* To minimize the possibility of "A" band oscillation and to reduce interference, a resistor (R35) has been added in the mixer grid circuit as shown in the accompanying diagram.



A 390-ohm resistor has been added in the mixer grid circuit of the RCA 8V112 to reduce interference.

In late production sets C42 has been changed from 22 μμf to 15 μμf and R18 has been changed from 22,000 ohms to 18,000 ohms. This change was made to prevent oscillation at the high end of the f-m band.

Add the following to the parts list:
Resistor — fixed composition, 390 ohms, ±10%, ½ watt (R35)

RCA 8V112, Chassis RC-616, RC-616F

The schematic diagram for this model, which is contained in *pages 18-17 through 18-24 of Rider's Volume XVIII,* is in error in showing the connection of R22. It should be shown connected to C18A instead of to the RED lead of the output transformer.

In order to provide adequate lead length, resistor R10 (56,000 ohms) has been changed from ½ watt to 1 watt.

Chassis RC-616F, used in the second production of these instruments, is very similar to Chassis RC-616 except for the following:

First Production RC-616
Four position selector switch
M.M.—PHONO—AM—FM
Aux. input jack is not used

Second Production RC-616F
Five position selector switch
AUX.—M.M.—PHONO—AM—FM
Aux. input jack is used.

Except for the following replacement parts, all parts are identical.

74163 Selector switch is used in place of 73608 (switch S1, S2)

74164 Control panel decal for mahogany or walnut instruments is used in place of 73764 decal

74354 Control panel decal for blonde instruments is used in place of 73765 decal

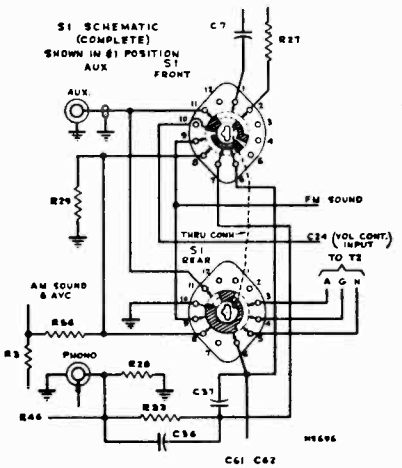
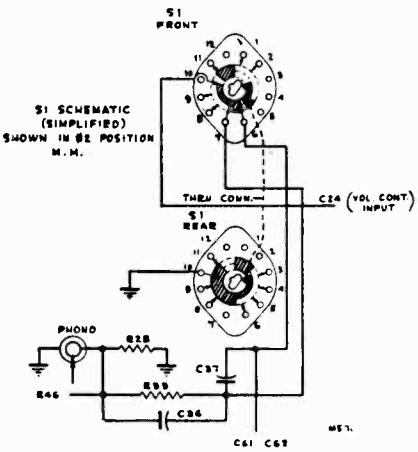


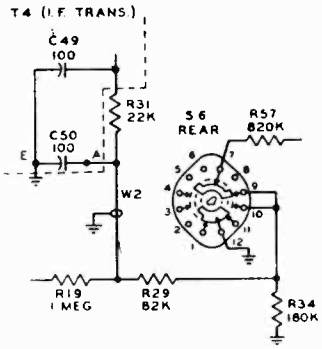
Fig. 1. (Above) shows the selector switch used in RCA Chassis RC-616F. Fig. 2. (Below) The simplified circuit of the selector switch in the #2 position.



Figs. 1 and 2 show the selector switch S1 used in Chassis No. RC-616F. The connections to S2 are identical in both chassis. Note that position #2 (M.M.) of RC-616F corresponds to position #1 (M.M.) of RC-616. No connections are made through S2 in AUX. position.

RCA 8V151, Ch. RK-121C

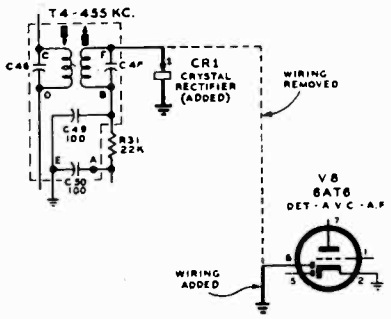
This model appears on *pages 18-25 through 18-40 of Rider's Manual Volume XVIII.* In the diode load circuit, R29 (270,000) should be deleted—R20 (82,000) and R34 (180,000) should be added, as shown in the accompanying diagram.



Diode Load Circuit for RK-121C.

The wiring diagram is incorrect in the wiring of the range switch. The illustration below shows the changes which should be made.

Late production models of Chassis No. RK-121C use a crystal rectifier for a-m detection instead of the diode plate (pin 6 of V8) of 6AT6 as shown.

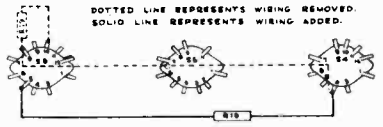


Crystal Rectifier for RK-121C.

Service Caution: (1) Maintain a minimum lead length of ¾ inch on the crystal leads. Excess heat from a soldering iron will damage the crystal, (2) the normal voltage existing in this circuit should never be exceeded when testing or trouble shooting, and (3) maintain polarity of crystal.

The following change has been made in the parts list.

Add:
54374 Rectifier—crystal rectifier (CR1)



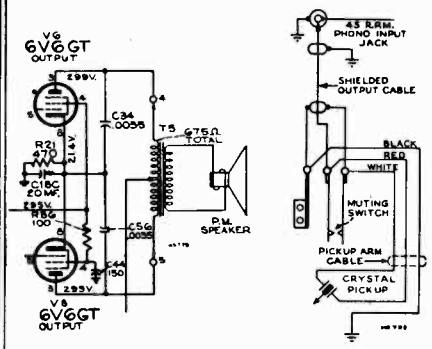
Change in Wiring of RCA 8V151.

An addition to the Parts List under Miscellaneous is:
74312 Ornament — Wood fibre ornament for front of cabinet.

RCA 9W101, 9W103, 9W105

These models appear on *pages 19-36 through 19-44 of Rider's Manual Volume XIX.*

A capacitor (150 $\mu\mu$f-C44) has been added between the screen grid terminal of V8 (6V6GT) socket and chassis as shown in the accompanying illustration. This was



Output Tubes Circuit Pickup Arm Cable Models 9W101, 9W103, 9W105

done to eliminate spurious audio oscillation.

The simplified schematic diagrams (phono position) on page *19-39* show C34 and C56 connected to ground. They should be shown connected to the cathodes of the 6V6GT tubes as shown in the accompanying illustration.

To improve f-m stability one dial lamp is now connected to pin #2 of V9 (6X5GT). Previously both were connected to pin #2 of V8 (6V6GT).

Speakers stamped 92569-1WX have been used as a substitute for 92569-5W speakers in Model 9W101; 92569-1WX speakers have a 2.2-ohm voice coil; 92569-5W speakers have a 3.2-ohm voice coil.

The following additions have been made to the parts list:

48125 Capacitor—Ceramic, 150 $\mu\mu$f (C44) Same as C7, C19, C38, C50, C53
13867 Cap—Dust cap
36145 Cone—Cone and voice coil assembly
5039 Plug—4 prong male plug for speaker
71145 Suspension—Metal cone suspension
37899 Transformer—Output transformer (T3)

Note: When replacing complete speaker order Stock No. 73635 (92569-5W).

37396 Grommet—Rubber grommet for mounting speaker (3 required)—for Model 9W103
73896 Loop—Loop antenna complete for Models 9W101 and 9W103 (previously listed for 9W101 and 9W105).

The RP-168A-1 record changer pickup arm cable now being used is a three wire cable (RED-WHITE-BLACK). In some instruments the black wire is omitted or a shielded wire may be used as shown in 9W101, 9W103, 9W105 Service Data. The latest connection diagram is shown in the accompanying illustration.

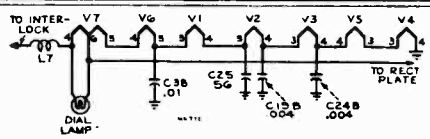
RCA 8X53, 65X1, 65X2, RC-1064

Model 8X53 appears on *pages 18-41 and 18-42 of Rider's Volume XVIII* and Models 65X1 and 65X2 appear on *pages 15-61 and 15-62 of Rider's Volume XV.*

The number of turns of dial cord on the tuning shaft has been increased from 2-¼ turns to 3-¼ turns.

RCA 8X71, 8X72

These models appear on *pages 19-30 through 19-34 of Rider's Manual Volume XIX.* A capacitor (0.01 μf-C38) has been added between pin #3 of V6 (35C5) and chassis. The revised heater connection



Heater Connections—Models 8X71, 8X72

schematic diagram is illustrated in the accompanying diagram.

The following have been added to the parts list:

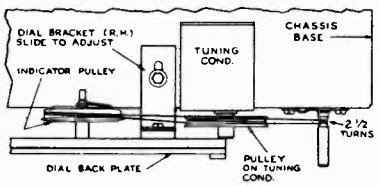
71923 Capacitor—Tubular, 0.01 μf, 200 v. (C38) same as C23, C36.

RCA 75ZU, Ch. RC-1063A

This model appears on *pages 19-45 and 19-46 of Rider's Manual Volume XIX.* A groove approximately 1/16 inch deep by ⅛ inch wide is now included on the outer rim of the bakelite station selector indicator pulley, Stock No. 73060.

If trouble is encountered with the drive cord coming off this pulley, either of the following corrections may be applied:

(a) Position the pulley in relation to the gang drum by the adjustment provided on the long support bracket for the dial back plate assembly so that the drive cord occupies the position indicated in the accompanying illustration.



Dial Drive Cord of RCA 75ZU.

(b) Replace the pulley with one incorporating the groove indicated above.

The service data for the 50-cycle version of Radiola 75ZU will apply to this instrument except:

RP-178 record changer only is used.

A conversion spring (Stock No. 73158) is added to the motor spindle shaft for 50-cycle operation.

A decal ("RCA Victor" Stock No. 71984) is added to the front of the cabinet.

These changes apply to the RC-1063B also.

The following have been added to the parts list for instruments using blonde mahogany cabinets:

73722 Knob—Power—Phono—radio switch knob—for blonde instruments
73629 Knob—Tuning Knob—for blonde instruments
73630 Knob—Volume Control Knob—for blonde instruments

RCA 66BX, Ch. RC-1040, RC-1040A, RC-1040B; 8BX5, 8BX54, 8BX55, Ch. RC-1059, RC-1059A; 8BX65, Ch. RC-1040C, RC-1040D; 9BX5, Ch. RC-1059B

Model 66BX appears on *pages 15-87 through 15-88 of Rider's Manual Volume* XV and on *page C17-7 of Rider's Manual Volume XVII.* Models 8BX5, 8BX54, and 8BX55 appear on *pages 19-5 through 19-9 of Rider's Manual Volume XIX.* Models 8BX6 and 8BX65 appear on *pages 18-11 through 18-14 of Rider's Manual Volume XVIII.*

The line-battery switch used in these receivers is of the "slide" type. The actual switch does not have numbered terminals, although the schematic diagrams have numbers indicated. The numbers on the schematic diagrams do not indicate the actual sequence of the terminals on the switch. The accompanying illustrations show the actual sequence of the switch terminals and the corresponding numbers which appear on the schematic diagrams. Figure 1 is the diagram for the 8BX5,

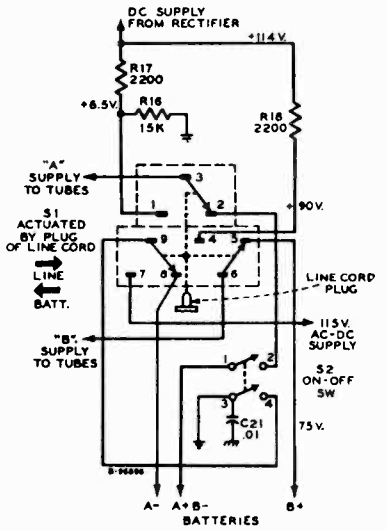


Fig. 1. Line-battery switch for RCA 8BX5.

first production, Ch. RC-1059. Figure 2 applies to models 8BX5, 8BX54, 8BX55, second production, Ch. RC-1059A; 9BX5, first production, Ch. RC-1059B; 9BX5, second production, Ch. RC-1059C. For models 8BX6 and 66BX, the circuit is as shown in Figure 2, except for different resistor numbers and values.

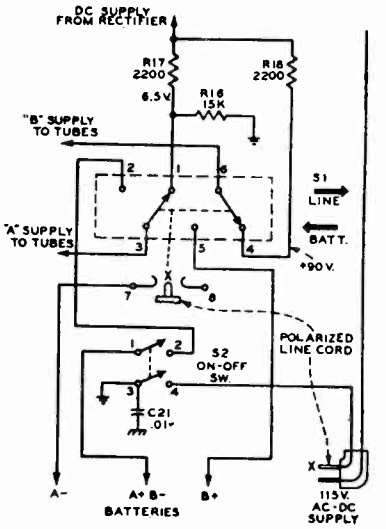


Fig. 2. Line-battery switch for RCA 8BX5, 8BX54, 8BX55, 9BX5, 8BX6, and 66BX.

RCA 8X544, 8X545, 8X546, Chassis RC-1065, RC-1065A

These models are the same as Model 8X541, on *pages 18-45 and 18-46 of Rider's Volume XVIII*, except for the color of the cabinets and the parts noted here.

The parts are the same, except for:

73486 Loop — loop and back cover assembly for Models 8X544 and 8X545

73487 Loop — loop and back cover assembly for Model 8X546

Y2096 Cabinet — plastic cabinet — mahogany — complete with station indicator and dial backing disc — for Model 8X544

Y2097 Cabinet — plastic cabinet — walnut — complete with station indicator and dial backing disc — for Model 8X545

Y2098 Cabinet — plastic cabinet — blonde — complete with station indicator and backing disc — for Model 8X546

70429 Grommet — rubber grommet to mount speaker (4 required). This part has been added to Models 8X541, 8X542, 8X543, 8X544, 8X545, 8X546, and 8X547. To reduce microphonics, the speaker is now mounted to the chassis and to the cabinet using rubber grommets. The screws through the grommets should be tightened only enough to obtain a secure assembly.

RCA 68R1, 68R2, 68R3, 68R4, Ch. RC-608; 610V1, Ch. RC-610; 610V2, Ch. RC-610C

The 68R series appear on *pages 16-39 through 16-43 of Rider's Volume XVI*. The 610 series appear on *pages 19-56 through 19-64 of Rider's Volume XIX*.

In locations where 10.7-mc i-f interference (not tunable) is encountered on the f-m band of these receivers, the following may eliminate the condition:

1. Check lead dress (and correct if necessary) to minimize antenna coupling into the i-f amplifier input. Resistor R1 (located on the antenna terminal board) should be dressed on the side of the terminal board away from the 6BE6 1st detector socket, V1.

2. Dress the 6BE6 1st detector plate lead along the shelf base and under C2 (330 $\mu\mu$f) using C2 as a partial shield for this lead.

3. Ground one f-m antenna terminal to the chassis at the terminal board. (Dipole still connects normally.) This is generally more effective than connecting a 10.7-mc series-tuned trap from the f-m antenna terminal to the chassis.

4. Place a tube shield over the 6BE6 1st detector tube, grounding the shield to chassis using as short a ground as possible. Correct for any detuning caused by this method.

5. Correct realignment of circuits is suggested to provide maximum sensitivity, since step 3 may reduce sensitivity slightly.

RCA 75X11, 75X12, 75X14, 75X15, 75X16

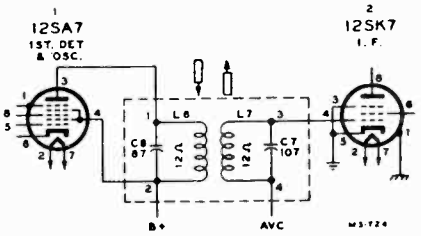
These models appear in *Rider's Manual Volume XVIII on pages 18-49 and 18-50*.

In some chassis a substitute i-f transformer has been used in these models. An adapter plate is riveted to the chassis for mounting purposes. A mounting clip is used to secure the transformer to the mounting plate. The accompanying diagram illustrates the revised schematic.

The following have been added to the Parts List:

73935 Clip—Spring clip for mounting i-f transformers, type 970441

93036 Transformer — First i-f transformer, stamped 970441-1 (C6, C7, L6, L7)



Substitute 1st I.F. Transformer—75X Series

RCA 77U

This model appear on *pages 18-53 and 18-54 of Rider's Volume XVIII*. The following parts should be added to the parts list.

73109 Nut—Tee nut to mount record changer—3 required.

73110 Screw—¼-20 x 1¾" fillister head machine screw to mount record changer.

The service data previously issued for this model also apply to instruments using blonde mahogany cabinets, except for the following parts which are used with such cabinets.

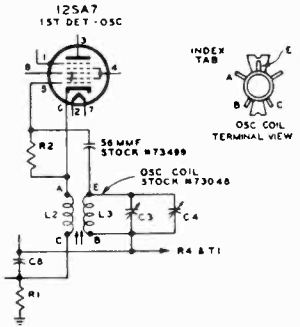
73631 Knob—power, radio and phono switch knob—tan—for blonde instruments.

73629 Knob—tuning knob —tan— for blonde instruments.

73630 Knob—volume control knob—tan —for blonde instruments.

The following voltage and current measurements apply to this model. A selenium rectifier is used. The oscillator grid voltage (pin 5 of the 12SA7) is —10 volts at 600 kc and —11 volts at 1600 kc. Voltages are measured with Chanalyst or VoltOhmyst to common insulated wiring —B). The voltages and currents should hold to within ± 20% with a 117-volt, 60-cycle power supply.

Tube	Plate Voltage	Screen Voltage	Cathode Voltage	Cathode Current
(1) 12SA7 1st det. osc.	92.	92.	—	9.4 ma.
(2) 12SK7 I.F. Amp.	92.	92.	—	13.3 ma.
(3) 6C4 A.F. Amp.	15.	—	—	0.32 ma.
(4) 6AQ6 2nd Det.—AVC—Ph. Inv.	50.	—	—	0.18 ma.
(5) 35L6GT Output	121.	92.	5.6	31.7 ma.
(6) 35L6GT Output	121.	92.	5.6	31.7 ma.



Oscillator coil 73048 is connected into the circuit of the RCA 77U as shown.

In some chassis capacitor C18 is 0.027 μf instead of 0.025 μf as shown on the schematic. In some instruments a substitute oscillator coil has been used. The original coil (70477) uses a capacitive winding (L4) for coupling the oscillator circuit to the oscillator grid (pin 5) of the 12SA7 tube. The substitute coil uses a 56-$\mu\mu$f ceramic capacitor for the same purpose. (L4 is not used.) The accompanying figure shows how this coil is connected into the circuit.

The following changes should be made in the parts list.

Delete:

73007 Condenser—

Add:

73007 Condenser — variable tuning condenser (C3, C4, C6, C7)

RCA 610V1, Ch. RC-610C; 610V2, Ch. RC-610

These models appear on *pages 19-56 through 19-60 of Rider's Volume XIX*. A small quantity of these receivers were shipped with the incorrect loop antennas. The incorrect loops contain approximately 14 turns instead of 17 turns. This reduced inductance causes low sensitivity and poor selectivity, particularly below 900 kc.

Complaint cases of poor sensitivity, poor selectivity, or interference in the form of local station(s) repeating at one or several places on the "A" band (except response at the image frequency) should have the loop checked as one possible cause.

The incorrect loop may peak at the high end of the "A" band but will not peak at lower frequencies. This may be checked by varying the oscillator coil inductance. The correct loop tracks normally across the band.

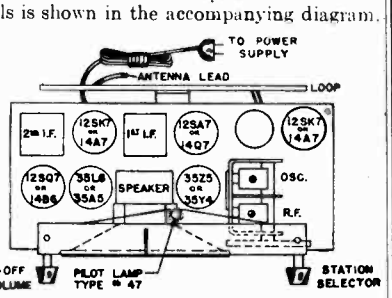
The stock number of the antenna terminal board is 72058. It was listed incorrectly as 70258.

RCA 710V2, Ch. RC-613A

These models appear on *pages 18-56 through 18-60 of Rider's Volume XVIII*. Resistor R15 in the cathode circuit of the type 6AU6 f-m driver stage has been changed from 68 ohms to 120 ohms. This change was made because certain 6AU6 tubes were found to draw grid current at the bias value produced by 68 ohms, which resulted in a decrease in f-m sensitivity.

Regal W800

This model is the same as Model 800 which appears on *page 16-1 of Rider's Volume XVI*. The socket layout for both models is shown in the accompanying diagram.



The socket layout of the Regal Models W800 and 800.

RCA 612V1, 612V3, 612V4, Ch. RK-121, RS-123

Models 612V1 and 612V3 appear on *pages 17-31 through 17-43 of Rider's Volume XVII*. Model 612V4 is the same except for the cabinet. Some of these receivers have developed a howl when operating on the f-m band. Howl of this nature is generally a result of vibration from the speaker being transmitted to some component, or series of components, in the oscillator circuit. This vibration causes the oscillator frequency to become modulated, resulting in a howl being emitted from the speaker.

The following are possible causes:

1. Loose elements in the oscillator tube.
2. Loose plates or unequal spacing of rotor and stator plates in the f-m oscillator section.
3. Capacitor C88 should be placed adjacent to the side wall of the r-f shelf and held firmly in place. This may be accomplished by melting wax against the capacitor and the chassis.
4. All oscillator, r-f, and ant. leads should be well separated and arranged to produce the least capacitance change if set breaks into vibration.

When searching for the cause of the trouble, an alignment tool having a high dielectric constant and without a metal tip can be used to probe in the circuit. It is important that the position of the wires and components be changed as little as possible during realignment. During such probing, the air column of the speaker in relation to the chassis must be as near as possible to normal operating position. Failure to maintain such relation may result in false indications of either excessive howl or no howl.

On the RK-121 chassis, starting with serial number 25,000, a 10-ohm carbon resistor has been added between C16 (100 $\mu\mu$f) and terminal number 1 of S4 Front. This resistor has been inserted to eliminate dead spots between 1400 and 1600 kc on the "A" band. This resistor should be added to any early model set developing dead spots, but make certain that the over-all lead length, including the resistor remains the same as before.

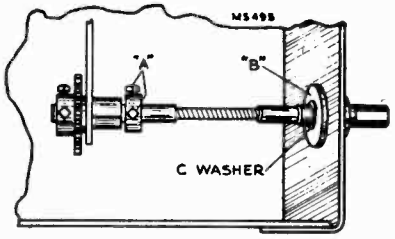


Fig. 1. The early production coupling shaft of the RCA 612V series.

The range switch coupling shaft on the early and late productions differ. To remove the early production coupling shaft, refer to Fig. 1 and the following directions. Loosen square head set screws "A" in collar of shaft, remove "C" washer from shaft at inside of bushing "B", push shaft through bushing to permit removal of "C" washer normally recessed inside bushing. Pull shaft through bushing to inside of chassis.

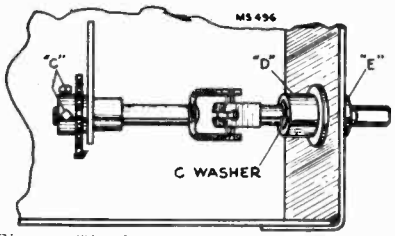


Fig. 2. The late production range switch coupling shaft of the RCA 612V series.

Refer to Fig. 2 for the late production range switch coupling shaft. Loosen square head set screws "C" in collar of gear. Remove nut "E" (on front apron of chassis) from bushing "D". Push shaft and bushing to the rear so that shaft and bushing are clear of the chassis apron. Flex the shaft and pull forward. To remove bushing from shaft, use procedure described for early type shaft.

The brown lead of the dial lamp for phono. operation is at present dressed to contact #3 of S-1 Front, then through the space between the switch rotor and through the bolt spacer. This lead should be dressed between the spacer and the shelf cradle. The bus wire from the "C" band antenna coil to contact #9 of S-1 Rear is to be dressed a distance of ¼ inch from the loop load coil antenna lead (yellow). The f-m antenna lead (yellow) is to be dressed between the switch spacer through the bolt and the switch rotor shaft, keeping clear of the shelf and cradle.

The changes indicated should be made in the parts list. The entire listing of Miscellaneous parts is given for convenience.

Add the following to the parts list:

72119 Escutcheon—Escutcheon only—less screen, window and marker strips—for blonde instruments.

Change 71868 Frame in the parts list to read

71868 Frame—Rollout carriage frame with brackets—less wheels.

The parts list for these models applies to Model 612V4 also except for the following miscellaneous parts:

73719 Back—Cabinet back—blonde—for sides—2 required

73720 Back—Cabinet back—blonde—for center

X1825 Cloth—Grille cloth—for 612V4 blonde

The RP-176A record changer is used.

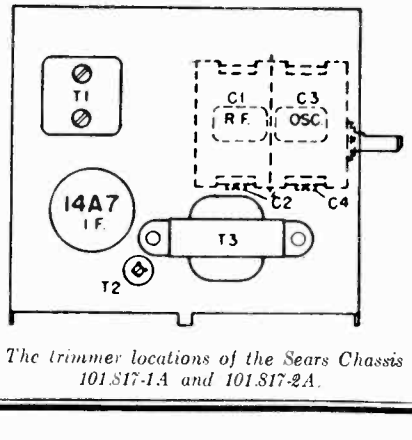
STOCK No.	DESCRIPTION
	RADIO CHASSIS ASSEMBLIES RK-121
Add:	
72986	Bushing—Threaded bushing for knob end of selector switch coupling shaft (late production).
72984	Plate—Connecting plate for selector switch coupling shafts (late production).
34761	Resistor—10 ohms, ½ watt (R84).
72982	Shaft—Selector switch coupling shaft—switch end (late production).
72983	Shaft—Selector switch coupling shaft—knob end—less threaded bushing (late production).
72951	Shield—Lead tube shield (for V5).
Delete:	
71791	Cable—
Change in Stock No.:	
45213	Capacitor—to 39396 Capacitor—(C16, C21, C83).
33789	Capacitor—(C60) to 33223 Capacitor—(C60).
32634	Cord—to 72987 Cord—
	AMPLIFIER ASSEMBLIES RS-123
Add:	
72955	Capacitor—Electrolytic comprising 1 section of 30 mfd., 450 volts, 1 section of 50 mfd., 400 volts, and 1 section of 40 mfd., 25 volts (C1A, C1B, C1C).
Delete:	
36599	Capacitor—
Change in Stock No.:	
72596	Capacitor—to 71551 Capacitor—(C7).
	MISCELLANEOUS
71864	Antenna—Di-pole antenna
72599	Back—Cabinet back for 612V1—for center
72598	Back—Cabinet back for 612V1—sides (2 required)
72590	Back—Cabinet back for 612V3—for center
72579	Back—Cabinet back for 612V3—sides (2 required)
70160	Back—Cabinet back—mahogany—for sides (2 required)—for 612V4
70162	Back—Cabinet back—mahogany—for center—for 612V4
70161	Back—Cabinet back—walnut—for sides (2 required)—for 612V4
70163	Back—Cabinet back—walnut—for center—for 612V4
71888	Bottom—Bottom cover (pan) for rollout mechanism
30639	Bracket—Pilot lamp bracket
71874	Bushing—Bushing and washer for large knobs (4 required)
72899	Button—Plug button for rollout assembly sides (2 required)
71884	Button—Push button
72447	Cable—Shielded audio cable complete with plugs
71863	Cable—5 wire moulded antenna lead-in cable
38684	Capacitor—Mica trimmer, on loop, 2-20 mmf. (C1)
X1617	Cloth—Grille cloth for 612V1—wal. or mahog. cabinets
X1624	Cloth—Grille cloth for 612V1—blonde cabinets
X1620	Cloth—Grille cloth—upper—for 612V3—wal. or mahog. cabinet
X1621	Cloth—Grille cloth—lower—for 612V3—wal. or mahog. cabinets
X1618	Cloth—Grille cloth—upper—for 612V3—blonde cabinet
X1629	Cloth—Grille cloth—lower—for 612V3—blonde cabinet
X1607	Cloth—Grille cloth for 612V4
71906	Decal—Trade mark decal (Victrola)
71910	Decal—Trade mark decal (RCA-Victor)
71876	Escutcheon—Escutcheon only less screen, window and marker strips for walnut instruments
71877	Escutcheon—Escutcheon only less screen, window and marker strips for mahogany instruments
71868	Frame—Mounting frame and bracket
71943	Grille—Metal grille—upper—for 612V3
71944	Grille—Metal grille—lower—for 612V3
70165	Grille—Metal grille for 612V4
72009	Grommet—Rubber grommet for mounting loop brackets—part of loop (2 required)
72763	Handle—Pull handle for rollout mechanism
73031	Hinge—Door hinge L.H. for 612V1 (2 required)
73032	Hinge—Door hinge R.H. for 612V1 (2 required)
71945	Hinge—Door hinge for 612V3—wal. or mahog. cabinets and 612V4 record storage compartment doors (4 required)
73004	Hinge—Door hinge for 612V3—blonde cabinet (4 required)
71764	Hinge—Drop door hinge for 612V1 and wal. or mahog. 612V3 cabinets (2 required)
73001	Hinge—Drop door hinge for 612V3 blonde cabinet (2 required)
73024	Hinge—Drop door hinge for 612V4 (2 required)
70167	Hinge—Speaker compartment door hinge L.H. for 612V4 (2 required)
70166	Hinge—Speaker compartment door hinge R.H. for 612V4 (2 required)
13103	Jewel—Pilot lamp cap
71883	Knob—Tone control knob for wal. or mahog. cabinets
72761	Knob—Tone control knob for blonde cabinet
71821	Knob—Volume control, power switch, selector switch or tuning knob for wal. or mahog. cabinets
72118	Knob—Volume control, power switch, selector switch or tuning knob for blonde cabinets
11765	Lamp—Pilot lamp
71862	Loop—Antenna loop complete (L1, L15, C1)
71969	Marker—Call letter markers
72765	Nut—Speed nut to fasten transparent screen to escutcheon (2 required)
71879	Plate—Backing plate for transparent screen
71881	Plate—Call letter marker plate
72764	Plate—Backing plates (1 set) for pullout handle
30868	Plug—2 contact female plug for power cable
71907	Plug—9 contact female plug for power cable
32641	Plug—3 prong male plug for loop cable
71968	Plug—9 prong male plug for power cable
31048	Plug—Pin plug for audio cable (2 required)
71890	Pull—Door pull for 612V1 (2 required)
71946	Pull—Door pull for 612V3
73034	Pull—Door pull for 612V4
71891	Pull—Drop door pull for 612V1
71873	Retainer—Rubber retainer to mount record changer (2 required)
71878	Screen—Transparent screen
36422	Socket—3 contact female socket for loop cable
38873	Spring—Conical spring to mount record changer (4 required)
71867	Spring—Retaining spring for push button
30000	Spring—Retaining spring for knobs
71869	Spring—Braking spring for right rear wheel (612V1 and 612V3 early prod.)
71870	Spring—Braking spring for left rear wheel (612V1 and 612V3 early prod.)
71865	Spring—Spring to hold flexible cable from mechanism
71866	Stop—Rollout carriage stop consisting of disc, rubber sleeve and spacer
73069	Stop—Drop door fall supports metal stop for 612V4
70164	Stop—Stop for drop door for 612V4
72396	Stop—Stop for speaker compartment doors for 612V4
71892	Strike—Cabinet doors strike and catch
71880	Strip—Backing strip for call letter marker plate
71889	Support—Drop door fall support—for 612V1 (2 required)
72999	Support—Drop door fall support—R.H.—for 612V3 wal. or mahog. cabinets
73000	Support—Drop door fall support—L.H.—for 612V3 wal. or mahog. cabinets
73002	Support—Drop door fall support—R.H.—for 612V3 blonde cabinet
73003	Support—Drop door fall support—L.H.—for 612V3 blonde cabinet
*72940	Support—Drop door fall suoport—L.H. for 612V4
*72939	Support—Drop door fall support—R.H. for 612V4
71872	Tire—Rubber tire for front rollout wheels
71871	Tire—Rubber tire for rear rollout wheels
*2917	Washer—"C" washer for rubber retainer (2 required)
71875	Washer—Spring washer for fastening front wheels and late production rear wheels
71887	Wheel—Front wheel and tire assembly (2 required)
72858	Wheel—Rear wheel and tire assembly (2 required)—late production only
71886	Wheel—Left rear wheel complete with braking mechanism, less braking spring #71870
71885	Wheel—Right rear wheel complete with braking mechanism, less braking spring #71869
71882	Window—Window for call letter markers

Parts list of the RCA 612V1, 612V3, 612V4

Sears 8070, Ch. 101.817-1A; 8070A, Ch. 101.817-2A

These Models are the same as Model 7070, appearing on *pages 17-2, 17-3, and 17-15 of Rider's Volume XVII*, except for the following changes. The appearance only of the parts have been changed in Ch. 101-817-1A.

In Ch. 101.817-2A, capacitor C17 has been changed in value from 0.05 μf to 0.01 μf. Resistor R8 has been changed in value from 100 ohms to 150 ohms. The second i-f transformer has been changed from capacitor tuning to slug tuning. The new parts number is R65374. The location of the trimmers is shown in the accompanying diagram.

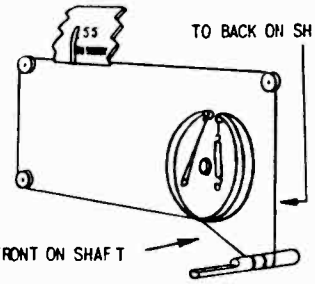


The trimmer locations of the Sears Chassis 101.817-1A and 101.817-2A.

Sears 8020, Chassis 132.841

This model appears on *pages 18-56 through 18-60 of Rider's Volume XVIII*. It has been discovered that the dial cord on some of these receivers binds. If the dial cord is strung as shown on *page 18-58*, continued turning of the tuning knob in a clockwise direction, after the pointer has reached the right-hand end of the dial, will cause the tuning shaft to turn in the cord and the cord will slide back on the shaft toward the chassis. Then, when the knob is turned in the counterclockwise direction, the cord will travel farther back on the shaft and have a tendency to come in contact with the chassis and bind on the shaft.

If the cord is wound from back to front on the tuning shaft, as shown in the accompanying figure, it will travel away from the chassis when the knob is turned in a counterclockwise direction and the binding will not occur.



When the dial cord of the Sears 8020 is wound from back to front on the tuning shaft, the cord will not bind on the chassis.

If excessive hum is encountered, try disconnecting the low-voltage section of the electrolytic capacitor, part number N21744, which is the cathode bypass capacitor on the 50L6GT output tube. Substitute a separate 20-μf, 25-v. capacitor for this section.

Some of the original electrolytic capacitors had the sections wound in improper sequence, so there was capacitive coupling between the input high-voltage section and the low-voltage cathode bypass section. This condition would cause excessive hum in the receiver output. It is probable that this condition will be found only on the later production sets of this model.

Sears 8011, Ch. 132.840

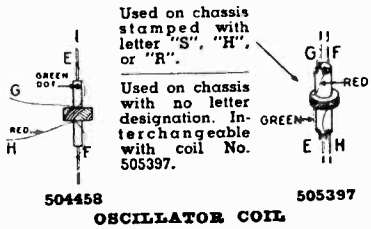
This model is the same as Model 8010, Ch. 132.840, appearing on *page 19-26 of Rider's Manual Volume XIX*, except for the following changes. Model 8010 has a brown cabinet and knobs, while Model 8011 has an ivory cabinet and knobs. Parts which are different from the 8010 are as follows: N21092-1 Cabinet less front trim assembly N21204-3 Knob, control, volume and tuning.

Stewart-Warner A51T Series

These models are the same as Model A51T1, appearing on *pages 17-4 through 17-6 of Rider's Volume XVII*. The code listings for these models are:

Model	*Code*
A51T1	9020-A
A51T2	9020-B
A51T3	9020-C
A51T4	9020-D

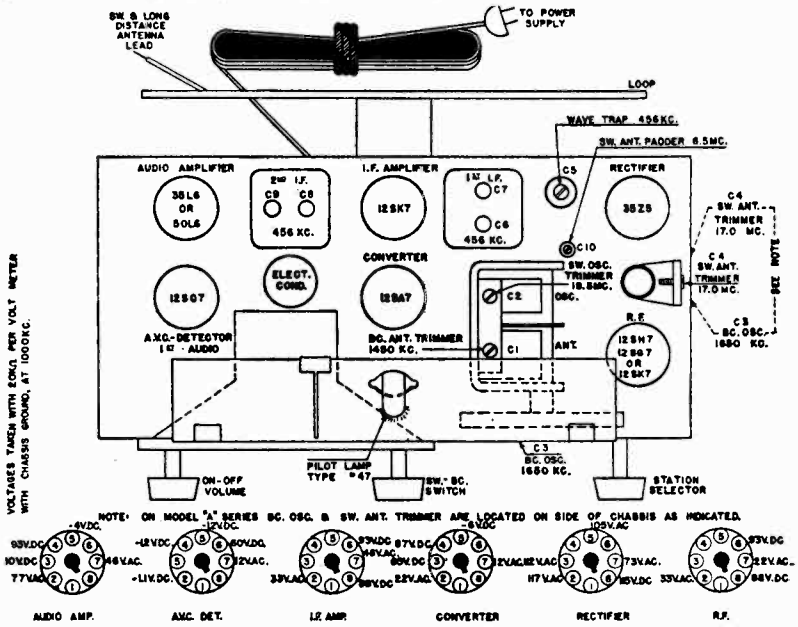
On chassis which have the letters H or R stamped on the rear surface adjacent to the model numbers, the rotor of the gang tuning capacitor is grounded instead of being connected to the AVC line. Oscillator coil 505397 (see accompanying diagram) is used on chassis which are stamped with the letters "S", "H", or "R".



Oscillator coil for Stewart-Warner A51T series.

Regal W900

This model is the same as Model 900 which appears on *pages 16-2 and 16-3 of Rider's Volume XVI*. The socket layout and voltages for both models are shown in the accompanying diagram.

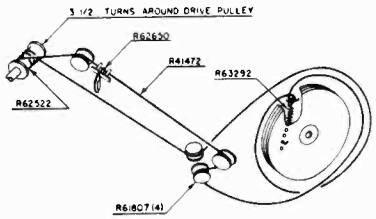


Tube layout, trimmer locations, and voltages of the Regal W900.

Sears 101.809 Series

These chassis are all the same as Model 7080, Ch. 101.809, appearing on *pages 16-1, 16-4, 16-5, and 16-8 of Rider's Volume XVI*, except for the following changes.

Models 8083, 8083A, Ch. 101.809-1A. Pushbuttons have been added. The record changers used in these models are all different. Resistor R5, 330,000 ohms, formerly across the phono pickup socket, has been removed. The dial drive hookup is as shown in the accompanying diagram.

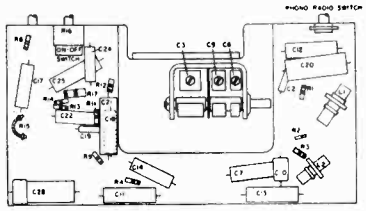


The dial drive hookup for the Sears Chassis 101.809-1A.

All resistors which were 1/3 watt are now 1/2 watt. All capacitors, except C23, C26, and C27, now have a voltage rating of 600 volts. A 6-by-9-inch p-m speaker (R62658) is used, requiring cone and voice coil R62659, and output transformer R62660.

Models 8084, 8084A, Ch. 101.809-1B. Same as Chassis 101.809-1A, except for the record changers.

Models 7080, 7080A, Ch. 101.809-2. Same as Chassis 101.809, except for a new type tone control circuit. A 0.001-μf capacitor (C24) is connected from the plate (pin 2) of the 7C6 tube to the variable arm of the 2-megohm tone control (R16). The other end of this tone control is connected to the B-line. The parts layout for this chassis is shown in the accompanying diagram.



The parts layout for the Sears Chassis 101.809-2.

Models 8101, 8101A, 8101B, 8101C, 9101, Ch. 101.809-3C. These models are the same as chassis 101.809-2 except for differences in the cabinets, and the fact that different record changers are used.

Stewart-Warner A41T1, Code 9032-A

This is the same as Model A41T1 appearing on *pages 17-1 through 17-3 of Rider's Manual Volume XVII*, except for the following change. Resistor 40, formerly 270 ohms, has been changed to 560 ohms to minimize "B" supply drain. Chassis which incorporate this change have a letter "S" stamped on the rear surface. The new resistor is described as follows:

502127 Resistor—carbon—560 ohms, 1/4 w.

Stewart-Warner 61T Series: 9022-T

These models are the same as Model 61T16, appearing on *pages 15-7 and 15-8 of Rider's Volume XV*, except for some changes. The code listings for these models are:

Model	*Code*
61T16	9022-A
61T16W	9022-AW
61T26	9022-B

A 0.01-μf capacitor (45) has been added from the black lead (center tap) of the loop antenna to ground. A 0.05-μf capacitor (46) has been connected from the cathode of the 12SF7 tube to the AVC line. A 390-ohm resistor (44) has been connected in shunt with the pilot lamp.

The following should be added to the parts list:

Diagram No.	*Part No.*	*Description*
45	502151	Capacitor—0.01 μf, 400 v.
46	502153	Capacitor—0.05 μf, 200 v.
44	502140	Resistor—carbon 390 ohms, ¼ w.
37	504756	Transf.—output, for speaker with prefix Y.
	504758	Transf.—output, for speaker with prefix Z.
	504781	Transf.—output, for speaker with prefix C.
12	502208	Speaker—p.m., dynamic, 5-inch
	502298	Speaker—p.m., dynamic, 5-inch
41	504757	Cone and voice coil, spkr. with prefix Y.
	504759	Cone and voice coil, spkr. with prefix Z.
	504782	Cone and voice coil, spkr. with prefix C.
	502502	Back for cabinet, Model 9022T
	500385	Cabinet—ivory, Model 61T16W
	502476	Cabinet—ivory, Model 9022T
	502506	Clamp—dial scale mtg., Model 9022T
	502553	Knob—ivory, Model 61T16W
	502564	Knob—ivory, Model 9022-T

Stewart-Warner A61C and A61CR Series

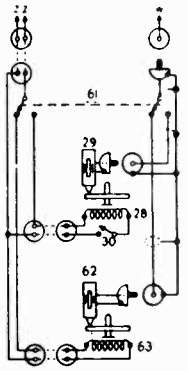
The following models are the same as Model A61CR1, appearing on *pages 17-3 and 17-7 and 17-8 of Rider's Volume XVII*, except for the record changers and cabinets. The parts list for these models appears on *page 17-3*. This information was inadvertently left out of the index and should be inserted.

The parts list appearing on *page 17-3* should be amended to include the following:

Model numbers and code numbers:

Model No.	*Code No.*
A61C20	9034-P
A61CR1	9034-C
A61CR1LP	9034-CLPW
A61CR2	9034-D
A61CR2LP	9034-DLP
A61CR3	9034-E
A61CR4	9034-F
A61CR4X	9034-FX
A61CR4LP	9034-FLP
A61CR4LPX	9034-FLPX
A61CR5	9034-G
A61CR6	9034-H
A61CR7	9034-J
A61CR7X	9034-JX
A61CR7LPW	9034-JLPW
A61CR7LPWX	9034-JLPWX
A61CR8	9034-K
A61CR9	9034-L
A61CR10	9034-M
A61CR11	9034-N
A61CR12	9034-GR
A61CR12LP	9034-GRLP
A61CR13	9034-GL
A61CR13LP	9034-GLLP
A61CR14	9034-GM
A61CR14LP	9034-GMLP
A61CR15	9034-GT
A61CR15LP	9034-GTLP
AC1CR16	9034-FH
A61CR16LP	9034-FHLP
A61CR17	9034-CM
A61CR17LP	9034-CMLP
A61CR21	9034-R

The phonograph connections for some of these models are shown in the accompanying diagram.



PHONO CONNECTIONS FOR MODELS A61CR4X, A61CR4LPX, A61CR7X & A61CR7LPWX.

PART NO.	DESCRIPTION
	OTHER ELECTRICAL PARTS
28	505273 Motor—for type "VM"-505339 record changer, 115 volt 60 cycle
	505758 Motor—for type "A"-505650 record changer 115 volt 60 cycle
	507403 Motor—for type "W"-506910 record changer 115 volt 60 cycle
	507409 Motor—for type "VM"-506911 record changer 115 volt 60 cycle
29	505100 Crystal cartridge for standard records (used on "A"-505650 & "VM"-505339 record changers)
	507400 Crystal cartridge for standard and "LP" records (used on "W"-506910 record changer)
	507405 Crystal cartridge for standard and "LP" records (used on "VM"-506911 record changer)
30	505269 Switch—"ON-OFF" for type "VM"-505339 & "VM"-506911 record changers
	505759 Switch—"ON-OFF" for type "A"-505650 record changer
	507402 Switch—"ON-OFF" for type "W"-506910 record changer
60	505342 Speaker P.M. dynamic (8 inch) (used on all models)
	506657 Speaker P.M. dynamic (6 inch) This is an additional speaker used only on models A61CR5, A61CR6, A61CR7, A61CR7X, A61CR7LPW, A61CR7LPWX, A61CR12, A61CR12LP, A61CR13, A61CR13LP, A61CR14, A61CR14LP, A61CR15, A61CR15LP, A61CR16, A61CR16LP, A61CR17 & A61CR17LP
61	507662 Switch—"ON-OFF" for type "R"-507556 record changer
62	507746 Crystal cartridge (used on "R"-507556 record changer)
63	507747 Motor—for type "R"-507556 record changer 115 volt 60 cycle
	MISCELLANEOUS PARTS
	160832 Clip—mts. escutcheon
	505465 Door (less hardware) for Models A61CR1 & A61CR1LP
	506412 Door—left hand (less hardware) for Model A61CR5
	506413 Door—right hand (less hardware) for Model A61CR5
	506414 Door—left hand (less hardware) for Models A61CR6, A61CR7, A61CR7X, A61CR7LPW & A61CR7LPWX
	506415 Door—right hand (less hardware) for Models A61CR6, A61CR7 A61CR7X, A61CR7LPW & A61CR7LPWX
	506075 Door (less hardware) for Models A61CR17 & A61CR17LP
	507184 Door—left hand (less hardware) for Models A61CR12 & A61CR12LP
	507185 Door—left hand (less hardware) for Models A61CR13 & A61CR13LP
	507186 Door—left hand (less hardware) for Models A61CR14 & A61CR14LP
	507187 Door—left hand (less hardware) for Models A61CR15 & A61CR15LP
	507188 Door—right hand (less hardware) for Models A61CR12 & A61CR12LP
	507189 Door—right hand (less hardware) for Models A61CR13 & A61CR13LP
	507190 Door—right hand (less hardware) for Models A61CR14 & A61CR14LP
	507191 Door—right hand (less hardware) for Models A61CR15 & A61CR15LP
	505488 Drawer—record changer; for Model A61CR3
	507480 Drawer—record changer; for Model A61CR21
	505666 Emblem, plastic
	505333 Escutcheon—dial
	505466 Handle—door; for Models A61CR1 & A61CR1LP
	506077 Handle—door; for Models A61CR17 & A61CR17LP
	506416 Handle—door; for Models A61CR5, A61CR12, A61CR12LP, A61CR13, A61CR13LP, A61CR14, A61CR14LP, A61CR15 & A61CR15LP
	506417 Handle—door; for Models A61CR6, A61CR7 A61CR7X, A61CR7LPW & A61CR7LPWX
	505486 Handle—drawer; for Model A61CR3
	506265 Handle for Models A61CR8, A61CR9 & A61CR10
	507481 Handle—drawer; for Model A61CR21
	505467 Hinge—door (supplied in pairs) for Models A61CR1 & A61CR1LP
	506076 Hinge—door (supplied in pairs) for Models A61CR17 & A61CR17LP
	506421 Hinge—door (supplied in pairs) for Models A61CR5, A61CR6, A61CR7, A61CR7X, A61CR7LPW, A61CR7LPWX, A61CR12, A61CR12LP, A61CR13, A61CR13LP, A61CR14, A61CR14LP, A61CR15 & A61CR15LP

PART NO.	DESCRIPTION
	MISCELLANEOUS PARTS (Cont.)
	505457 Hinge—lid (supplied in pairs) for Models A61CR2, A61CR2LP, A61CR5, A61CR6, A61CR7, A61CR7X, A61CR7LPW, A61CR7LPWX, A61CR8, A61CR9, A61CR10, A61CR11, A61CR12, A61CR12LP, A61CR13, A61CR13LP, A61CR14, A61CR14LP, A61CR15, A61CR15LP, A61CR16 & A61CR16LP
	505464 Hinge—lid (supplied in pairs) for Models A61CR1, A61CR1LP, A61CR4, A61CR4X, A61CR4LP, A61CR4LPX A61CR17 & A61CR17LP
	505344 Knob—tuning (clear plastic)
	505345 Knob—"VOLUME" (clear plastic)
	505346 Knob—"RADIO-PHONO" (clear plastic)
	506262 Knob—tuning (black plastic)
	506263 Knob—"VOLUME" (black plastic)
	506264 Knob—"RADIO-PHONO" (black plastic)
	505455 Lid (less hardware) for Models A61CR2 & A61CR2LP
	505462 Lid (less hardware) for Models A61CR1 & A61CR1LP
	505669 Lid (less hardware) for Models A61CR4, A61CR4X, A61CR4LP, A61CR4LPX, A61CR17 & A61CR17LP
	506160 Lid (less hardware) for Model A61CR11
	506268 Lid (less hardware) for Model A61CR8
	506269 Lid (less hardware) for Model A61CR9
	506270 Lid less hardware) for Model A61CR10
	506418 Lid (less hardware) for Model A61CR5
	506419 Lid (less hardware) for Models A61CR6, A61CR7, A61CR7X, A61CR7LPW & A61CR7LPWX
	507179 Lid (less hardware) for Models A61CR16 & A61CR16LP
	507180 Lid (less hardware) for Models A61CR12 & A61CR12LP
	507181 Lid (less hardware) for Models A61CR13 & A61CR13LP
	507182 Lid (less hardware) for Models A61CR14 & A61CR14LP
	507183 Lid (less hardware) for Models A61CR15 & A61CR15LP
	505456 Lid support for Models A61CR2, A61CR2LP, A61CR8, A61CR9, A61CR10, A61CR11, A61CR16 & A61CR16LP
	505463 Lid support for Models A61CR1, A61CR1LP, A61CR4, A61CR4X, A61CR4LP & A61CR4LPX
	506074 Lid support for Models A61CR17 & A61CR17LP
	506422 Lid support for Models A61CR5, A61CR6 A61CR7, A61CR7LPA, A61CR12, A61CR12LP, A61CR13, A61CR13LP, A61CR14, A61CR14LP, A61CR15 & A61CR15LP
	505469 Light diffusing strip
	505717 Needle—phonograph; for standard record (used on "A"-505650, & "VM"-505339 record changers)
	507401 Needle—phonograph; for standard and "LP" records (used on "W"-506910 record changer)
	507406 Needle—phonograph; for standard and "LP" records (used on "VM"-506911 record changer)
	507748 Needle—phonograph (used on "R"-507556 record changer)
	507749 Nut—retains needle (used on "R"-507556 record changer)
	500966 Plug—phono. pick-up cable
	501031 Plug for phono. motor cable
	505686 Pointer
	505487 Rail for drawer; Model A61CR3 (supplied in sets)
	506234 Rail for drawer; Model A61CR21 (supplied in sets)
	119087 Ring for dial cord
	113463 Rubber pad for mtg. chassis
	79905 Screw—#8x1½" for loop mounting
	79993 Screw—#8x1¼" for mtg. chassis
	505716 Screw—set for phono needle (used on "VM"-505339 & "A"-505650 record changers)
	507404 Screw—set for phono. needle (used on "W"-506910 record changer)
	503588 Shaft & Drum for dial
	505313 Shaft—tuning
	505653 Shield for phono. pick-up cable Connector
	505722 Shield—light
	116680 Socket—octal base
	160039 Socket—phono. plug
	160392 Socket—octal (rectifier)
	505307 Socket & phono. motor cable
	505459 Socket—dial lamp
	505654 Socket for phono. pick-up cable Connector
	505161 Spring—tension
	506276 Stop for door; Models A61CR17 & A61CR17LP
	111456 Washer—spring washer for tuning shaft

The parts list of the Stewart Warner A61C and A61CR series.

Tele-Tone Chassis A

Models 123, 125, 127, and 131 are the same as Model 100, Chassis A, which appears on *page 15-2 of Rider's Volume XV.*

Tele-Tone Chassis D

Models 110, 119, 124, 126, and 132 are the same as Model 117, Chassis **D**, appearing in *Rider's Volume XV, page 15-4.*

Tele-Tone Chassis U

Models 172 and 176 are the same as Model 156, Chassis U, which appears on *page 17-4 of Rider's Volume XVII.*

Tele-Tone Chassis W

Models 154, 155, 173, and 177 are the same as Model 152, Chassis W, which appears on *pages 17-2 and 17-3 of Rider's Volume XVII.*

Templetone H-127

This model is the same as Model G-725, appearing on *pages 17-3 through 17-6 of Rider's Volume XVII.*

United Motors 982421

This model appears on *pages 19-44 through 19-49 of Rider's Manual Volume XIX.* The following service parts have been changed after serial #1-38500.

Illus. No.	*Production Part No.*	*Service Part No.*	*Description*
6	1219508	1219508	1st i-f coil assy.
7	1219509	1219509	2nd i-f coil assy.
25	7240724	M908	Electrolytic
25A			20 μf, 25 v.
25B			20 μf, 400 v.
25C			20 μf, 400 v.
28	7237836	E202	0.002 μf, 600 v. tubular
48	1213217	A101	100 ohms, ½ w.
	1218107	5233	6SR7
	1213793	5241	6V6GT
	7237751	5229	6SK7
	7237752	5222	6SA7

Watterson RC-4581

This model is the same as Model 4581 appearing on *page 15-1 of Rider's Volume XV.*

Western Auto D2718 Series B, Serial No. 137000 Up

This model is the same as Model D2718, appearing on *pages 17-20 through 17-23 of Rider's Volume XVII,* except for the following changes. Capacitor C30, formerly connected from the junction of R-16, C-29, and pin 8 of the 12SQ7 tube to pin 2 of the 35Z5GT rectifier tube, is connected from the same junction to the center tap (pin 3) of the filament of the 35Z5GT rectifier tube.

The part number of capacitor C16 and C20 should be changed from 47X446 to 47X466. The value remains the same. Part number 17X96, celluloid crystal, should be added to the parts list.

Western Auto D4832-B

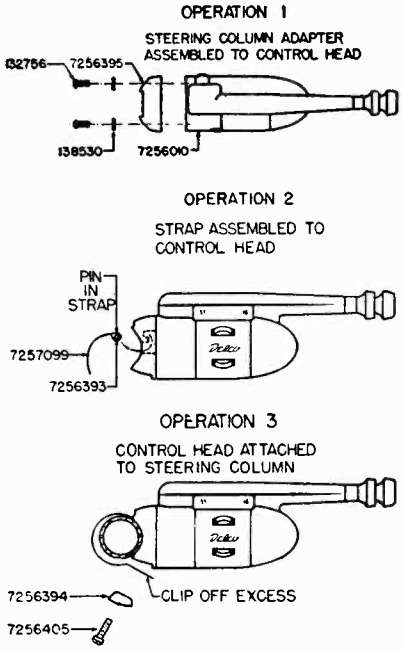
This model appears on *pages 18-69 through 18-72 of Rider's Volume XVIII.* The "B" chassis of this model differ from the "A" chassis by a change in the value of resistor R-4 from 220,000 ohms to 10 000 ohms.

The new part number and description are as follows:
R-4 B-85103 10,000 ohms, 0.5 w.

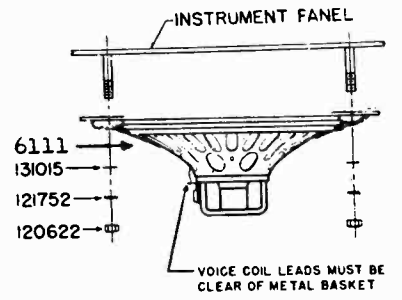
United Motors R-705

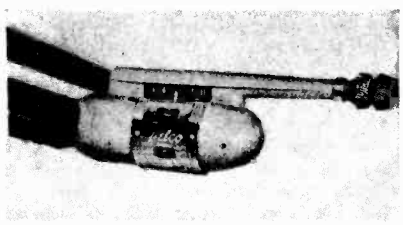
This model appears on *pages 17-1 through 17-6 of Rider's Volume XVII.* This receiver may be installed in the 1949 Fords by using parts from the adapter parts package number 4428. It is necessary to use the Delco universal speaker, part number 6111—6" × 9" eliptical speaker, in place of the speaker supplied with the radio set. This speaker should be returned to your stock under part number 6104.

The parts that are to be used from adapter package 4428, are shown in the following operations.



OPERATION 4: Remove the tips from speaker cable and solder ends to 6" × 9" speaker terminals.





The various operations necessary to install United Motors Model R-705 in the 1949 Fords, as well as the assembled control head are illustrated.

Westinghouse H-125, H-126, H-127

Models H-125 and H-126 appear in *Rider's Volume XV, pages 15-8 through 15-10.* Several changes were made in the chassis of these two models in late production. A 35L6GT output tube replaces the 35A5. The electrical characteristics of the tubes are similar except for a difference in tube bases and connections. An isolating network consisting of a 470-ohm resistor (44) and a 0.02-μf capacitor (14) has been inserted in the plate and screen voltage supply line for the r-f and converter stages. In the circuit, the rotor plates of the tuning and trimmer capacitors are now connected directly to chassis ground rather than to the AVC line.

Model H-127 is the same as the previous models with a burgundy and gold cabinet. The following items should be added to the parts lists for these models:

14	RCP10W2203A	Capacitor, 0.02 μf
44	RC20AE471M	Resistor, 470 ohms 0.5 watt
	V-3711-2	Case Assembly, center (H-126 and H-127)
	V-3991	Cover, left hand (H-127)
	V-3992	Cover, right hand (H-127)
	V-3498-2	Handle Assembly (H-127)
	V-3481-2	Knob (H-127)
	V-3333-2	Medallion (H-127)
	V-3455-2	Dial (H-127)

Westinghouse H-164, H-166, H-166A, H-167

These models appear on *pages 18-12 through 18-19 of Rider's Volume XVIII.*

To reduce hum in later production of these models, a de-coupling network was inserted in the plate circuit of the 6AT6 a-m detector, avc and a-f amplifier tube. This network consists of a 100,000-ohm ½ watt resistor (RC20AE104K) and a 0.1 μf 400 volt resonant type capacitor (V-5442-1). The resistor is inserted between the plate load resistor (R11) and the B plus line, and the capacitor is connected from the junction of R11 and the new resistor to ground.

Westinghouse H-183, H-183A

These models appear on *pages 19-15 through 19-17 of Rider's Manual Volume XIX.* An error exists in the schematic diagram. The value of R9 in the converter circuit should be 3,300 ohms instead of 300 ohms.

The position of C20 in the circuit has been changed. On some chassis this capacitor was connected across the primary of the output transformer as shown on the schematic diagram. In later production, the capacitor is connected from the plates to the cathodes of the parallel 25L6GT output tubes.

Westinghouse H-186, H-187

These models appear on *pages 18-26 through 18-30 of Rider's Volume XVIII.*

To reduce hum in later production of these models, a de-coupling network was inserted in the plate circuit of the 6AT6 AM detector, AVC and A-F amplifier tube. This network consists of a 100,000 ohm ½ watt resistor (RC20AE104K) and a 0.05 μf 400 volt capacitor (RCP10W4503A). The resistor is inserted between the plate load resistor (R13) and the B plus line, and the capacitor is connected from the junction of R13 and the new resistor to ground.

Westinghouse H-202, H-204

These models appear on *pages 19-24 through 19-28 of Rider's Manual Volume XIX*. The schematic diagram shows C12 and R17 in series between the a-m antenna terminal and the top of L17. R17 should connect to the bottom of L17 rather than to the top of L17.

Westinghouse H-188, Ch. V-2133

This model appears on *pages 19-18 and 19-19 of Rider's Volume XIX*. Short wave interference may be cured by replacing the 0.05-μf resonant capacitor (C7) with a 0.1-μf standard paper capacitor of 200 volts or higher rating.

The 220,000-ohm resistor, R11, which was previously connected between the common negative line and the chassis, is not being used on late chassis.

The switch, SW1, is incorrectly shown on the schematic diagram and parts list as a D.P.S.T. switch. Actually, it is a S.P.S.T. switch, and it interrupts only one side of the a-c line, the side which connects to the common negative line.

In later production, a V-6199-2 2nd i-f transformer was used in place of the V-5686 2nd i-f transformer listed. Although the new transformer is smaller than the original one, it is directly interchangeable through the use of a V-5426 mounting clip. The new transformer is slug-tuned and has one adjustment hole in the top of the can and one in the bottom of the can. The terminals are marked by numbers which are equivalent to the colors on the old transformer as follows: 1 equals green, 2 equals white, 3 equals blue, and 4 equals red. For replacement purposes, order the V-6199-2 2nd i-f transformer and V-5426 mounting clip.

Some chassis may use a V-5686 i-f transformer in place of the V-5685 1st i-f transformer; however, the V-5685 transformer as listed in the parts list should be ordered for replacement of the 1st i-f.

The following items should be added to the parts list:

Part No.	*Description*
V-6199-2	Transformer, 2nd i-f, (L6, L7, C19, C20)
V-5426	Clip, i-f mounting
V-1160-2	Cabinet, ivory
V-5778-2	Baffle and grille cloth assembly for ivory cabinet
V-5779-2	Grille, for ivory or black cabinet

Note: The V-1160-1 cabinet listed in the parts list is a black cabinet, and the V-5778-1 baffle and grille cloth assembly is for use with the black cabinet.

Westinghouse H-190, H-191, H-191A

These models appear on *pages 19-20 through 19-23 of Rider's Manual Volume XIX*. In later production, the cathode resistor, R3, for the 6BA6 1st i-f amplifier was removed and the cathode connected directly to ground. In addition, a 0.0022-μf mica capacitor (RCM30B222M) was connected across the 6BA6 2nd i-f amplifier cathode resistor, R4.

On some chassis, V-5596 "HI-KAP" capacitors are substituted for the following capacitors:

V-5040-15 (C7, C8, C9, C10, C11)
V-5040-11 (C19, C20, C21).

In the parts list, the part number of "Pull, door, phono (H-191 and H-191A)" should be changed to V-5877-1 and the part number of "Pull, door, record compartment (H-191 and H-191A)" should be changed to V-5877-2. These part numbers were reversed. Also, the part number of "Hinge, L.H." should be changed to V-6603-1, and the part number of "Hinge, R.H." should be changed to V-6603-2.

Westinghouse H-204A

This model appears on *pages 19-24 through 19-28 of Rider's Manual Volume XIX*. On some chassis, V-5595 "HI-KAP" capacitors are substituted for V-5040-13 (C51, C52, C53, C54, C55, C56, C57) capacitors. The substitution was made for convenience in production, and the receiver operation is not affected.

Westinghouse H-210, H-211; Ch. V-2144, V-2144-1

These models appear on *pages 19-33 through 19-35 of Rider's Volume XIX*. If the dial pointer has a tendency to bind, lubricate the two dial pulleys with record changer lubricant and move the dial cord tension spring to another hole in the drum to increase the tension.

If the dial pointer rattles, glue a piece of bumper material (cork and rubber composition) 1/8" thick and about ½" square between the right-hand pulley rivet on the dial background and the front of the chassis.

In later production models, the resistance of the 12BA6 i-f amplifier cathode resistor, R3, was changed to 668 ohms. The part number of the new resistor is RC20AD680J. In addition, the resistor, R12, in the lead from pin 5 of the 35W4 was deleted from the circuit, and a direct connection was made in lieu of the resistor.

The tuning shafts used in later production have a wider groove for the dial cord. With these shafts, there are 3¼ turns of dial cord around the shaft rather than 2¼ turns as indicated on the dial-drive drawing.

Zenith S-11468

Model S-11468 may be found in the Record Changer section of *Rider's Volume XV, pages RCD.CH. 15-1 through RCD. CH. 15-9*.

The following instructions deal with repairing erratic landing of the needle of Model S-11468. In the first production of this non-intermixer record changer, a neoprene cork-tipped lift pin, Part No. S-13056, was used to stabilize the set down or landing of the needle on the run-in groove of the record. The weight of the tone arm and the friction plate, riding on the neoprene tip of the lift pin was relied on to provide effective braking action. Grease or oil on the neoprene tip of the lift pin will cause erratic landing of the tone arm on the record. To remove the oil or grease, clean the pin tip and friction plate with carbon tetrachloride and roughen with fine sandpaper.

Later production S-11468 changers have a spring type brake on the tone arm shaft and use an all metal lift pin, Part No. S-13086. Erratic landing, where the arm swings sharply to the center of the record or beyond, may be caused by an incorrect locating bushing. Replace with a 94-415 bushing.

If the tone arm skips grooves and repeats, the vertical hinge on the tone arm may be too tight, causing the arm to hang slightly. This prevents the needle from exerting enough pressure on the record to follow the record grooves. To free the hinge, use a pair of long nose pliers and bend the horizontal spring "U" bracket until it pivots freely. Be certain that the connecting lead to the crystal cartridge is dressed so that it does not interfere with either the vertical or horizontal movement of the tone arm. *This is important.*

Excessive center hole wear on records is caused by a sharp edge or burrs on the spindle shelf. The edge of the record shelf must be perfectly smooth and slightly rounded. Check the edge, and if sharp, smooth out with fine sandpaper.

Zenith 5DO and 5RO Series, Chassis 5C01, 5C02, and 5C04

These models appear on *pages 15-8 and 15-9 of Rider's Volume XV*.

Alternate tubes are used in the 5C01 chassis. A single chassis may contain octal, lock-in, and miniature button tubes. The alternate lineups are as follows.

Original	*Alternate*	*Alternate*
12SA7GT	12BE6	14Q7
35Z5GT	35W4	
12SK7	12BA6	
12SQ7	12AT6	
50L6GT	50B5	

If the oscillator should shift, replace the 220-ohm oscillator coupling resistor (R8) with a 1000-ohm resistor. When the oscillator drops out at the low end of the band, remove the 10,000-ohm grid leak resistor (R1) from the common return (B—) and connect it instead to the cathode of the converter. If audio oscillation occurs in the early model, disconnect the 0.0005-μf capacitor (C13) from the common return and connect it to the cathode of the 50L6GT output tube, as shown in the late model schematic on *page 15-8*. Remove the 250-$\mu\mu$f capacitor (C20) that is connected from the plate to the cathode of the 50L6GT output tube. When hum and microphonics appear, check for a grounded tuning capacitor frame to the cabinet ventilator plate.

The letter "V" after a chassis number indicates that an aluminum chassis is used.

Zenith Chassis 6C05, 6D0 Series

This chassis appears in *Rider's Volume XV, pages 15-2, 15-28, and 15-29.*

There will be variations in the tube line-up for different 6C05 chassis. A single chassis may contain octal, lock-in, and miniature button tubes. If an original tube is replaced with an alternate, the socket must also be replaced.

Original	*Alternate*	*Alternate*
12SJ7GT		
12SA7GT	12BE6	14Q7
12BA6		
12SQ7GT	12AT6	
35L6GT		
35Z5GT	35W5	

If the oscillator shifts, replace R3 (220 ohms) with a 1,000-ohm resistor.

If the oscillator drops out at the low end of the band, disconnect R1 (10,000 ohms) from the negative return and connect to the cathode of the converter tube.

For audio oscillation, disconnect C14 from the negative return and connect to the cathode of the 35L6GT. Take out C21 (connected from the plate to cathode of the 35L6GT).

If there is oscillation at 910 kc, change C5 (negative return to chassis) from 0.05 to 0.1 μf.

Check for grounded tuning capacitor frame in case of oscillation, hum, and poor sensitivity. Correct by inserting cork or rubber pad between rear capacitor frame and chassis. Cement in place.

The letter "V" as in Chassis number 6C05V, indicates that an aluminum chassis is used.

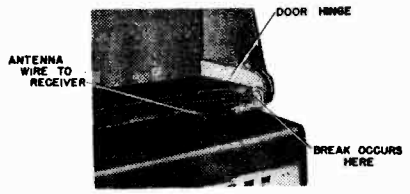
Zenith 4G800 Chassis 4E41

This model appears in *Volume XVII of Rider's Manuals, pages 17-1 and 17-2.* The On-Off switch #85-433 does not completely break contact on some receivers when the lid is closed, causing battery drain. To correct this condition, saw one plastic switch knob 46-736 into 1/16" lengths and place a length on the switch shaft, and then replace the knob. This will force the switch down far enough when the lid is closed to break contact and disconnect the batteries.

In some cases the calibration pointer touches the metal front of the cabinet, thus putting the gang at an a-c potential and causing a hum. To correct this condition place a fibre washer #93-323 between the pointer and the metal dial front. This fibre washer between the metal front panel and the dial pointer, completely prevents this "shorting" condition.

In very rare cases, when hum is encountered and cannot be corrected in any other manner, changing the 1S5 tube is suggested.

On later production runs the 3Q4 tube was replaced with a 3V4 tube. The circuit remains the same in this case. However, the wiring to the tube base has been altered. The 3Q4 is not interchangeable with the 3V4 because of socket connections.



Enough extra lead length should be left when replacing the wavemagnet lead on the Zenith 4G800 so that a break does not occur at the point indicated.

In some cases when the front lid of the receiver is open, the receiver will cut in and out or sometimes be entirely dead. The wire from the wavemagnet to the front door hinge may break at the hinge connection. To correct this condition, remove the handle and resolder these leads, being quite certain that solder is not allowed to run back on the antenna lead and that enough extra antenna lead is allowed for flexing to prevent breakage when the door is open as illustrated in the accompanying diagram.

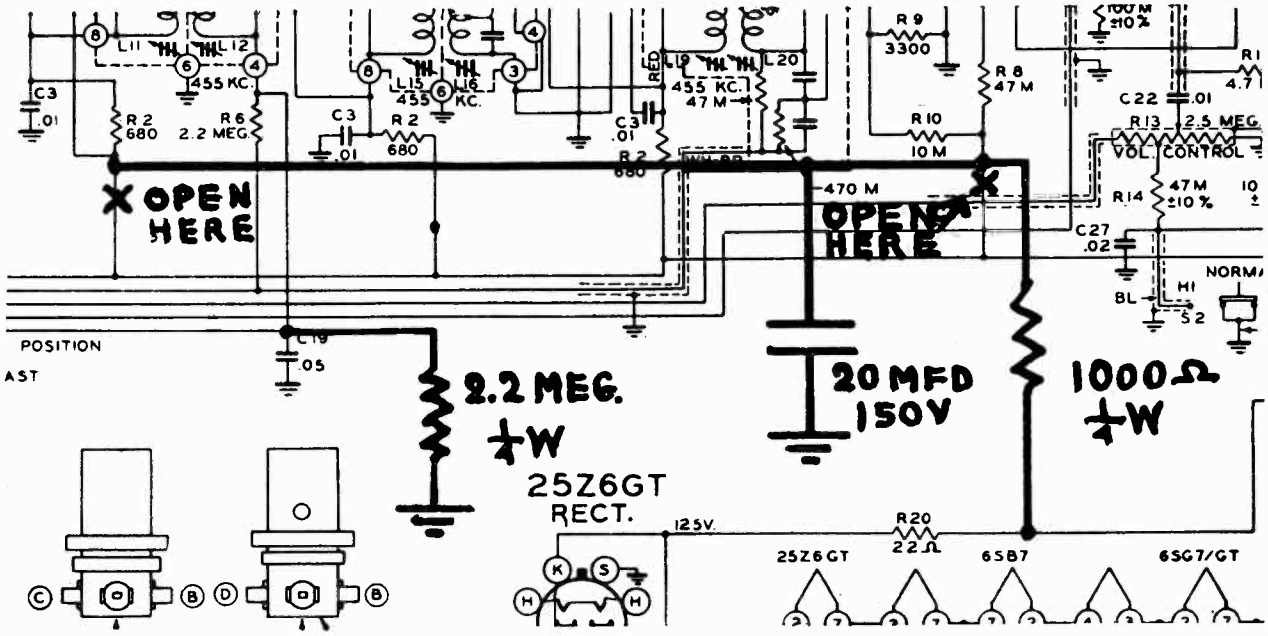
Zenith 6G801, Chassis 6E40

This model appears in *Rider's Volume XVIII, pages 18-7, 18-8, and 18-10.* In some cases when microphonics are encountered they can be eliminated by replacing one or more of the tubes. The offending tube can be located by turning the set on with the volume advanced and the set tuned to an off-station position. Then gently tap each tube, the one emitting the loudest "ping" is the defective item.

Zenith 8H023, 8H034, Chassis 8C01

These models appear on *pages 15-71 to 15-74 of Rider's Volume XV.* The rushing noise that occurs when the volume control is turned to minimum is caused by a poor connection from the grid element to the grid cap of the 6S8GT tube. A hot iron and a little flux on the grid cap will remove the high-resistance solder joint.

If the f-m oscillator drifts, check for a red dot on the oscillator tuning-slug wire. If the wire is unmarked, replace with one which has a red dot. If the receiver flutters on f.m., this may be cured by installing a 22-1635, 20-μf, 150-V capacitor and two 1/4-watt resistors, 63-583, 1000 ohms, and 63-600, 2.2 Megohms, as indicated in the accompanying diagram.



Drift in the f-m oscillator of the Zenith 8H023 may be corrected by making the changes indicated.

Zenith 9H881, 9H882, 9H885, 9H888, Ch. 9E21

These models appear on *pages 19-22 through 19-29,30 of Rider's Volume XIX*. If capacitor C-4, 0.05 μf, in series with the wavemagnet is open, the signals will be weak and the addition of an external antenna will not appreciably improve the signal strength. The replacement of this capacitor with a new 0.05 μf capacitor usually clears up the trouble.

If the phonograph is dead, check resistor R-14, 10,000 ohms, ½ watt, for intermittent operation. Due to movement of the r-f shelf when the band switch is operated, this resistor sometimes becomes intermittent, thus opening the phono circuit.

In most cases when aligning these models, it is not necessary to change or make any alterations in the i-f or discriminator trimmers. These trimmers are quite stable, and the only change recommended in alignment is that of the r-f section.

Be very sure to dress the tone control wires away from the pulley and dial cord. If these are not dressed away, binding and dial slipping will result.

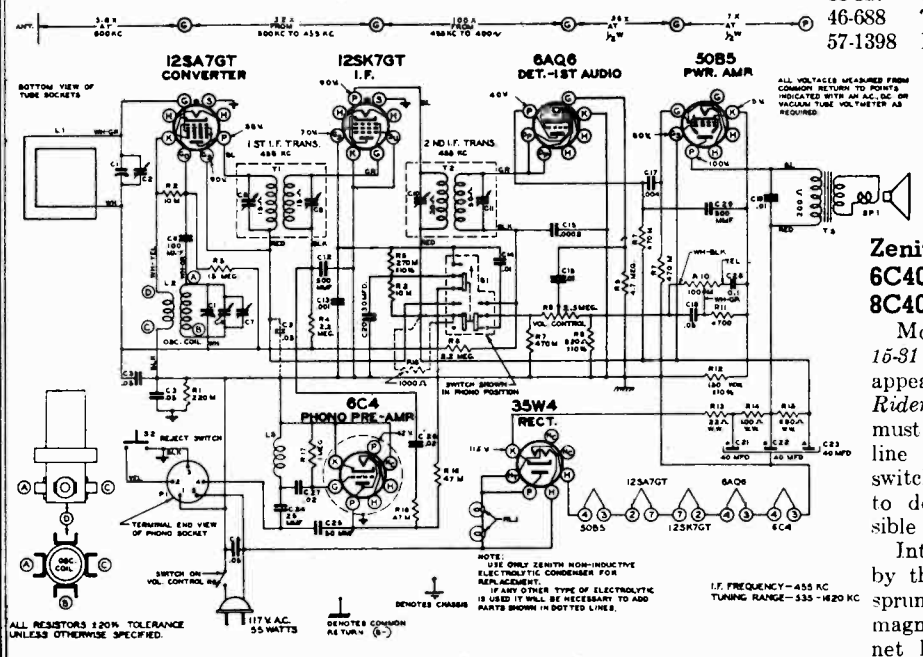
If static is present when tuning in a station, check and see if the silver foil on the paper tube shield is tightly wrapped on the cardboard form. Sometimes this foil unwraps from the cardboard form and lies against the gang plates, creating static.

Zenith 6R886Z, Chassis 6E02Z

Model 6R886Z is the same as Model 6R886 which appears in *Rider's Manual Volume XVII, pages 17-16 and 17-17*, except that a tone control has been added, as illustrated in the accompanying diagram.

The following parts were added:

S-14667	Dial pointer and pulley assy.
S-14670	Tone control brkt. and lug assy.
12-1490	Cover plate support
22-827	0.1 μf 200 v.
46-688	Tone control knob
57-1398	Escutcheon
63-1653	Tone control
78-793	Socket-octal tube
85-438	Phono-Radio switch
125-66	Rubber grommet
166-41	Rubber bumper
188-34	Retaining ring.



Changes in the Zenith 6R886Z.

Zenith Chassis 6C01, 6D0 Series

Chassis 6C01, 6D0 Series, which appears on *page 15-26 of Rider's Volume XV*, will contain variations in the tube line-up. A single chassis may contain octal, lock-in, and miniature button tubes. If an original tube is replaced with an alternate, the socket must also be replaced.

Original	*Alternate*
35Z5G/GT	35W4
12SQ7GT	12AT6

When replacing speakers, use a speaker with the same code letter (49U, AG etc.) as the original otherwise a low-pitch hum may be produced. If a speaker with a different code is used, R10 (feedback resistor) may have to be changed. With 49U, H, or AG speakers, R10 is 390,000 ohms. When using a 49CS549 speaker, R10 must be 680,000 ohms. R10 is 330,000 ohms for all other speakers.

To repair this set when it produces a howl, change the 14C7 tube, which is probably microphonic.

For oscillation, hum, and poor sensitivity, check for grounded tuning capacitor frame. Correct by inserting a rubber pad between the capacitor frame and chassis. Cement in place.

Zenith 8G005 Series

These models appear on *pages 15-63 through 15-70 of Rider's Volume XV*. All receivers of this series are similar. Different letters after the numbers 8G005 indicate differences in the cabinet only, except for Model 8G005BT. The latter is an export-standard model and employs a 220-120-volt changeover switch in the rear of the chassis. Otherwise, it is the same as the rest of the series.

Zenith 6G001, 6G001YX, Chassis 6C40, 8G005, 8G005YX, Chassis 8C40

Model 6G001 appears on *pages 15-30 and 15-31 of Rider's Volume XV*. Model 8G005 appears on *pages 15-63 through 15-70 of Rider's Volume XV*. The On-Off switch must be in the Off position whenever the line plug is inserted into the changeover switch on the rear of the chassis. Failure to do this may cause flashing and possible burn-out of the output tubes.

Intermittent operation may be caused by the wavemagnet snap connectors being sprung, causing a poor contact. Poor wavemagnet contact is made through the cabinet hinge.

The letter "X" after the model number (6G001YX, 8G005YX) indicates that an aluminum cabinet is used.

MODELS RC195, RC196, RC197, RC210. RC211, RC212

RC195, RC196, RC197 RECORD CHANGERS

A very small quantity of record changers with model numbers RC195, RC196, RC197 were produced. These Record Changers are early production version of the RC210, RC211, and RC212 Record Changers. The only difference between them is that on the RC195, RC196, and RC197 Record Changers, no provision was made for automatically playing 7-inch records. (Centerpost is not removable and pickup arm does not have size selector knob.)

OPERATING INSTRUCTIONS

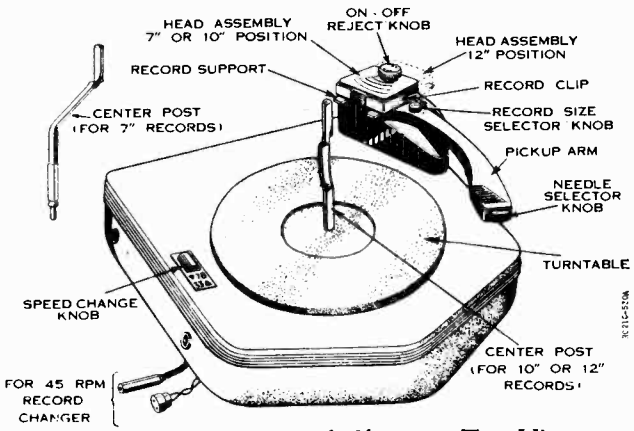


Figure 1. RC210 Record Changer, Top View.

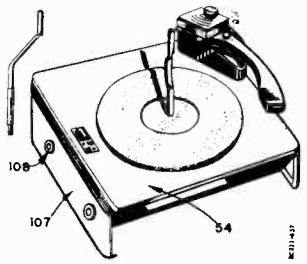


Figure 2. RC211 Record Changer

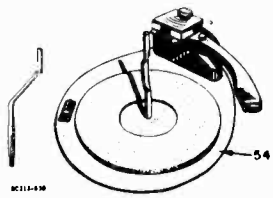


Figure 3. RC212 Record Changer

This Admiral Record Changer will automatically play a series of ten 7-inch, twelve 10-inch, or ten 12-inch records of either the 78 RPM, or the new 33 RPM type. The records must be of one size and type for each loading.

Models RC210 and RC211 can also be used, in connection with the Admiral 45 RPM Record Changer, to play the new 7-inch, 45 RPM records. Two plugs have been provided to allow for connecting it to the Admiral 45 RPM Record Changer.

SETTING NEEDLE SELECTOR AND SPEED CHANGE KNOBS

Rotate the pickup arm cartridge, by turning the needle selector knob which extends out from the front of the pickup arm. The small arrow next to the "33" and "78" indicates the direction in which the knob must be rotated. When turning this knob to either the "78" or the "33" position, make certain that it is turned until it reaches its stop.

For playing 78 RPM records, move the speed change knob to the "78" position; for playing 33 RPM records, move it to the "33" position. When moving the speed change knob, make certain that it clicks or snaps into position.

Be certain that the needle selector knob and speed change knob are both set for "78", or are both set for "33"

SETTING FOR SIZE OF RECORD

SELECTING CENTERPOST: This record changer is designed to be used with either of two centerposts. The centerpost which has a curved portion in the center is the centerpost for 10-inch and 12-inch records. The second centerpost is bent approximately 45 degrees and is to be used for automatically playing 7-inch records.

To change centerposts it is only necessary to lift the centerpost from its socket. Place one hand on the turntable while pulling out the centerpost with the other hand.

SETTING HEAD ASSEMBLY: In order to play 7-inch or 10-inch records, rotate the head assembly so that the embossed design is toward the centerpost. See figure 1. For 12-inch records, rotate the head assembly so that the embossed design is away from the centerpost.

SETTING RECORD SIZE SELECTOR KNOB: To play 7-inch records, turn the Record Size Selector knob to the left so that the figure "7" on the knob is adjacent to the dot on the pickup arm. To play 10-inch or 12-inch records, turn this knob to the right until the figures "10 12" are adjacent to the dot on the pickup arm.

STARTING THE RECORD CHANGER

Do not load 33 RPM records with the standard 78 RPM type. Also, the records must be of the same size (all 7-inch, all 10-inch, or all 12-inch) for each loading.

After setting the head assembly for the correct record size, move the record clip so that it is away from the centerpost before loading the changer.

Place your records over the centerpost so that they rest on its offset. The edge of the bottom record will be held up by the record support.

Move the record clip so that it rests on the top record.

Turn the On-Off Reject knob to the "ON" position.

Press down on the On-Off Reject knob momentarily to the "Reject" position. The bottom record will drop to the turntable and the Record Changer will play the entire stack of records automatically.

REJECTING A RECORD

If you wish to stop playing any record and start playing the next one, merely press down on the On-Off Reject knob momentarily.

STOPPING AND UNLOADING

This Record Changer cannot be turned off, by means of the On-Off Reject knob, during its change cycle. Therefore, after the last record, allow the mechanism to go through its change cycle and start playing over again.

MODELS RC210,
RC211, RC212

THE CHANGE CYCLE

DESCRIPTION OF CHANGE CYCLE
(See Figures 4 and 5)

If at all possible, we recommend that you carefully observe the operation of a changer that is in normal operating condition. It is a good idea to rotate the turntable by hand and repeat the changing cycle until you understand the function of each part. **It is important to note that this changer employs the oscillating type trip, which depends upon the in and out movement of the pickup arm caused by the eccentric groove in the record.**

The changer operates as follows: The changer mechanism is driven during its change cycle by the knurled hub of the turntable rotating the rubber-tired drive wheel (69). During normal playing, the drive wheel is held in a neutral position as illustrated in Fig. 4A, so that the indentation prevents the tire from contacting the knurled hub. The drive wheel (69) is held in this position by the trip stop wire (91A) and the cam stop stud (72A) on the control cam (72).

During the record play and as the needle enters the record eccentric groove, the pickup arm is moving in toward the centerpost. The pawl (103A) is moving across the trip serrations (94). When the eccentric groove in the record causes the pickup arm to move away from the centerpost, the pawl (103A) tends to reverse its direction but its sharp point catches in one of the trip serrations (94) and moves the trip lever (91). As the eccentric groove moves the pickup arm back in toward the centerpost, and then away from the centerpost again, the pawl (103A), again locks in one of the trip serrations, moves the trip lever (91) far enough so that the trip stop wire (91A) is no longer engaged with the cam stop stud (72A). **This oscillating trip action is dependent upon the adjustment of the trip set screw (95).** If it is adjusted properly, the pickup arm will move away from the centerpost, toward the centerpost, and as it comes away the second time the changer will trip and start its change cycle. (See paragraph under heading "Trip Adjustment.") The position of drive wheel (69) at this moment is shown in Figure 4B.

This allows the cycle spring (92) to pull the control cam clockwise (bottom view). Since the control cam (72) and the drive wheel (69) are on the same shaft, the drive wheel is turned so its rubber tire is against the knurled hub of the turntable (see Figure 4B). The turntable now rotates the drive wheel (69) which simultaneously rotates the control cam (72). As soon as changer has been tripped, the trip cocking spring (90) causes the trip lever (91) to return the trip stop wire (91A) to the noraml playing position.

Roller (85) riding on the control cam (72) moves the pivot link (84) which in turn rotates the control plate (83). The rotation of the control plate (83) causes its inclined tab (83A) to ride against the lift rod (28) which lifts the pickup arm from the record. The arm control lever roller and stud (103B) then engages the safety arm (100). Further rotation of the control cam (72) moves the pivot link (84) causing further rotation of the control plate (83) causing the pickup arm to move to the right, clearing the record. This much has taken place in approximately one-third of the total rotation of the control cam.

As the control cam rotates further, its push-off stud (72B) engages with the end of the slot in the pushoff

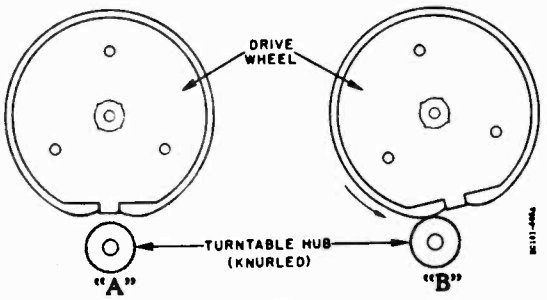


Figure 4. Drive Wheel Positions.

link assembly (76), moving it. This movement is transmitted through the push-off arm (76A) and as a result, the push-off shaft (10) is rotated. This rotates the push-off cam (10A) which in turn slides the push-off plate (11) forward and drops the next record to be played. Note that the record stack rests on the record support shelf (12). The small slide at the top end of the centerpost holds back all records other than the bottom one when the push-off plate (11) moves forward.

As the control cam continues its rotation, the pivot link (84) moves back following the cam, since the roller (85) is kept in contact with the cam by the control plate spring (87). This moves the control plate (83) back, the arm control lever (103) moves the pickup arm to the set-down point for the record to be played. The pickup arm is held above the record because the lift rod (28) is still resting at the top of the inclined tab (83A) on the control plate (83). The set-down point is governed by the set-down adjusting screw (21). (See figure 6.) The shoulder on the set-down arm (104A) holds the pickup arm at the set-down point until it is pushed back by the edge of the control plate engaging the set-down arm stud (104B). The pickup arm is then free and moves down toward the record starting groove.

When the record changer is set to play 7-inch or 10-inch records, the set-down arm (104A) through the tension of the set-down spring (106) moves the arm in toward the centerpost until the return roller and stud (103C) reaches the shoulder of the set-down arm (104A). The pickup arm is held in this position until the control plate (83) engages the set-down arm stud (104B), pushing the set-down arm back, releasing or freeing the pickup arm.

When the changer is set for 12-inch records the size change eccentric (82) moves the set-down and size change assembly (104) so that the arm return roller and stud (103C) does not travel as great a distance along the set-down arm (104A) before it reaches the shoulder. Therefore the pickup arm cannot move in toward the centerpost as far as for 7-inch or 10-inch records, during change cycle.

When the On-Off Reject knob (1) is pressed down, the push-off cam and shaft (10) moves the reject arm (97) down. This movement causes the trip lever (91) to move which prevents the trip stop wire (91A) from engaging the cam stop stud (72A). The change cycle then proceeds in the manner described above.

The change cycle is exactly the same for either speed (33 RPM or 78 RPM) except for the fact that the change cycle time is proportional to the turntable speed (33 RPM or 78 RPM).

MODELS RC210, RC211, RC212

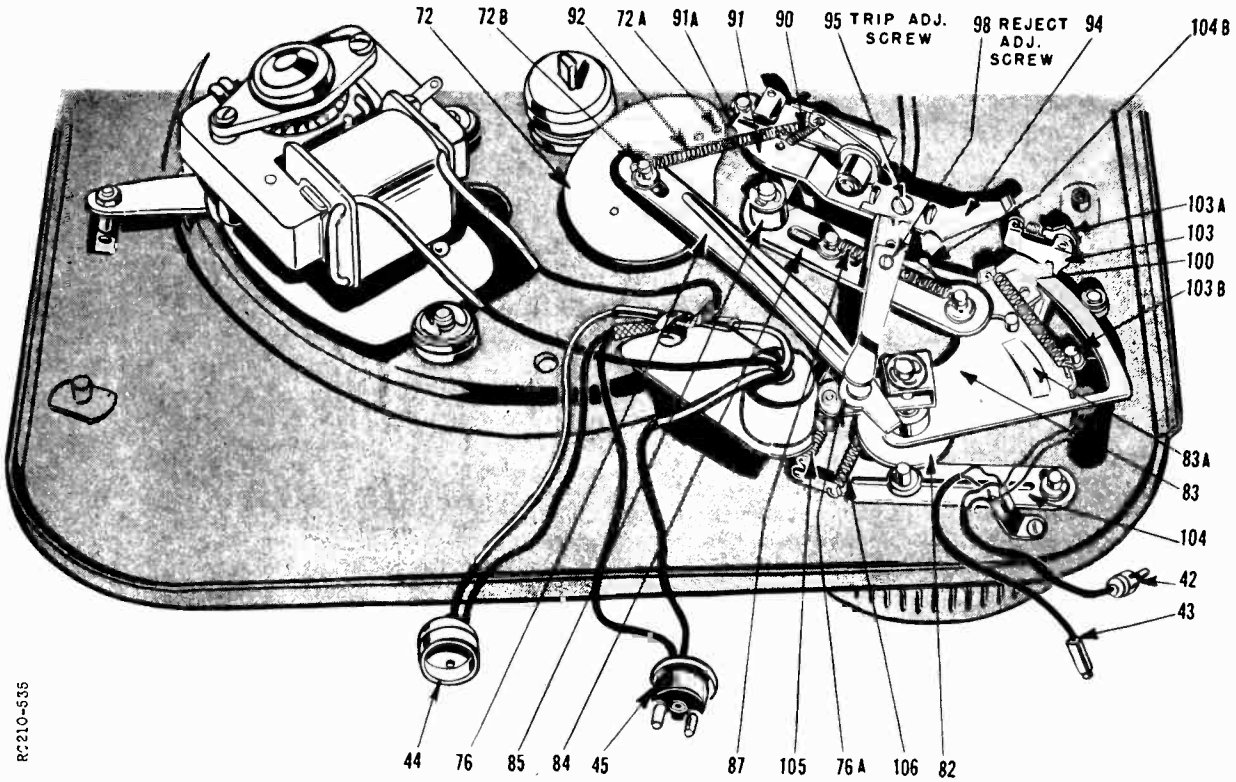


Figure 5. Bottom View Assembled.

Playing 7-inch records automatically is accomplished by removing the centerpost for 10-inch or 12-inch records and inserting the centerpost for 7-inch records. Rotation of the record size selector knob (17) to the position for 7-inch records, rotates the set-down eccentric (23). The set-down eccentric rotates or moves the set-down plate, part of pivot and mounting plate (24), and the pivot spring and hub (29). This in turn moves the arm control lever, studs, and pawl (103) so the pawl (103A) is closer to the lip of the trip serrations (94). This results in moving the end of the pick-up arm closer to the centerpost, by the distance needed for proper set-down on 7-inch records.

ADJUSTMENTS

ADJUSTMENT OF SET-DOWN POINT

Adjustment of the set-down point, for either 7-inch, 10-inch, or 12-inch records, is made by adjustment of the set-down adjusting screw (21), see Figure 6. Screw (21) is accessible through hole in right side of pickup arm. This adjustment must be made with the record size selector knob (17) in the "10.12" position. When turning this knob be sure to turn it all the way (the dot between "10.12" should line up with the indicating dot on the pickup arm) to avoid making the set-down adjustment at the wrong point, resulting in improper set-down on 7-inch records. Turning the set-down adjusting screw (21) in, moves the set-down point of the pickup arm closer to the centerpost and turning the screw out moves it away from the centerpost.

Make the set-down point adjustment as follows:

1. Set record size selector knob (17) to the "10.12" position; be sure the knob is turned all the way to its stop (the dot between "10.12" should line up with dot on pickup arm).
2. Set needle selector knob to either position being certain that the knob is turned to its stop so the needle projects straight down.
3. Set the head assembly to the position for playing 7-inch or 10-inch records.
4. Press down on the On-Off Reject knob (1) momentarily. Rotate the turntable by hand through the change cycle until the pickup arm moves down toward the turntable.
5. Check the distance between the needle point and the near side of the centerpost. For proper set-down on 10-inch records, the distance between needle and centerpost should be between 4⅝" and 4-11/16".
6. Adjust set-down screw (21) and repeat steps 4 and 5 until the proper distance is obtained. If this adjustment is made carefully, the set-down point for 7-inch records and 12-inch records will be automatically correct.
7. Check 12-inch set-down as follows: Set the head assembly to the position for 12-inch records, press On-Off Reject knob momentarily, rotate turntable by hand through the change cycle and check the 12-inch set-down point. The proper distance between the needle point and the near side of the centerpost is between 5⅝" and 5-11/16".
8. Check 7-inch set-down as follows: Set the head assembly to the position for 7-inch and 10-inch records, set the record size selector knob (17) so the dot under the "7" lines up with the locating dot on the pickup arm. (NOTE: In some early production sets, it may be necessary to set the

record size selector knob (17) so that the dots are slightly out of line.) Press the On-Off Reject knob momentarily, rotate the turntable by hand through the change cycle and check the 7-inch set-down point. The proper distance between needle point and the near side of the centerpost is between 3-3/16" and 3¼".

9. If step 7 or step 8 indicates improper set-down on 7-inch records or 12-inch records, make a compromise adjustment for 10-inch record set-down as outlined in steps 3, 4, 5 and 6.

ADJUSTING THE PICKUP ARM HEIGHT (See Figure 6)

This record changer is designed so that when the needle point rests ¼" above the changer pan, the pick-up arm will automatically lift high enough, during change cycle, to clear the top record of a stack of ten 7-inch, twelve 10-inch, or ten 12-inch records on the turntable. With proper pickup arm height setting, the pickup arm will not lift high enough to strike the bottom record of the stack to be played.

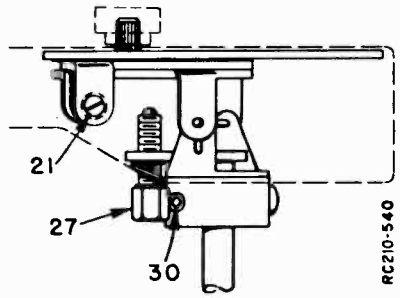


Figure 6. Arm Detail Showing Adjustments.

With the record changer out of change cycle and the pickup arm clear of the turntable, adjust the lift adjusting screw (27) so that the needle rests approximately ¼" above the top of the changer pan. Turning screw (27) in raises the pickup arm; turning it out lowers the arm.

After this adjustment has been made, the record changer should be run through its change cycle a few times to make certain that the pickup arm does not touch the bottom record of the stack to be played. If, for some reason, the arm lifts too high, a compromise adjustment should be made. That is, turn the screw out and lower the pickup arm slightly.

REJECT AND TRIP ADJUSTMENTS

Before making either reject or trip adjustments it is very important to make certain that the reject spring (2) is holding the push-off shaft (10) up, as far as it will go. If this precaution is not observed, erratic reject and trip action may result.

Possible causes of the spring not holding the push-off shaft up are:

a. The On-Off Reject knob (1) may be loose.

b. The reject spring (2) may be broken, missing, slipped down between washer (3) and push-off shaft (10), or has lost its tension.

c. Push-off shaft (10) binding.

REJECT ADJUSTMENT

1. Be sure to read the paragraph under "Reject and Trip Adjustments".

2. Adjust the reject link adjusting screw (98) until there is approximately 1/32 of an inch space between the end of the reject arm (97) and the rivet on the push-off arm and link assembly (76). NOTE: If there is no space between these two parts, it will be possible for the changer to begin its change cycle when the on-off reject knob is turned to the "OFF" position. If there is too much space, the changer may reject erratically.

3. Operate the Record Changer, press the On-Off Reject knob momentarily and check reject action.

TRIP ADJUSTMENT

Since this Record Changer uses the oscillating trip principle to begin its change cycle, it is very important that the trip adjusting screw (95) is properly adjusted. See Figures 5 and 7.

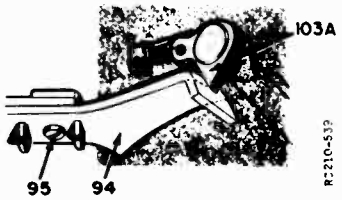


Figure 7. Positioning Trip Serrations.

The trip adjusting screw (95) is properly adjusted when the record changer trips into change cycle after the eccentric groove in the record has caused the pickup arm to move away from the centerpost once or twice, that is, one or two backswings of the pickup arm, before the changer trips into change cycle. Since some eccentric grooves cause greater movement of the pickup arm than others, the changer might trip into change cycle with only one backswing on some records and with two backswings on others.

The ideal adjustment of screw (95) for best operation is when the point of the pawl (103A) is horizontally even or level with the smooth side of the trip serrations (94). NOTE: The point of the pawl will be approximately 3/32 of an inch from the bottom edge of the lip on the trip serrations. See Figure 7.

Adjust the trip adjusting screw (95) as follows:

1. Be sure to read the paragraph under "Reject and Trip Adjustments".

2. Connect record changer motor to power source and turn the On-Off Reject knob on and off as needed to check this adjustment.

3. Adjust trip adjusting screw (95) until the point of the pawl (103A) is horizontally even or level with the smooth side of the trip serrations (94), or until the point of the pawl is 3/32 of an inch from the bottom edge of the lip on the trip serrations. See Figure 7.

4. If the top of the trip stop wire (91A) is not level with the top of the main cam stop stud (72A) as shown in Figure 8, check to see if the trip stop wire is bent slightly. If it is, bend the wire until it is even (level) with the top of the stud.

5. Place a record on the turntable and check to make certain that the changer trips into change cycle with one or two backswings of the arm.

IMPORTANT

The eccentric groove of a record should be used when checking the trip adjustment. Do not lift the pick-up arm and move it in and out by hand.

If the trip adjusting screw (95) is turned out too

far, it will take more than two backswings of the pickup arm to trip the changer into change cycle. If the screw (95) is almost all the way out, the changer will not trip. If the screw is turned too far in, there will be excessive drag and wear on the trip serrations, pawl point and on record eccentric grooves. Consequently, the trip adjustment should be made very carefully.

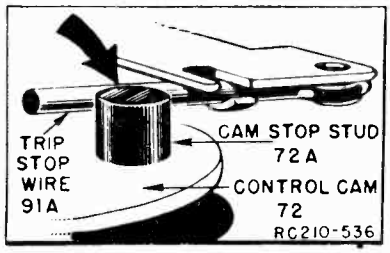


Figure 8. Positioning Trip Stop Wire.

SERVICE AND REPAIR

CAUTIONS

1. **See that the rubber tires on both the drive wheel and the idler wheel are kept clean and free from oil, grease, dirt or any foreign material.** Carbona or carbon tetrachloride may be used for cleaning these parts.
2. The drive wheel assembly (69) appears to be almost identical with that used on the model RC170 and RC170A record changers. **These parts are not interchangeable.**
3. When replacing the rubber tire (68) do not bend the tab on the drive wheel over too far as this may result in the tire catching or rubbing on the drive wheel pressure spring (71).
4. If the On-Off Reject knob (1) cannot be pulled off with the fingers, pry very carefully. The head cover (7) is plastic and if the On-Off Reject knob is pried off, excessive force should not be used.
5. When removing or replacing the pawl spring (102) care should be taken not to stretch it.
6. When removing or replacing the pickup arm (18), always loosen the Allen set screw (30) and lift off the complete assembly. The pivot spring, hub and pin assembly (29) can be removed from the pivot plate assembly (24) and replaced much more readily with the complete pickup arm assembly off of the changer.
7. When replacing the switch mounting bracket (79) or the trip bracket (89) be sure to locate the half punches in the holes in the pan before tightening their mounting screws (80).
8. When replacing the on-off switch assembly (81) care should be used in bending the tab fasteners so that the switch is mounted firmly to the bracket.
9. When replacing or reinstalling the record size selector knob (17), turn the set-down eccentric (23) to the position for 10" and 12" set-down. Then install the knob (17) so that the dot between "10.12" lines up with the locating dot on the pickup arm.

CARTRIDGE AND NEEDLES

The cartridge (34) used in these record changers is especially designed and there are a few things which should be observed when replacing the cartridge (34), needles (36 and 37), or pickup arm cable (40).

When replacing either needle make certain that the correct needle is inserted in the proper "side" of the cartridge. The needle (36) for 33 RPM records is an osmium tipped needle especially designed for playing 33 RPM records. The radius of the point of the 33 RPM needle is only 1/3 of the radius of the point of a standard (78 RPM) needle. If this sharp needle is used on standard 78 RPM records, it has a tendency to "wobble" in the record groove and would possibly damage the standard record groove. A needle for 78 RPM records may possibly damage 33 RPM "microgroove" records because of its tendency to "skate" across a microgroove record. Consequently, care should be taken when replacing needles.

The needle (36) for 33 RPM records is painted red to identify it. The needle guard on the 33 RPM "side" of the cartridge has red color dots to distinguish it from the 78 RPM "side" of the cartridge. The red (33 RPM) needle (36) should be inserted in the side of the cartridge which has the red color dots.

When replacing the cartridge (34) care must be taken when placing the pickup arm cable pinjacks on the cartridge. There must be sufficient slack in the cable to allow the cartridge to rotate. It is also important that the short length of plastic tubing be kept over one terminal.

TWO SPEED MOTOR (67)

The turntable speed of these Record Changers is changed mechanically. When the speed change knob (58) is moved to the "33" position, the speed change arm (56) moves. This causes the 33 RPM drive shaft to pivot and ride against the idler wheel (60). When the speed change knob is moved to the 78 RPM position, the speed change arm causes the 33 RPM drive shaft to pivot away from the idler wheel (60). When the speed change knob (58) is moved, make certain that it "clicks" or "snaps" into position.

Note that the 33 RPM drive shaft is driven by the 78 RPM drive shaft by means of a rubber belt (63). This belt should be clean and free from oil. If the belt is greasy or stretched, it might possibly slip which would cause the turntable speed to vary, resulting in unsatisfactory operation.

When replacing the speed change knob (58), make certain that the shaft in the knob does not touch the sides or ends of the cut-out in the pan. The speed change arm (56) must be installed properly (its half-punches keep the proper angle). If it is not installed correctly, the speed change knob shaft may rub against the edge of the opening in the pan causing rumble and noise pickup. Also, the clearance between the bottom of the speed change knob and the top of the pan should not be less than 1/64 of an inch or more than 3/64 of an inch.

REMOVING THE PLASTIC BASE HOUSING (14)

Should it be necessary to remove the plastic base housing, proceed as follows:

1. Remove retaining rings (86 and 88).
2. Release one end of the index spring (105).

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3. Lift the entire head assembly up from the top of the changer.
4. Loosen Allen set screw (30) and lift complete pickup arm assembly off.
5. Remove retaining ring (31) and washer (32).
6. Remove three screws (16) holding base.
7. Lift off the plastic base housing (14).
8. When reassembly has been completed, the pickup arm height should be carefully checked and adjusted, if necessary, by means of the lift adjusting screw (27). The set-down should also be checked and adjusted, if necessary, as outlined under "Adjustment Of Set-Down Point".

REMOVING TURNTABLE (8) AND BEARING ASSEMBLY (49)

To remove the turntable it is only necessary to grasp the turntable by its edges and lift up. Before replacing the turntable, make sure that the recessed part of the drive wheel (69) is towards the centerpost. If necessary, turn drive wheel counterclockwise about a turn so it locks in this position. The pickup arm should be positioned away from the turntable. In replacing the turntable, force is not needed to seat it. Make certain, however, that the idler wheel of the motor has been pushed in towards the centerpost and that the idler wheel is making contact with the inner side of the turntable flange.

The dimensions of the two speed motor are such that three cork washers (47) are used under the turntable hub to keep the turntable from rubbing against the idler wheel drive shafts.

In some cases it may be found that the three cork washers, after considerable use, are compressed so the turntable will rub. To build the stack up, an additional thin cork washer should be used. This fourth cork washer may be placed at the top or bottom of the stack.

The washers (47 and 48) and thrust bearing assembly (49) are removed by sliding them off of the centerpost. In replacing, have them in the order shown in Figure 9.

REMOVING BOTTOM COVER (107)

For Model RC210 only. To remove the bottom cover (107) from the record changer, remove the two rear screws (50) through the bottom. Then press on the front edge of the bottom cover; this frees the changer from the slotted mounting brackets at the front of the bottom cover. To replace bottom cover, reverse above operations.

The changer must float on the springs (51) to prevent microphonic feedback, thus these springs must be re-installed properly. The wider end fits around and hugs the extrusion in the mounting brackets in the bottom cover. The narrow end of the spring fits over the threaded bushing on the changer pan (54). To assure "free floating" of the changer, spacer washers (52) are used under the narrow portion of springs (51).

For Model RC211 only. To remove the bottom cover on this model (RC211), remove the three mounting screws (50), from the top of the changer pan. Then merely lift the changer pan off of the bottom cover (107) being careful to see that lead-in cables and motor leads are disconnected.

When reinstalling the changer pan on the bottom cover be certain the float springs (51) are properly installed. Insert the mounting screws (50). IMPORTANT: These screws must be installed so they travel freely through the extruded holes in the changer pan. If the screws touch the edges of the holes in the pan, a scraping sound will occur when records drop to the turntable and microphonics might also result.

LUBRICATION

Under normal operating conditions, the motor should never require oiling. The rest of the changer, however, should be lubricated with grease whenever it comes into the shop for repairs or adjustment. **All pivot and friction points should be greased adequately but not excessively.** A good automobile chassis grease may be used for this purpose.

The push-off shaft (10), powdered iron roller (85), oilite bearings, (used in the turntable hub and base housing), may be lubricated with SAE No. 20 motor oil.

Care shoull be taken to prevent any of the lubricant from coming into contact with the drive or idler wheel tires. Also be careful, when using oil, that an excess does not seep into the felt of the turntable.

RECORD CHANGER TROUBLE SHOOTING

1. Records Do Not Drop To Turntable Or More Than One Record Drops.

(a) Check the distance between the inside edge of the centerpost (9) and the edge of the record support (12). This distance should be 4-61/64" ± 1/32", in the 10-inch position.

With the centerpost for 7-inch records in place and the head assembly in the 10-inch position, the distance between the inside edge of the centerpost and the edge of the record support should be 3½" ± 1/32". These dimensions are critical and if distance does not meet specifications, bend the centerpost slightly toward or away from the head assembly as needed.

2. Changer Repeatedly Trips Into Change Cycle.

(a) Check for broken trip cocking spring (90), or
(b) Check for broken reject spring (2), or
(c) Check for On-Off Reject knob (1) loose, or
(d) Check for misadjustment of reject adjusting screw (98), or trip adjusting screw (95).

3. Changer Will Not Trip.

(a) Check for broken or loose cycle spring (92),
(b) Check On-Off switch cover (81). If cover is is not assembled to switch properly it may bind push-off link and arm (76) preventing cycle spring (92) from pulling the main cam (72) around, or
(c) Check for misadjusmtent of the trip adjusting screw (95), or
(d) Check for bent trip stop wire (91A), or
(e) Check for broken pawl spring (102).

4. Changer Will Not Reject.

(a) Check adjustment of reject screw (98).

5. Cannot Get Proper Set Down.

(a) Check set-down spring (106), or
(b) Check for broken or loose set-down adjusting spring (22), or
(c) Check for loose pickup arm counter weight screws (20) resulting in erratic set-down. (These screws hold pivot and mounting plate (24) in position).

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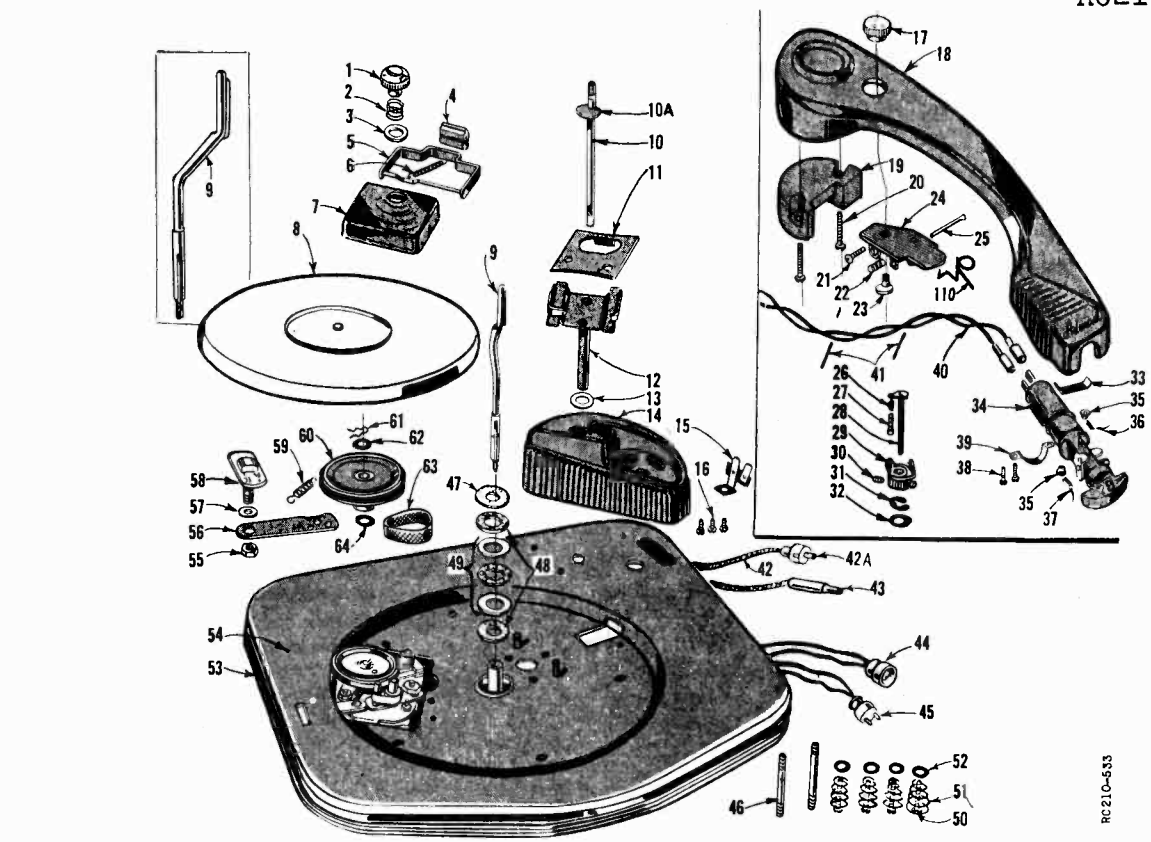

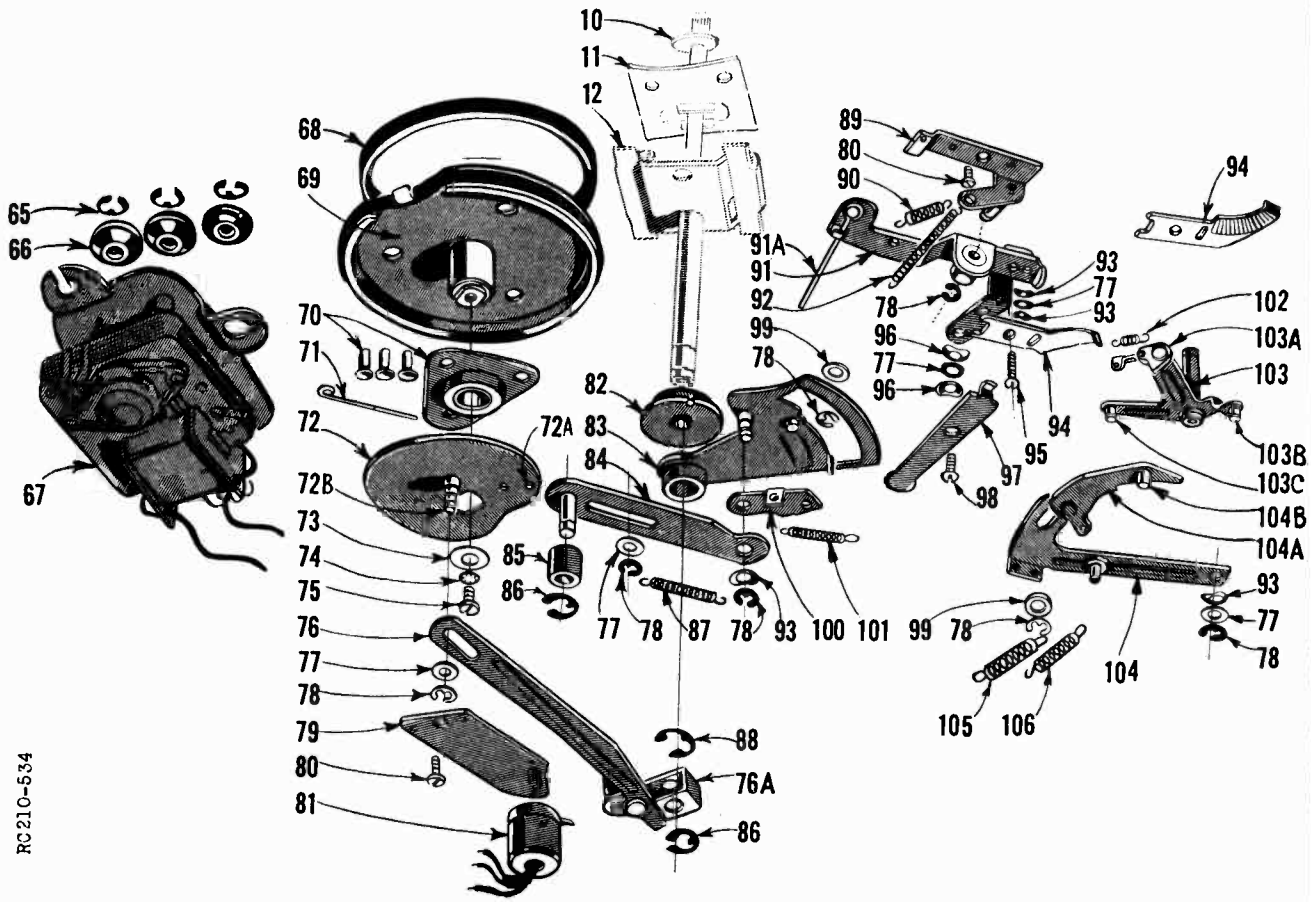

Figure 9. RC210 Record Changer, Exploded.

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PARTS LIST

Ref. No.	Part Number	Description
1	403A27	On-Off Reject Knob
2	405A97	Reject Spring
3	4B1-166-47	Washer (Flat) .390x5/8x1/16
4	406A18	Rubber Bumper for Record Clip
5	403A32	Record Clip (Plastic)
6	405A94	Record Clip Spring
7	403A31	Head Cover (Plastic)
8	G400B167	Turntable
9	G400B311	Centerpost Assy. (for 10" & 12" Records)
	G400B310	Centerpost Assy. (for 7" Records)
10	G400A248	Push-Off Cam and Shaft Assembly
10A		Push-Off Cam (Part of 10)
11	401A166	Push-Off Plate
12	G400A249	Support Tube and Shelf Assembly
13	4B1-166-47	Washer (Flat) .390x5/8x1/16
14	403C28	Base Housing
15	10B1-6	Terminal Strip
16	402A148	Screw, Base Housing Mounting
17	403A37	Record Size Selector Knob
18	403C35	Pickup Arm
19	404A23	Pickup Arm Counterweight
20	1A50-6-47	Screw, #4 FH S.T. (2 req.)
21	45-500-C2-47	Set-Down Adjusting Screw 4-40x½ BH MS
22	405A118	Set-Down Adjusting Spring
23	402A173	Set-Down Eccentric
24	G400A297	Pivot and Mounting Plate
25	414A31	Pivot Shaft
26	405A120	Lift Adjusting Lock Spring
27	402A156	Lift Adjusting Screw
28	G400A238	Lift Plate and Rod Assembly
29	G400A294	Pivot Spring & Hub (includes 8-32 Set Screw)
30	1A43-14	Allen Set Screw 8-32
31	401A235	Retaining Ring
32	412A32	Washer
33	405A111	Cartridge Indexing Spring
34	98A54-1	Cartridge, includes Needle Screws (less Needles)
35	98A54-2	Needle Screw (Knurled)
36	98A15-6	33 RPM Needle (Painted Red)
37	98A15-7	78 RPM Needle
38	402A139	Plastiscrew, #2 (2 req.)
39	401A264	Cartridge Hold-Down Bracket
40	G400A307	Pickup Arm Cable and Lugs
41	414A30	Wire Clip, approx. ½" long (2 required)
	414A34	Wire Clip, approx. ¾" long (1 required)
42	413A11-1	Shielded Lead-in Cable & Plug (15") for RC211, RC212
	413A11-2	Shielded Lead-in Cable & Plug (30") for RC210 only
42A	88A2-3	Plug (for lead-in cable)
43	89A5-27	Shielded Cable & Socket (RC210, RC211 only) for 45 RPM Record Changer
44	413A12	Motor Socket & Leads (RC210, RC211 only) for 45 RPM Record Changer
45	88A8-1	Motor Plug (Male)
46	1A80-5	Stud Bolt (for RC210 only)
47	412A9	Cork Washer 3/64" thick (1 req.)
48	412A1	Cork Washer 3/32" thick (2 req.)
49	415A11	Thrust Bearing
50	G400A197	Mtg. Screw & Washer Assembly for RC210, RC212 (4 req.)
	402A154	Float (Mounting) Screw for RC211 only (3 req.)
51	19A10-3	Conical Mounting Spring (for RC210, RC211, RC212)
52	4B1-72-21	Fibre Mounting Washer for RC210 only (4 req.)
53	403A24	Plastic Trim (for RC210)
	403A38	Plastic Trim for RC211 (2 req.)
54	G400D303	Changer Pan Assembly (RC212)
	G400D291	Changer Pan Assembly (RC210)
	G400D306-1	Changer Pan Assembly, (RC211) Copper
	G-400D306-2	Changer Pan Assembly, (RC211) Black
55	2A1-20-47	Hex Nut #10-32
56	401A242	Speed Change Arm (for RC210, RC211)
	401A269	Speed Change Arm (for RC212 only)
57	4B1-68-47	Washer
58	403A33	Speed Change Knob
59	405A107	Idler Wheel Spring
60	G400A279	Idler Wheel Assembly
61	405A15	Hairpin Clip
62	412A30	Washer (under Hairpin Clip)
63	406A20	Drive Belt
64	98A54-4	Fibre Washer (under Idler Wheel)
65	401A229	Retaining Ring
66	406A21	Rubber Mounting Grommet (3 req.)
67	407B15	2 Speed Motor
	405A113	50 Cycle Conversion Spring (for 78 RPM Drive Shaft)
	405A112	50 Cycle Conversion Spring (for 33 RPM Drive Shaft)
68	406A13	Drive Wheel Tire Only
69	G400A252	Drive Wheel (includes Tire)
70	404A18-1	Drive Wheel Support Assembly (includes Rivets)
71	414A23	Drive Wheel Pressure Spring
72	G400A227	Control Cam Assembly
72A		Cam Stop Stud (Part of 72)
72B		Push-Off Link Stud (Part of 72)
73	401A145	Control Cam Washer
74	3B1-26-47	Lockwasher, #8 I.T.
75	85-375-C2-39	Control Cam Screw 8-32x⅜ BH MS
76	G400A219	Push-Off Arm and Link Assembly
77	4B1-68-47	Washer
78	401A177	Retaining Ring
79	401A223	Switch Bracket
80	1A53-9-47	Screw, Switch Bracket Mounting
81	408A1	On-Off Switch and Cover
82	404A17	Size Change Eccentric
83	G400A226	Control Plate, Hub and Stud Assembly
84	G400A224	Pivot Link and Stud
85	415A9	Powdered Iron Roller
86	401A229	Retaining Ring
87	405A91	Control Plate Assembly
88	401A230	Retaining Ring
89	G400A228	Trip Bracket and Stud Assembly
90	405A88	Trip Cocking Spring
91	G400A230-1	Reject Arm Support and Trip Lever
91A		Trip Stop Wire (Part of 91)
92	405A87	Cycle Spring
93	405A22	Spring Washer
94	401A271	Trip Serrations
95	65-500-C2-47	Trip Adjusting Screw
96	405A98	Spring Washer
97	401A237	Reject Arm
98	65-500-C2-47	Screw, Reject Adjusting 6-32x⅜"
99	401A173	Washer
100	401A202	Safety Arm
101	405A90	Safety Spring
102	405A89	Pawl Spring
103	G400A233	Arm Control Lever, Studs and Pawl
104	G400A222	Set-Down and Size Change Assembly
105	405A92	Index Spring
106	405A93	Set-Down Spring
107	G400D260	Bottom Cover (RC210)
	G400D287-2	Bottom Cover, Painted Black (RC211)
	G400D288-1	Bottom Cover, Painted Copper (RC211)
108	27A24	Bushing in Bottom Cover for RC210, RC211
109	405A99	Spring Washer for Bushing (RC210, RC211)
110	414A33	Size Change Tension Spring

OPERATING INSTRUCTIONS

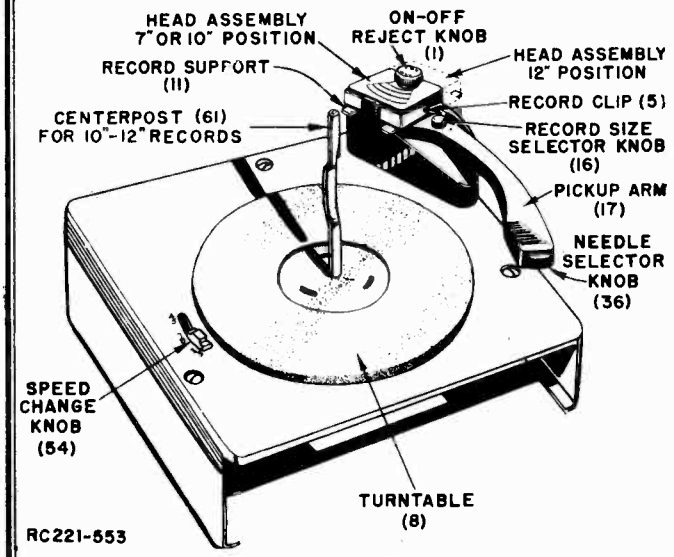


Figure 1. RC221 Record Changer, Top View.

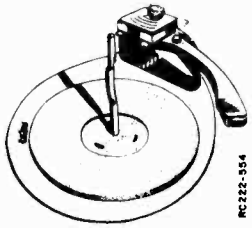


Figure 2. RC222 Record Changer.

This Admiral Record Changer is designed to automatically play a series of twelve 10-inch or ten 12-inch 78 RPM or 33 RPM records. It will also automatically play ten 7-inch 33 RPM records or twelve of the new 7-inch 45 RPM records, by using an accessory 7-inch centerpost and an accessory 45 RPM Spindle Unit. The records must be of one size and type for each loading.

SELECTING CENTERPOST

To play 78 RPM or 33 RPM records (7-inch, 10-inch or 12-inch), insert the proper centerpost into the socket in the center of the turntable. To remove a centerpost, merely place one hand on the turntable and lift up the centerpost with the other hand. To play 45 RPM 7-inch records, insert the 45 RPM spindle into the socket in the center of the turntable. Turn the spindle counter-clockwise until the "Lock-In Lugs" fall into and lock in the three holes in the turntable. To remove the spindle, hold the turntable stationary, turn the spindle clockwise, then lift it out of the socket.

IMPORTANT: If the 45 RPM spindle is being used for the first time or if the changer does not operate properly on 45 RPM, be sure to read the information given under the heading "45 RPM Spindle Adjustment."

SETTING SPEED CHANGE KNOB

For playing 78 RPM records, move the speed change knob (54) the "78" position; for playing 33 RPM records, move it to the "33" position; for 45 RPM records, move it to the "45" position. When moving the speed change knob, make certain that it clicks or snaps into position.

SETTING NEEDLE SELECTOR KNOB

To play 78 RPM records, rotate the needle selector knob so the side marked "78" faces up; to play 33 RPM records or 45 RPM records, the side marked "LP" must face up. The small arrows next to the "78" and "LP" indicate the direction in which the knob must be turned. When turning this knob to either position, make certain that it is turned until it reaches its stop.

SETTING HEAD ASSEMBLY

To play any 7-inch or 10-inch records, rotate the head assembly so that its embossed design is toward the centerpost. For 12-inch records, rotate the head assembly so that the embossed design is away from the centerpost.

SETTING RECORD SIZE SELECTOR KNOB

To play any 7-inch records, turn the Record Size Selector knob (16) all the way to the left until it reaches its stop.

To play 10-inch or 12-inch records, turn this knob to the right until it reaches its stop.

LOADING AND STARTING THE RECORD CHANGER

To load 78 RPM or 33 RPM records, place a stack of records so that they rest on the record support (11) and the offset in the centerpost. Do not mix records—play a stack of the same size and type.

To load 45 RPM records, place as many as twelve records over the 45 RPM Spindle, so that they rest on the record supports (67). Be sure that the records are held up by BOTH record supports as shown in figure 9. If the bottom record slips down over one of the record supports, the record may not drop when the changer goes through its change cycle.

REJECTING A RECORD

If you wish to stop playing any record and start playing the next one, merely press down on the On-Off Reject knob momentarily.

STOPPING AND UNLOADING

This Record Changer cannot be turned off, by means of the On-Off Reject knob, during its change cycle. Therefore, after the last record, allow the mechanism to go through its change cycle and start playing over again.

THE CHANGE CYCLE

DESCRIPTION OF CHANGE CYCLE FOR 78 RPM AND 33 RPM OPERATION

(See Figures 3, 4 and 5)

If at all possible, we recommend that you carefully observe the operation of a changer that is in normal operating condition. It is a good idea to rotate the turntable by hand and repeat the change cycle until you understand the function of each part.

It is important to note that this changer employs two different types of trip arrangements. For 78 RPM and 33 RPM operation, the oscillating type trip is used, which depends upon the in and out movement of the pickup arm caused by the eccentric groove in the record. For 45 RPM operation, a position type trip is used which trips the changer into change cycle when the pickup arm reaches a given distance from the 45 RPM spindle.

The changer operates as follows: The turntable is driven by the rubber tired idler wheel (58) on the three speed motor. The turntable speed (78 RPM, 33 RPM or 45 RPM) is determined by the diameter of the drive shaft that drives the idler wheel. See figure 3. The 78 RPM drive shaft is a part of the motor armature. The 33 RPM and 45 RPM drive shafts are moved in and out of position mechanically when the speed change knob is moved.

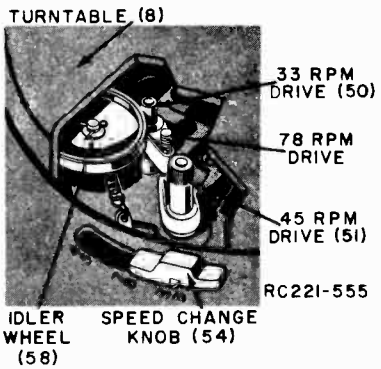


Figure 3. Motor, Showing 3 Drives.

The changer mechanism is driven during its change cycle by the rubber-tired drive wheel (86), which in turn is driven by the knurled hub of the turntable. During normal playing, the drive wheel is held in a neutral position as illustrated in Fig. 4A, so that the indentation prevents the tire from contacting the knurled hub. The drive wheel (86) is held in this position by the trip stop wire (111A) and the cam stop stud (91A) on the control cam (91).

During the record play and as the needle enters the record eccentric groove, the pickup arm is moving in toward the centerpost. The pawl (127B) is moving across the trip serrations (114). When the eccentric groove in the record causes the pickup arm to move away from the centerpost, the pawl (127B) tends to reverse its direction, but its sharp point catches in one of the trip serrations (114) and moves the trip lever (111). As the eccentric groove moves the pickup arm back in toward the centerpost, and then away from the centerpost again, the pawl (127B), again locks in one of the trip serrations, moves the trip lever (111) far

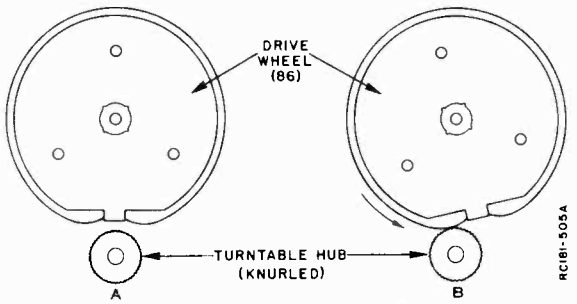


Figure 4. Drive Wheel Positions.

enough so that the trip stop wire (111A) is no longer engaged with the cam stop stud (91A). ***This oscillating trip action is dependent upon the adjustment of the oscillating trip adjusting screw (115).*** If it is adjusted properly, the pickup arm will move away from the centerpost, then toward the centerpost, and as it comes away the second time the changer will trip and start its change cycle. (See paragraph under heading "Oscillating Trip Adjustment.") The position of drive wheel (86) at this moment is shown in Figure 4B.

This allows the cycle spring (112) to pull the control cam clockwise (bottom view). Since the control cam (91) and the drive wheel (86) are on the same shaft, the drive wheel is turned so its rubber tire is against the knurled hub of the turntable (see Figure 4B). The turntable now rotates the drive wheel (86) which simultaneously rotates the control cam (91). As soon as the changer has been tripped, the trip cocking spring (110) causes the trip lever (111) to return the trip stop wire (111A) to the normal playing position.

Roller (105) riding on the control cam (91) moves the pivot link (104) which in turn rotates the control plate (123). The rotation of the control plate (123) causes its inclined tab (123A) to ride against the lift rod (30) which lifts the pickup arm from the record. The arm control lever roller and stud (127C) then engages the safety arm (124). Further rotation of the control cam (91) moves the pivot link (104) causing further rotation of the control plate (123); this moves the pickup arm to the right, clearing the record. This much has taken place in approximately one-third of the total rotation of the control cam.

As the control cam rotates further, its push-off stud (91B) engages with the end of the slot in the push-off link assembly (95), moving it. This movement is transmitted through the push-off arm (95A) and as a result, the push-off shaft (9) is rotated. This rotates the push-off cam (9A) which in turn slides the push-off plate (10) forward and drops the next record to be played. Note that the record stack rests on the record support shelf (11). The small slide at the top end of the centerpost holds back all records other than the bottom one when the push-off plate (10) moves forward.

As the control cam continues its rotation, the pivot link (104) moves back following the cam, since the roller (105) is kept in contact with the cam by the control plate spring (106). This moves the control plate (123) back; the arm control lever (127) moves the pickup arm to the set-down point for the record to be played. The pickup arm is held above the record because the lift rod (30) is still resting at the top of the inclined tab (123A) on the control plate (123). The

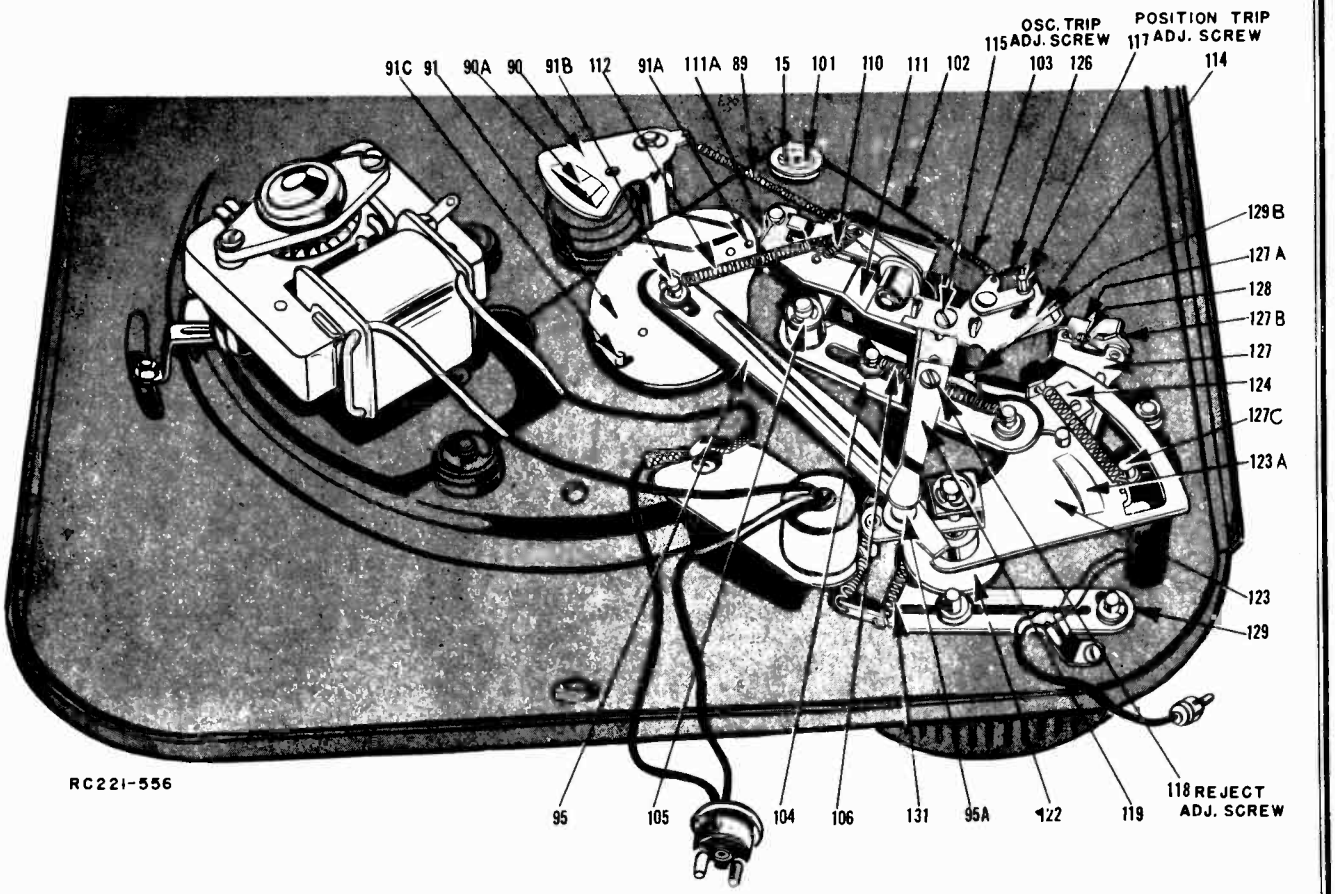


Figure 5. RC221 Bottom View Assembled.

set-down point is governed by the set-down adjusting screw (20). (See figure 10.) The shoulder on the set-down arm (129A) holds the pickup arm at the set-down point until it is pushed back by the edge of the control plate engaging the set-down arm stud (129B). The pickup arm is then free and moves down toward the record starting groove.

When the record changer is set to play 7-inch or 10-inch records, the set-down arm (129A), through the tension of the set-down spring (131), moves the arm in toward the centerpost until the return roller and stud (127D) reaches the shoulder of the set-down arm (129A). The pickup arm is held in this position until the control plate (123) engages the set-down arm stud (129B), pushing the set-down arm back, releasing or freeing the pickup arm.

When the changer is set for 12-inch records the size change eccentric (122) moves the set-down and size change assembly (129) so that the arm return roller and stud (127D) does not travel as great a distance along the set-down arm (129A) before it reaches the shoulder. Therefore the pickup arm cannot move in toward the centerpost as far as for 7-inch or 10-inch records, during change cycle.

When the On-Off Reject knob (1) is pressed down, the push-off cam and shaft (9) moves the reject arm (119) down. This movement causes the trip lever (111) to move which prevents the trip stop wire (111A) from engaging the cam stop stud (91A). The change cycle then proceeds in the manner described above.

The change cycle is exactly the same for either speed (33 RPM or 78 RPM) except for the fact that the change cycle time is proportional to the turntable speed (33 RPM or 78 RPM).

Playing 7-inch (33 RPM) records automatically is accomplished by removing the centerpost from 10-inch or 12-inch records and inserting the centerpost for 7-inch (33 RPM) records. Rotating the record size selector knob (16) to the position for 7-inch records, rotates the set-down eccentric (25). The set-down eccentric rotates or moves the set-down plate, part of pivot and mounting plate (22), and the pivot spring and hub (31). This in turn moves the end of the pickup arm closer to the centerpost and automatically provides for proper set-down on 7-inch records.

DESCRIPTION OF CHANGE CYCLE FOR 45 RPM OPERATION

For 45 RPM operation, the record changer functions in exactly the same manner as described under the heading "Description of Change Cycle for 78 RPM and 33 RPM." However, a few parts not yet described operate when the speed change knob (54) is in the "45" position and the 45 RPM spindle (62) is in place.

Since 45 RPM records do not have an eccentric groove, a position type trip is required to trip the changer into its change cycle. When the speed change knob is moved to the "45" position, the tension on the position trip cord (102) is released. This allows the position trip cocking spring (126) to pull the trip engagement arm (114A) so that the position trip

adjusting screw (117) will ride on the position trip incline (127A) as the pickup arm moves toward the centerpost. As the position trip incline (127A) moves across the position trip adjusting screw (117), the trip lever (111) moves, thereby moving the trip stop wire so it is no longer engaged with the control cam stop stud (91A). The changer then goes through its change cycle in the same manner as it does for 33 RPM and 78 RPM operation.

After the control cam (91) has rotated approximately one third of its rotation, the riser control stud (91C) engages the riser plate (90), driving the riser plate counter-clockwise so that its inclined portion (90A) rides across the push-off adjusting shaft (75) on the 45 RPM spindle. This forces the push-off adjusting shaft and the slicer cam and shaft assembly (69), up into the spindle.

As the slicer cam (69A) rises, its sides push the slicers (65 & 66) outward. The slicers move under the second from the bottom record of a stack. The record supports (67) are moved into the spindle simultaneously since the ears of the slicers are fitted into the cut-away section of the record support on the opposite side of the spindle.

When the push-off adjusting shaft (75) reaches the top of the inclined portion of the riser plate (90), the slicers (65 & 66) are fully extended, and the record supports are all the way into the spindle. This allows the bottom record to drop to the turntable while the remainder of the stack is held up by the slicers.

As the control cam continues its rotation, the riser control stud (91C) releases the riser plate (90) and the riser plate is returned to its normal position by the riser plate return spring (89). The record supports (67) and slicers (65 & 66) are returned to their normal position by the record support spring (68) and the slicer springs (64). At this point the record stack drops from the slicers to the record supports.

ADJUSTMENTS

REJECT AND TRIP ADJUSTMENTS

This record changer employs two different types of trip mechanisms to trip it into change cycle. For 78 RPM and 33 RPM operation, an "oscillating" type trip is used. See figure 6. This type of trip depends upon the in and out movement of the pickup arm caused by the eccentric groove in the record.

For 45 RPM operation, a "position" type trip is used. See figure 8. (45 RPM records do not have an eccentric groove.) This type of trip arrangement, trips the changer into change cycle when the pickup arm reaches a given distance from the 45 RPM spindle.

Screw adjustments are provided for both types of trips. However, before making either of the trip adjustments or the reject adjustment, it is very important to make certain that the reject spring (2) is holding the push-off shaft (9) up, as far as it will go. It is also important that there is $\frac{1}{32}$ of an inch clearance between the end of the reject arm (119) and the rivet on the push-off arm and link assembly (95). If these precautions are not observed, erratic reject and trip action may result, or if there is no clearance at the end of the reject arm, the changer may repeatedly trip into change cycle.

Possible causes of the spring not holding the push-off shaft up are:

a. The On-Off Reject knob (1) may be loose.
b. The reject spring (2) may be broken, missing, slipped down between washer (3) and push-off shaft (9), or has lost its tension.
c. Push-off shaft (9) binding.

REJECT ADJUSTMENT

1. Make certain that the push-off shaft (9) is not binding and is being held up, as far as it will go, by the reject spring (2) and the On-Off Reject knob (1).
2. Adjust the reject adjusting screw (118) until there is approximately $\frac{1}{32}$ of an inch space between the end of the reject arm (119) and the rivet on the push-off arm and link assembly (95).
   NOTE: If there is no space between these two parts, it will be possible for the changer to begin its change cycle when the on-off reject knob is turned to the "OFF" position. If there is too much space, the changer may not reject or will reject erratically.
3. Operate the Record Changer, press the On-Off Reject knob momentarily and check reject action.

OSCILLATING TRIP ADJUSTMENT
For 33 RPM and 78 RPM Operation

IMPORTANT: This adjustment must be made properly before making the Position Trip Adjustment.

This record changer uses the oscillating type trip for 78 RPM and 33 RPM operation. See figure 6. In order for the changer to trip properly, the oscillating trip adjusting screw (115) must be properly adjusted. Also, this adjustment affects the position trip adjustment and consequently should be made carefully before attempting the position trip adjustment.

The oscillating trip adjusting screw (115) is properly adjusted when the record changer trips into change cycle after the eccentric groove in the record has caused the pickup arm to move away from the centerpost once or twice, that is, one or two backswings of the pickup arm, before the changer trips into change cycle. Since some eccentric grooves cause greater movement of the pickup arm than others, the changer might trip into change cycle with only one backswing on some records and with two backswings on others.

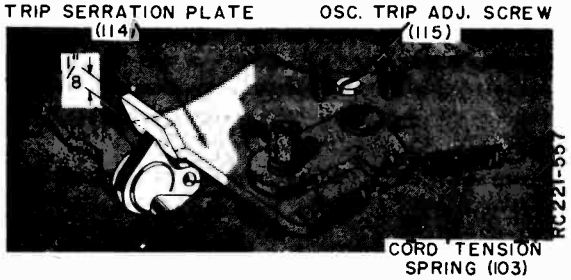


Figure 6. Trip Serration Plate, Showing Oscillating Trip Adjustment.

The ideal adjustment of screw (115) for best operation is when the point of the pawl (127B) is horizontally even or level with the smooth side of the trip serration plate (114). NOTE: The point of the pawl should be approximately 1/8 of an inch from the bottom edge of the lip on the trip serration plate. See figure 8.

Adjust the oscillating trip adjusting screw (115) as follows:

1. Make certain that the push-off shaft (9) is not binding and is being held up, as far as it will go, by the reject spring (2) and the On-Off Reject knob (1). Also check for 1/32 of an inch clearance at the end of the reject arm. See the third paragraph under heading "Reject and Trip Adjustments."
   Check to be sure that the position trip cord (102) is not broken or loose and that the cord tension adjusting cam (101) is not misadjusted.
2. Check to see that the top of the trip stop wire (111A) is even (level) with the top of the control cam stop stud (91A) as shown in figure 7. If the stop wire is not even with the top of the stud, bend the wire until it is even. The trip bracket assembly should be removed before bending the trip stop wire.

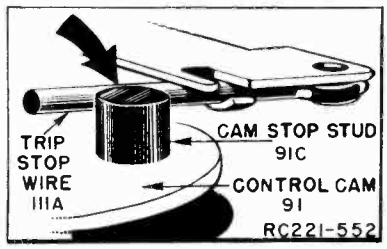


Figure 7. Positioning Trip Stop Wire.

3. Set speed change knob in the "78" or "33" position.
4. Connect record changer motor to power source and turn the On-Off Reject knob on and off as needed to check this adjustment.
5. Adjust trip adjusting screw (115) until the point of the pawl (127B) is horizontally even or level with the smooth side of the trip serrations (114). See figure 6. The point of the pawl should be 1/8 of an inch from the bottom edge of the lip on the trip serrations.
6. Place a record on the turntable and check to make certain that the changer trips into change cycle with one or two backswings of the arm. Three or four backswings may be required on 7-inch 33 RPM records.

Important

The eccentric groove of a record should be used when checking the oscillating trip adjustment. Do not lift the pickup arm and move it in and out by hand.

If the oscillating trip adjusting screw (115) is turned out too far, it will take more than two backswings of the pickup arm to trip the changer into change cycle. If the screw (115) is almost all the way out, the changer will not trip. If the screw is turned too far in, there will be excessive drag and wear on the trip serrations, pawl point and on record eccentric grooves.

POSITION TRIP ADJUSTMENT
For 45 RPM Operation

IMPORTANT: Before making this adjustment, the Oscillating Trip Adjustment should be properly made.

The position trip adjusting screw (117) is properly adjusted when the record changer trips into change cycle when the needle is 1 1/4" to 1 7/16" from the near edge of the 45 RPM spindle or 2" to 2 3/16" from the center of the centerpost hole in the turntable.

Turning the position trip adjusting screw (117) in, moves the trip point away from the 45 RPM spindle. Turning the screw out, moves the trip point closer to the 45 RPM spindle.

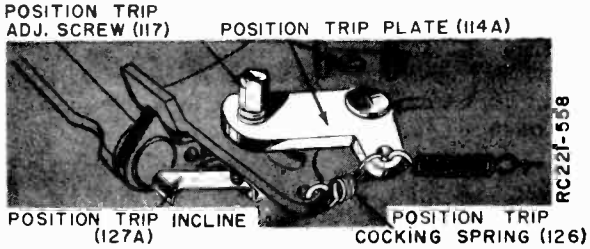


Figure 8. Trip Serration Plate, Showing Position Trip Adjustment.

Adjust the position trip adjusting screw (117) as follows:

1. Make certain that the push-off shaft (9) is not binding and is being held up, as far as it will go, by the reject spring (2) and the On-Off Reject knob (1). Also check for 1/32 of an inch clearance at the end of the reject arm. See the third paragraph under heading "Reject and Trip Adjustments."
   Check to be sure that the position trip cord (102) is not binding or twisted and that the cord tension adjusting cam (101) is not misadjusted, preventing the position trip cocking spring (126) from pulling the position trip plate (114A) into position.
2. Check to see that the top of the trip stop wire (111A) is even (level) with the top of the control cam stop stud (91A) as shown in figure 7. If the stop wire is not even with the top of the stud, bend the wire until it is even. The trip bracket assembly should be removed before bending the trip stop wire.
3. Check Oscillating Trip Adjustment.
4. Set the Speed Change knob in the "45" position.
5. Connect record changer motor to power source and turn changer on and off as needed to check this adjustment.
6. Adjust position trip adjusting screw so the changer trips at the proper point as given above.

ADJUSTMENT OF SET-DOWN POINT

IMPORTANT: This adjustment must be made with the record size selector knob (16) in the "10.12" position. Also, the head assembly must be in the position for 7-inch and 10-inch records.

Adjustment of the set-down point, for either 7-inch, 10-inch, or 12-inch records, is made by adjustment of the set-down adjusting screw (20), see figure 10. Screw (20) is accessible through hole in right side of pickup arm. When turning the record size selector knob (16) be sure to turn it all the way to avoid making the set-down adjustment at the wrong point, resulting in

improper set-down on 7-inch records. Turning the set-down adjusting screw (20) in, moves the set-down point of the pickup arm closer to the centerpost and turning the screw out moves it away from the centerpost.

CAUTION: Normal practice has been to check the set-down points, using records as a gauge. However, due to the large variety of record sizes, it is recommended that the distances specified below are checked to insure proper set-down on all sizes and types of records.

Make the set-down point adjustment as follows:

1. Set record size selector knob (16) to the "10.12" position; be sure the knob is turned all the way to its stop.
2. Set needle selector knob to either position being certain that the knob is turned to its stop so the needle projects straight down.
3. Set the head assembly to the position for playing 7-inch or 10-inch records.
4. Press down on the On-Off Reject knob (1) momentarily. Rotate the turntable by hand through the change cycle until the pickup arm moves down toward the turntable.
5. Check the distance between the needle point and the near side of the centerpost. For proper set-down on 10-inch records, the distance between needle and centerpost should be between 4 5/8" and 4 1/16".
6. Adjust set-down screw (20) and repeat steps 4 and 5 until the proper distance is obtained. If this adjustment is made carefully, the set-down point for 7-inch records and 12-inch records will be automatically correct.
7. Check 12-inch set-down as follows: Set the head assembly to the position for 12-inch records, press On-Off Reject knob momentarily, rotate turntable by hand through the change cycle and check the 12-inch set-down point. The proper distance between the needle point and the near side of the centerpost is between 5 5/8" and 5 1/16".
8. Check 7-inch set-down as follows: Set the head assembly to the position for 7-inch and 10-inch records, set the record size selector knob (16) all the way to the right until it reaches its stop. Press the On-Off Reject knob momentarily, rotate the turntable by hand through the change cycle and check the 7-inch set-down point. The proper distance between needle point and the near side of either of the two small centerposts is between 3 3/16" and 3 1/4". The proper distance from the needle point to the near side of the 45 RPM Spindle is between 2 9/16" and 2 5/8".
9. If step 7 or step 8 indicates improper set-down on 7-inch records or 12-inch records, make a compromise adjustment for 10-inch record set-down as outlined in steps 3, 4, 5 and 6.

ADJUSTING THE PICKUP ARM HEIGHT
(See Figures 9 and 10)

This record changer is designed so that when either needle point rests 3/16" above the changer pan, the pickup arm (17) will automatically lift high enough during the change cycle, to clear the top record of a stack of twelve 10-inch, ten 12-inch, ten 7-inch 33 RPM or twelve 7-inch 45 RPM records on the turntable. With proper pickup arm height setting, the pickup arm will not lift high enough to strike the bottom record of the stack to be played.

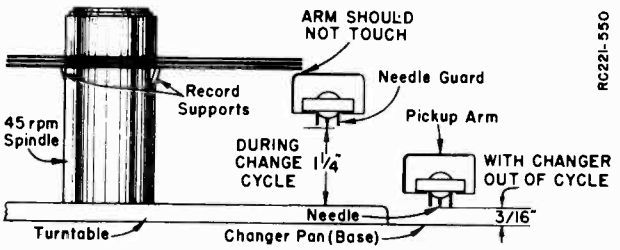


Figure 9. Checking Pickup Arm Height.

With the record changer out of change cycle and the pickup arm clear of the turntable, adjust the lift adusting screw (29) so that the needle rests approximately 3/16" above the top of the changer pan. Turning screw (29) in raises the pickup arm; turning it out lowers the arm. See Figure 10.

After this adjustment has been made, the record changer should be run through its change cycle a few times to make certain that the pickup arm does not lift high enough to touch the bottom record of the stack to be played. This adjustment should be checked with the 45 RPM Spindle in place and a 45 RPM record resting on the record supports (67). See figure 9. If, for some reason, the arm touches the bottom record, a compromise adjustment should be made. Turn the screw out and lower the pickup arm slightly.

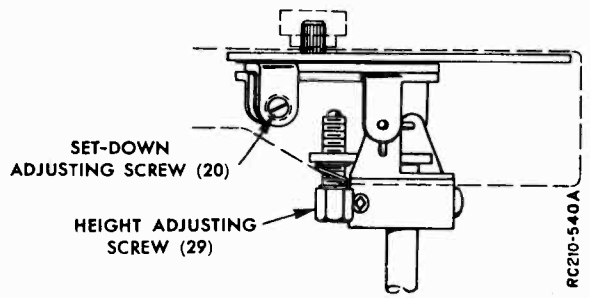


Figure 10. Arm Detail Showing Adjustments.

POSITION TRIP CORD TENSION ADJUSTMENT

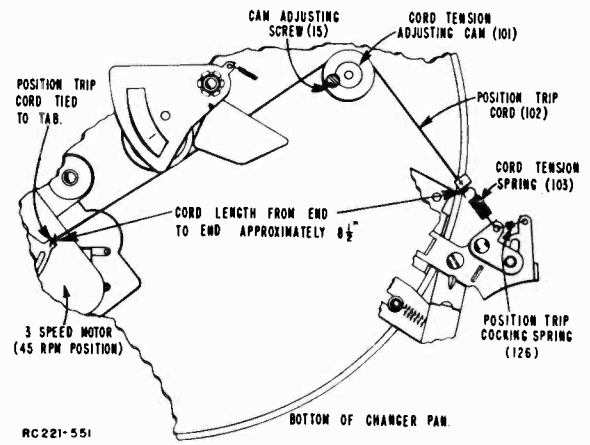


Figure 11. Adjusting Cord Tension.

An adjustment is provided which compensates for variations in the length of the position trip cord (102).

If the position trip cord is being replaced or if the adjusting cam lock screw (15) has come loose, allowing the cord tension adjusting cam (101) to rotate away from its normal position, proceed as follows:

1. Set speed change knob (54) to "45" position.
2. Move the cord tension adjusting cam (101) to just the point where all slack has been removed from position trip cord (102), and there is just a very slight tension on the cord tension spring (103). Do not adjust it so tight as to stretch the position trip cocking spring (126).
3. Tighten the adjusting cam lock screw (15).

ADJUSTING DISTANCE BETWEEN RECORD SUPPORT (11) AND CENTERPOSTS (60 and 61) (See Figures 12 and 13)

To check the distance between the record support (11) and centerposts (60 and 61), proceed as follows:

1. Set the head assembly to the position for 7-inch and 10-inch records. Insert the centerpost (61) for 10-inch and 12-inch records.
2. Hold the centerpost away from the head assembly to take up any play.
3. Measure the distance from the edge of the record support to the inside edge of the offset shelf on the centerpost. If this distance is not between 4-59/64" and 4-63/64", it will be necessary to bend centerpost until proper distance is obtained. NOTE: To bend the centerpost, remove it from the changer, and place the bottom end in a vise. Grasp the centerpost BELOW the offset (with a wrench) and bend it the amount needed in the direction necessary.

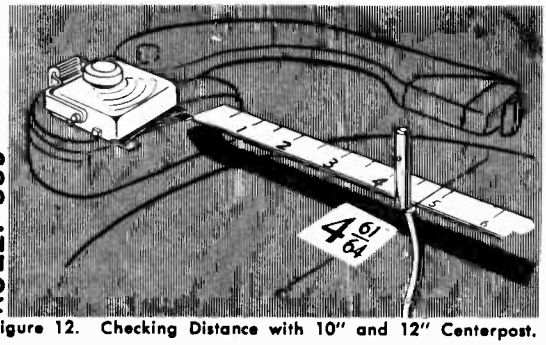


Figure 12. Checking Distance with 10" and 12" Centerpost.

4. With the head assembly in the position for 7-inch and 10-inch records, insert the centerpost (60) for 7-inch 33 RPM records. Then proceed with steps 2 and 3 above and check for a distance of between $3\frac{15}{32}$" and $3\frac{17}{32}$".
5. If this distance is not within the dimensions specified in step 4, bend the centerpost as described in step 3.

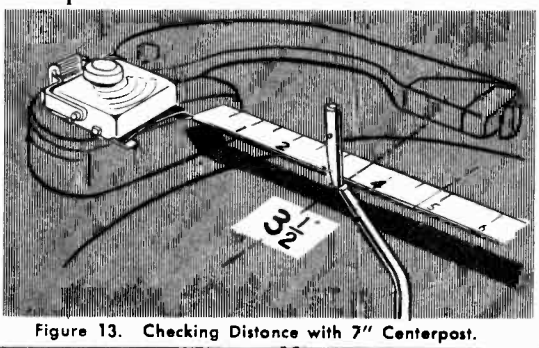
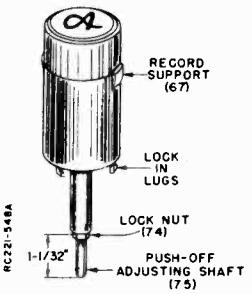


Figure 13. Checking Distance with 7" Centerpost.

45 RPM SPINDLE ADJUSTMENT

The push-off adjusting shaft (75 is the only adjustment on the 45 RPM Spindle (62). This adjustment is fairly critical and must be made for the individual record changer. The push-off adjusting shaft is pre-set at the factory so that the distance between the end of the shaft and the top of the lock nut (74) is $1\frac{1}{32}$". This adjustment should be satisfactory for most record changers. However, **the adjustment should be checked and adjusted, if necessary, before the 45 RPM Spindle is used.** To check for proper adjustment, proceed as follows:



1. Place the 45 RPM Spindle in the hole in the center of the turntable and turn it so that "lock-in lugs" fall into slots in the turntable (do not lock the lugs into the turntable).
2. Press down on the spindle and CAREFULLY note whether or not the slicers (65 and 66) just start to move out of the spindle.

3a If the slicers do not move when the spindle is pressed down, proceed with step 4.

3b If the slicers start to move out of the spindle as it is pressed down, lift the spindle out, loosen the lock nut (74), turn the push-off adjusting shaft (75) in approximately one turn and then tighten the lock nut. Insert the spindle, press it down and check to see if the slicers still move out. If the slicers move out, repeat this procedure, turning the adjusting shaft in, approximately one turn at a time, until the slicers do not move out when the spindle is pressed down.

4. Insert the spindle and lock it in place. Put a stack of records over the spindle, turn the record changer on and momentarily press the on-off reject knob (1) to the reject position.
5. If the bottom record drops to the turntable, keep rejecting records until the whole stack has been dropped to the turntable. Each record should slide smoothly down the spindle. If all records drop properly, the adjustment is satisfactory.
6. If records do not drop, remove the spindle, loosen the lock nut (74) and turn out the push-off adjusting shaft (75) approximately one turn and repeat steps 1 and 2, check step 3b and then proceed with steps 4 and 5. Repeat this procedure until the records drop properly.

MODELS RC221, RC222

SERVICE AND REPAIR

DISASSEMBLING THE 45 RPM SPINDLE
(See Figure 14)

To disassemble the spindle for parts replacement etc., proceed as follows:

1. Remove two screws from the underside of the spindle and lift up the spindle cap. See figure 14a. *CAUTION: When the spindle cap (63) is off, use extra care to keep from accidentally pushing up on the push-off adjusting shaft (75). If this shaft is pushed up, the slicer return springs (64) and slicer may fly off and be lost.*
2. Using a "long nose" pliers or tweezers, remove the slicer spring (64) which holds the top slicer (65) in place. Then remove the top slicer, see figure 14b. (NOTE: This slicer has an offset. It must be removed first when disassembling and installed last when reassembling).
3. Remove the other slicer return spring and the bottom slicer (66).
4. Now, push up on the push-off adjusting shaft (75) until the record supports (67) come up over the top of the spindle.
5. Grasp both record supports with the thumb and two forefingers and lift them off of the slicer cam (69A). Release record supports carefully so record support return spring (68) is not lost.
6. To remove the slicer cam and push-off assembly (69), remove the retaining ring (72) and the push-off return spring (71) from the underside of the spindle and lift the assembly off from the top of the spindle.

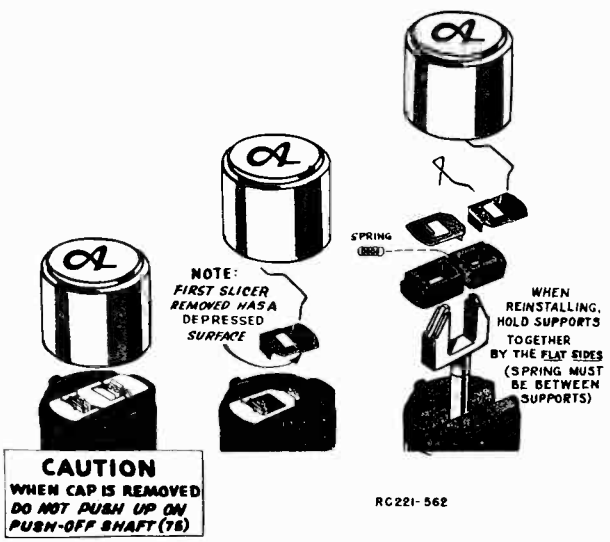


Figure 14. Disassembly of 45 RPM Spindle.

When assembling the spindle, merely reverse the above procedure. When installing the record supports (67) and their return spring (68), place the spring between the record supports (67) and compress the spring enough so the record supports can be slid down over the slicer cam (69A). When installing the slicers (65 and 66) be sure to install the flat slicer (66) first, and then the slicer with the offset (it also has a smaller cut-out).

CARTRIDGE AND NEEDLES

The cartridge (36) used in these record changers is especially designed and there are a few things which should be observed when replacing the cartridge (36), needles (40 and 41), or pickup arm cable (35).

When replacing either needle make certain that the correct needle is inserted in the proper "side" of the cartridge. The needle (41) for "LP" records is an osmium tipped needle especially designed for playing "LP" records. The radius of the point of the "LP" needle is only 1/3 of the radius of the point of a standard (78 RPM) needle. If this sharp needle is used on standard 78 RPM records, it has a tendency to "wobble" in the record groove and would possibly damage the standard record groove. A needle for 78 RPM records may possibly damage "LP" records because of its tendency to "skip" across the fine record grooves. Consequently, care should be taken when replacing needles.

The needle (41) for "LP" records is painted red to identify it. The needle guard on the LP "side" of the cartridge has red color dots to distinguish it from the 78 RPM "side" of the cartridge. The red (LP) needle should be inserted in the side of the cartridge which has the red color dots.

When replacing the cartridge (36) care must be taken when placing the pickup arm cable pinjacks on the cartridge. There must be sufficient slack in the cable to allow the cartridge to rotate. It is also important that the short length of plastic tubing be kept over one terminal.

THREE SPEED MOTOR

The turntable speed of this record changer is changed mechanically by causing one of the three drive shafts (having different diameters) to ride against the idler wheel. See figure 3. The 78 RPM drive shaft is part of the motor armature. The other two drive shafts (33 RPM and 45 RPM) are driven by the 78 RPM drive shaft by two rubber belts (55). These rubber belts (55) and the idler wheel (58) must be kept clean and free from oil. If they become greasy or stretched, they might possibly slip, causing the turntable speed to vary, resulting in unsatisfactory operation.

When replacing the speed change knob (54), make certain that the shaft in the knob does not touch the sides or ends of the cut-out in the pan. If the speed change arm is bent, the speed change knob shaft may rub against the edge of the opening in the pan, causing rumble and noise pickup. Also, the clearance between the bottom of the speed change knob and the top of the pan should not be less than 1/64 or more than 3/64 of an inch.

REMOVING THE PLASTIC BASE HOUSING (13)

Should it be necessary to remove the plastic base housing, proceed as follows:

1. Remove retaining rings (84 and 108).
2. Release one end of the index spring (130).
3. Lift the entire head assembly up from the top of the changer.
4. Loosen Allen set screw (32) and lift complete pickup arm assembly off.
5. Remove retaining ring (33) and washer (34).

6. Remove three screws (15) holding base.
7. Lift off the plastic base housing (13).
8. When reassembly has been completed, the pickup arm height should be carefully checked and adjusted, if necessary, by means of the lift adjusting screw (29). The set-down should also be checked and adjusted, if necessary, as outlined under "Adjustment of Set-Down Point."

REMOVING TURNTABLE (8) AND BEARING ASSEMBLY (48)

To remove the turntable it is only necessary to grasp the turntable by its edges and lift up. Before replacing the turntable, make sure that the recessed part of the drive wheel (86) is towards the centerpost. If necessary, turn drive wheel counter-clockwise about a turn so it locks in this position. The pickup arm should be positioned away from the turntable. In replacing the turntable, force is not needed to seat it. Make certain, however, that the idler wheel of the motor has been pushed in towards the centerpost and that the idler wheel is making contact with the inner side of the turntable flange. The idler wheel should be pushed in with a screwdriver or similar flat tool. Do NOT push toward the rear of the changer.

The dimensions of the three speed motor are such that three cork washers (46) are used under the turntable hub to keep the turntable from rubbing against the idler wheel drive shafts.

In some cases it may be found that the three cork washers, after considerable use, are compressed so the turntable will rub. To build the stack up, an additional thin cork washer should be used. This fourth cork washer may be placed at the top or bottom of the stack. CAUTION: If an addition cork washer is used, it may be necessary to make a compensating adjustment on the 45 RPM spindle. See "45 RPM Spindle Adjustment."

The washers (46 and 47) and thrust bearing assembly (48) are removed by sliding them off of the centerpost. Replace in the order shown in Figure 15.

REMOVING CHANGER FROM BOTTOM COVER

Model RC221 only. To remove the changer from the bottom cover of the RC221, remove the three mounting screws (79), from the top of the changer pan. Then merely lift the changer pan off of the bottom cover (136) being careful to see that lead-in cables and motor leads are disconnected.

When reinstalling the changer pan on the bottom cover, be certain that float springs (78) are properly installed. (The wide end of the spring fits around the extrusion on the changer pan.) Insert the mounting screws (79). IMPORTANT: These screws must be installed so they travel freely through the extruded holes in the changer pan. If the screws touch the edges of the holes in the pan, a scraping sound and microphonics may occur when records drop to the turntable.

REPLACING POSITION TRIP CORD (102)

The position trip cord (102) is ordinary braided silk or nylon dial cord approximately $\frac{1}{32}$" thick. To replace this cord, cut a piece of dial cord about 10" or 12" long and tie one end to the tab on the motor. See figure 11. This is most easily done by either making a slip knot so the knot will tighten when the cord is placed over the tab on the motor and pulled, or removing one end of the idler wheel spring (57) and pivoting the idler wheel and bracket out of the way. Tie the other end of the cord to the cord tension spring (103) so that the distance between the two knots is approximately 8½". Late production record changers have a metal clip (137) to fasten the cord at the tension spring end. After threading the cord under the control cam (91), hook the cord tension spring as shown in the illustration. Then adjust the cam (101) as outlined under "Position Trip Cord Tension Adjustment."

RISER PLATE (90)

The inclined portion of the riser plate (90) was copper plated in later production, to eliminate the possibility of stalling the changer during change cycle (45 RPM operation only).

If the record changer stalls during change cycle, try replacing the riser plate with part number G400A336.

LUBRICATION

Under normal operating conditions, the motor should never require oiling. Also, do NOT use oil on the 45 RPM spindle. The rest of the changer, however, should be lubricated with grease whenever it comes into the shop for repairs or adjustment. *All pivot and friction points should be greased adequately but not excessively.* A good automobile chassis grease may be used for this purpose.

The push-off shaft (9), powdered iron roller ((105), oilite bearings, (used in the turntable hub and base housing), may be lubricated with SAE No. 20 oil.

Care should be taken to prevent any of the lubricant from coming into contact with the drive or idler wheel tires, or the rubber drive belts. Also be careful, when using oil, that an excess does not seep into the felt of the turntable.

45 RPM RECORD SLIPPAGE

The 7-inch 45 RPM records may have a tendency to slip on each other when they are new. This would result in unsatisfactory reproduction which might be confused with results of a varying turntable speed.

In most cases, record slippage can be eliminated by making a series of shallow scratches, with a pen knife or other sharp instrument, on each record label. Another method of correcting this condition would be to place two small pieces of scotch tape, directly across from one another, on each record label.

RECORD CHANGER TROUBLE SHOOTING

Changer Will Not Trip.

1. Check for broken or loose cycle spring (112).
2. Check On-Off switch cover (100). If cover is not assembled to switch properly, it may bind push-off link and arm (95), preventing cycle spring (112) from pulling the control cam (91) around.
3. Check for misadjustment of the oscillating trip adjusting screw (115).
4. Check for bent trip stop wire (111A).
5. Check for broken pawl spring (128).

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Changer Repeatedly Trips Into Change Cycle.
1. Check for misadjustment of reject adjusting screw (118), or trip adjusting screw (115). See "Reject and Trip Adjustments".
2. Check for broken trip cocking spring (110).
3. Check for broken reject spring (2).
4. Check for loose On-Off Reject knob (1).
5. Check for bent trip stop wire (111A).

Changer Will Not Reject.
1. Check adjustment of reject adjusting screw (118).
2. Check for bent trip stop wire (111A).
3. Check for control cam (91) binding.

Pickup Arm Does Not Set Down Properly
1. Check set down adjustment. See paragraph under heading "Set Down Adjustments."
2. Check for broken or loose set down spring (131).
3. Check for broken or loose set-down adjusting lock spring (21).
4. Check for missing or loose pickup arm counterweight screws (19) resulting in erratic set-down. (These screws hold pivot and mounting plate (22) in position.)
5. Check for taut pickup arm cable (35). The cable must be loose between the pickup arm and the terminal strip (14).

Pickup Arm "Skips" Across Records
1. Check to be sure that cabinet is level.
2. Check for worn needle.

Turntable Rubs Against Motor Drive Shafts
1. Check for missing or compressed cork washer (46 or 47). See discussion under heading "Removing Turntable (8) and Bearing Assembly (48)" in the Service and Repair section.

Changer Trips Into Change Cycle When On-Off Reject Knob Is Turned to Off.
1. Check paragraph under "Reject Adjustment".

Changer Causes Rumble Or Noise
1. Check for broken or missing "float" springs (78).
2. Check for "float" screws (79) rubbing against the edges of the holes in the changer pan.
3. Check for the speed change knob shaft (54) rubbing against the cut-out in the changer pan.

Records Do Not Drop to Turntable or More Than One Record Drops. (33 RPM and 78 RPM operation only.)
1. Check distance between record support and centerpost as described under "Adjusting Distance Between Record Support (11) and Centerposts (60 and 61)"

Changer Trips Into Change Cycle Before Finishing Record (78 RPM and 33 RPM only).
1. Check for broken position trip cord (102 or cord tension spring (103).
2. Check to see that cord tension adjusting cam (101) has not loosened or is misadjusted.

Changer Will Not Trip (45 RPM operation only).
1. Check for broken or missing position trip cocking spring (126).
2. Misadjustment of the position trip adjusting screw (117). See paragraph under heading "Position Trip Adjustment".
3. Broken or bent position trip incline spring (127A).
4. Check to see that position trip cord (102) is not too short or is twisted or binding.
5. Check for misadjustment of the cord tension adjusting cam (101).

Changer Trips Into Change Cycle Before Finishing Record (45 RPM only).
1. Misadjustment of position trip adjusting screw (117). See "Position Trip Adjustment".

Records Do Not Drop to Turntable (7-inch 45 RPM only).
1. Adjust push-off adjusting shaft (75). See paragraph under heading "45 RPM Spindle Adjustment".
2. Check for broken or missing riser plate return spring (89).

Turntable Jumps (Rises) During Change Cycle (45 RPM only).
1. Adjust push-off adjusting shaft (75). See paragraph under heading "45 RPM Spindle Adjustment".

Changer Stalls in Change Cycle (45 RPM only)
1. See "Riser Plate (90)" discussion in the Service and Repair section.

CAUTIONS
1. *See that the rubber tires on both the drive wheel and the idler wheel and both drive belts are kept clean and free from oil, grease, dirt or any foreign material.* Carbona or carbon tetrachloride may be used for cleaning these parts.
2. When handling the idler wheel (58) or drive wheel (86), keep fingers and hands away from the rubber tires. This is also true when handling the rubber drive belts (55). Natural body oils on these parts may possibly cause slippage.
3. When replacing the rubber tire (85) do not bend the tab on the drive wheel over too far as this may result in the tire catching or rubbing on the drive wheel pressure spring (88).
4. If the On-Off Reject knob (1) cannot be pulled off with the fingers, pry very carefully. The head cover (7) is plastic and if the On-Off Reject knob is pried off, excessive force should not be used.
5. When removing or replacing the pawl spring (128) care should be taken not to stretch it.
6. When removing or replacing the pickup arm (17), always loosen the Allen set screw (32) and lift off the complete assembly. The pivot spring, hub and pin assembly (31) can be removed from the pivot plate assembly (22) and replaced much more readily with the complete pickup arm assembly off of the changer. When reinstalling pickup arm assembly or the arm control lever (127) be sure to replace all washers that were used originally.
7. When replacing the switch mounting bracket (98) or the trip bracket (109) be sure to locate the half punches in the holes in the pan before tightening their mounting screws (99).
8. When replacing the on-off switch assembly (100) care should be used in bending the tab fasteners so that the switch is mounted firmly to the bracket.
9. When replacing or reinstalling the record size selector knob (16), turn the set-down eccentric (25) to the position for 10" and 12" set-dowr (all the way to the left). Then install the knot (16) so that the dot between "10.12" lines up with the locating dot on the pickup arm.
10. When disassembling the 45 RPM spindle, do not push up on the push-off adjusting shaft just after removing the spindle cap.

In later production, turntable (8) is held in place by a retaining ring (part number 401A286). Remove before lifting turntable.

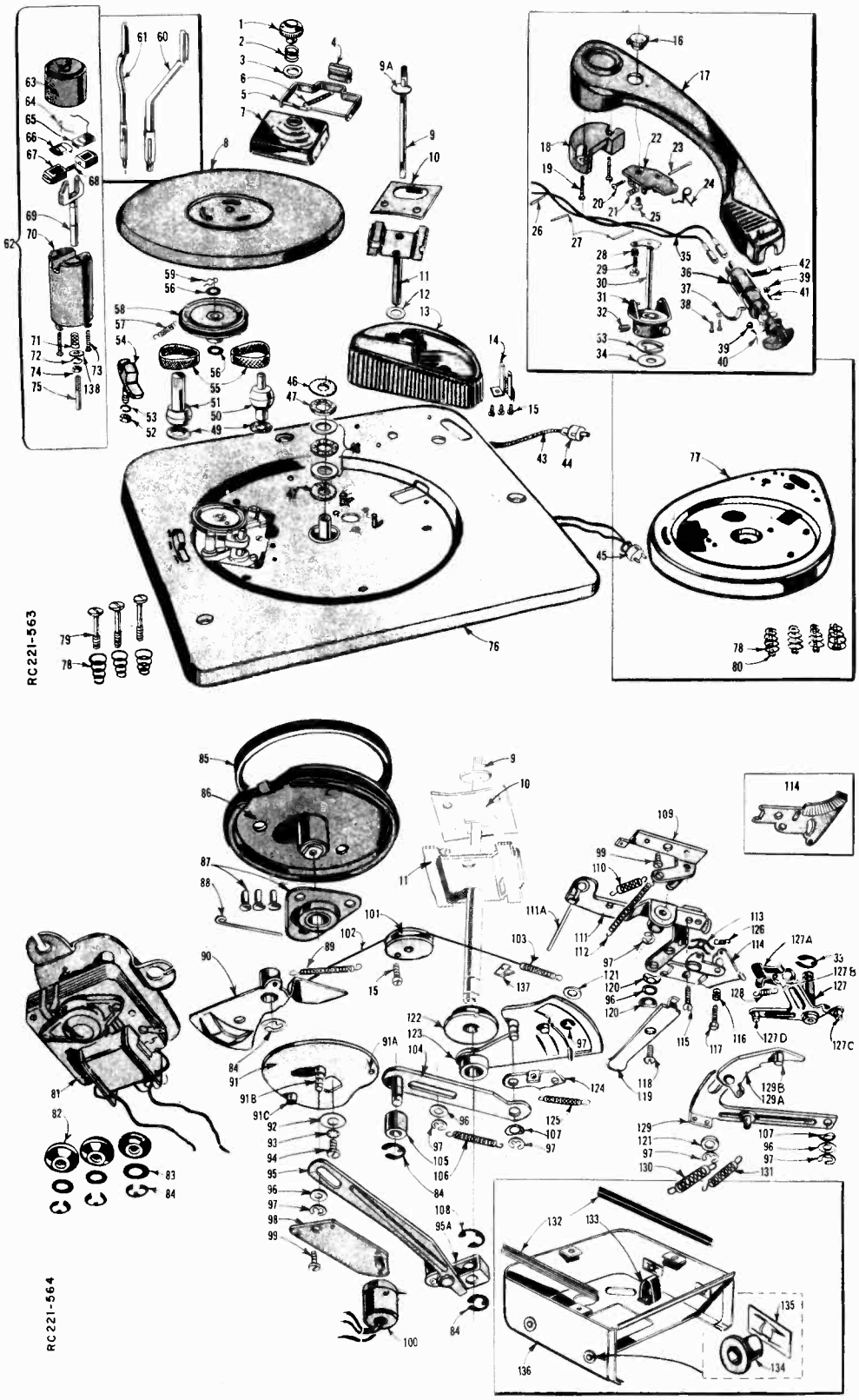

Figure 15. RC221 Exploded View.

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PARTS LIST

Ref. No.	Part Number	Description
1	403A27	On-Off Reject Knob
2	405A97	Reject Spring
3	4B1-166-47	Washer (Flat) .390x5/8x1/16
4	406A18	Rubber Bumper for Record Clip
5	403A32	Record Clip (Plastic)
6	405A94	Record Clip Spring
7	403A31	Head Cover (Plastic)
8	G400A332	Turntable
9	G400A248	Push-Off Cam and Shaft Assembly
9A		Push-Off Cam (Part of 9)
10	401A166	Push-Off Plate
11	G400A249	Support Tube and Shelf Assembly
12	4B1-166-47	Washer (Flat) .390x5/8x1/16
13	403C28	Base Housing
14	10B1-6	Terminal Strip
15	402A148	Screw, #6 P.K. Spec. 3/8" OFHST
16	403A37	Record Size Selector Knob
17	403C37	Pickup Arm
18	404A23	Pickup Arm Counterweight
19	1A50-6-47	Screw, #4 FH S.T. (2 req.)
20	45-500-C2-47	Set-Down Adjusting Screw 4-40x1/2 BH MS
21	405A118	Set-Down Adjusting Lock Spring
22	G400A297	Pivot and Mounting Plate
23	414A31	Pivot Shaft
24	414A33	Size Change Tension Spring
25	402A185	Set-Down Eccentric
26	414A34	Wire Clip, approx. 3/4" long (1 req.)
27	414A30	Wire Clip, approx. 1/2" long (2 req.)
28	405A120	Lift Adjusting Lock Spring
29	402A156	Lift Adjusting Screw
30	G400A238	Lift Plate and Rod Assembly
31	G400A294	Pivot Spring & Hub (includes 8-32 Set Screw)
32	1A43-14	Allen Set Screw 8-32
33	401A235	Retaining Ring
34	412A32	Washer
35	G400A307	Pickup Arm Cable and Lugs
36	409A11	Cartridge, includes Needles
37	401A264	Cartridge Hold-Down Bracket
38	402A139	Plastiscrew, #2 (2 req.)
39	98A54-2	Needle Nut (Knurled)
40	98A15-7	78 RPM Needle
41	98A15-6	"LP" Needle (Painted Red)
42	405A111	Cartridge Indexing Spring
43	413A11-1	Shielded Lead-in Cable & Plug (15")
44	88A2-3	Plug (for lead-in cable)
45	88A8-1	Motor Plug (Male)
46	412A9	Cork Washer 3/64" thick (1 req.)
47	412A1	Cork Washer 3/32" thick (2 req.)
48	415A11	Thrust Bearing
49	98A15-9	Oil Retaining Felt Washer (2 req.)
50	98A15-10	33 RPM Drive Shaft
51	98A15-11	45 RPM Drive Shaft
52	2A1-11-47	Hex Nut #6-32
53	3A4-5	Lock Washer
54	G400A330	Speed Change Knob
55	406A20	Drive Belt (2 req.)
56	412A30	Fibre Washer
57	98A15-13	Idler Wheel Spring
58	G400A279	Idler Wheel Assembly
59	405A15	Hairpin Clip
60	G400B310	Centerpost Assy. (for 7" Records)
61	G400B311	Centerpost Assy. (for 10" & 12" Records)
62	G400B329	45 RPM Spindle Complete
63	403A41	Spindle Cap
64	414A35	Slicer Return Spring (2 req.)
65	401A276	Top Slicer
66	401A275	Bottom Slicer
67	403A40	Record Support (2 req.)
68	405A125	Record Shelf Spring
69	G400A327	Slicer Cam and Shaft
70	403B39	Spindle Base
71	405A124	Push-Off Shaft Return Spring
72	401A235	Retaining Ring
73	60-1000-C2-47	Screw (2 req.) #6-32x1 RHMS
74	402A182	Lock Nut
75	402A181	Push-off Adjusting Shaft
76	G400D346-1	Changer Pan Assembly, Copper (RC221)
	G400D346-2	Changer Pan Assembly, Black (RC221)
77	G400D349	Changer Pan Assembly (RC222)
78	19A10-3	Conical Mtg. Spring (for RC221, RC222)
79	402A154	Float (Mounting) Screw for RC221 only (3 req.)
80	G400A197	Mtg. Screw & Washer Assembly for RC222
81	407B17	3 Speed Motor
82	406A21	Rubber Mounting Grommet (3 req.)
83	412A32	Fibre Washer (3 req.)
84	401A229	Retaining Ring
85	406A13	Drive Wheel Tire Only
86	G400A252	Drive Wheel (includes Tire)
87	404A18-1	Drive Wheel Assembly (includes Rivets)
88	414A23	Drive Wheel Pressure Spring
89	405A87	Riser Plate Return Spring
90	G400A336	Riser Plate and Hub
91	G400A342	Control Cam Assembly
91a		Cam Stop Stud (Part of 91)
91b		Push-Off Link Stud (Part of 91)
91c		Riser Control Stud (Part of 91)
92	401A145	Control Cam Washer
93	3B1-26-47	Lock Washer, #8 I.T.
94	85-375-C2-47	Control Cam Screw 8-32x3/8 BH MS
95	G400A219	Push-Off Arm and Link Assembly
96	4B1-68-47	Washer
97	401A177	Retaining Ring
98	401A223	Switch Bracket
99	1A53-9-47	Screw, Switch and Trip Bracket Mtg.
100	408A1	On-Off Switch and Cover
101	412A34	Cord Tension Adjusting Cam
102		Position Trip Cord Use 10" of braided silk or nylon radio dial cord (approx. 1/32" diameter).
103	405A127	Cord Tension Spring
104	G400A224	Pivot Link and Stud
105	415A9	Powdered Iron Roller
106	405A91	Control Plate Spring
107	405A22	Spring Washer
108	401A230	Retaining Ring
109	G400A228	Trip Bracket and Stud Assembly
110	405A88	Trip Cocking Spring
111	G400A230-1	Reject Arm Support and Trip Lever
111A		Trip Stop Wire (Part of 111)
112	405A87	Cycle Spring
113	405A128	Trip Serration Adjustment Spring
114	G400A333	Trip Serration Plate
115	65-500-C2-47	Trip Adjusting Screw
116	405A120	Position Trip Adjusting Lock Spring
117	402A186	Position Trip Adjusting Screw
118	65-375-C2-47	Screw, Reject Adjusting 6-32x3/8"
119	401A237	Reject Arm
120	405A98	Spring Washer
121	401A173	Washer
122	404A17	Size Change Eccentric
123	G400A226	Control Plate, Hub and Stud Assembly
124	401A202	Safety Arm
125	405A90	Safety Spring
126	405A126	Position Trip Cocking Spring
127	G400A340	Arm Control Lever, Studs and Pawl
128	405A89	Pawl Spring
129	G400A222	Set-Down and Size Change Assembly
130	405A92	Index Spring
131	405A93	Set-Down Spring
132	403A38	Plastic Trim for RC221 (2 req.)
133	32A88	Antenna Lead Support (RC221 only)
134	27A24	Bushing in Bottom Cover for RC221
135	2B10-10-59	Speed Nut (RC221)
136	G400D287-2	Bottom Cover, Painted Black (RC221)
	G400D288-1	Bottom Cover, Painted Copper (RC221)
137	401A283	Metal Clip
138	4B1-152-47	Washer (Flat) .328x5/8x1/16

OPERATING INSTRUCTIONS

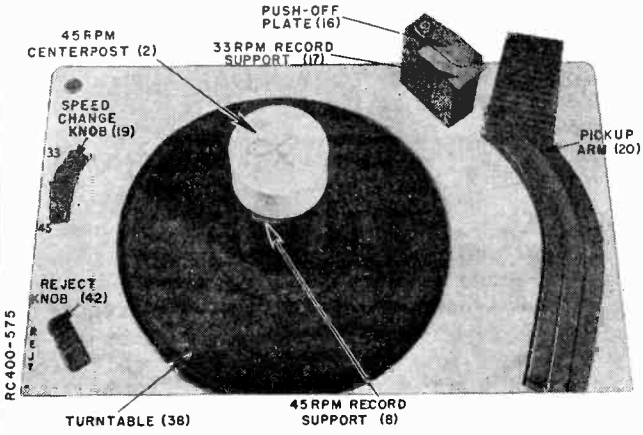


Figure 1. RC400 Record Changer (Top View).

This Admiral Record Changer is designed to automatically play a series of ten 7-inch 33 RPM "Long Play" records or ten 7-inch 45 RPM "Long Play" records. A wide-diameter, plastic centerpost is used for playing 45 RPM records and a conventional, metal centerpost is used for playing 33 RPM records.

SELECTING CENTERPOST

To play 45 RPM records, insert the large diameter (plastic) centerpost (2) into the hole in the center of the turntable (38). While holding the turntable with one hand, turn the centerpost counter-clockwise until the lock-in-lugs fall into and lock in the three slots in the turntable. To remove this centerpost, hold the turntable with one hand and turn the centerpost clockwise; then lift it up.

To play 33 RPM records, insert the small diameter (metal) centerpost (1) into the center of the turntable and press it down until it "locks" in place. To remove this centerpost, merely lift it straight up and out.

SETTING SPEED CHANGE KNOB

To play 45 RPM records, set the Speed Change Knob (19) so that its indicating arrow points to "45". To play 33 RPM records, set this knob so its indicating arrow points to "33". When moving this knob to either position, make sure that the knob "clicks" into position.

This control also has a center ("neutral") position for disengaging the rubber-tired idler wheel (47). The changer pan is not marked "neutral" but the position can be felt when the Speed Change Knob is halfway between "33" and "45". In this position, the compound idler wheel is not in contact with the drive shaft or the turntable. **When the record changer is not going to be used for some time, set the speed change knob in the center position.**

LOADING AND STARTING THE RECORD CHANGER

To load 45 RPM records, place as many as ten over the 45 RPM centerpost so that the bottom record rests on the record supports (8). To load 33 RPM records, place as many as ten over the 33 RPM centerpost so that the bottom record rests on the ledge on the centerpost (1) and the 33 RPM record support (17). Start the changer by turning the Radio-Phono switch on the radio to the "Phono-On" position.

STOPPING AND UNLOADING

Turn changer off by turning Radio-Phono switch on the radio to "Phono-Off" position. Do not turn changer off during change cycle. To unload, merely lift records straight up.

THE CHANGE CYCLE

45 RPM OPERATION
(See Figures 2, 3 and 4)

If at all possible, we recommend that you carefully observe the operation of a changer that is in normal operating condition. It is a good idea to rotate the turntable by hand and repeat the change cycle until you understand the function of each part.

The changer operates as follows: The turntable (38) is driven by the smaller of the two rubber tires on the compound idler wheel (47), riding against the outer rim of the turntable.

The speed of the turntable is determined by the setting of the speed change knob (19). When the knob is in the "45" position, the larger rubber tire on the compound idler wheel (47) rides against the 45 RPM section (larger diameter) of the motor drive shaft. When the knob is moved to "33", the compound idler wheel moves so that the larger tire rides against the 33 RPM section (smaller diameter) of the motor drive shaft. See Figure 2.

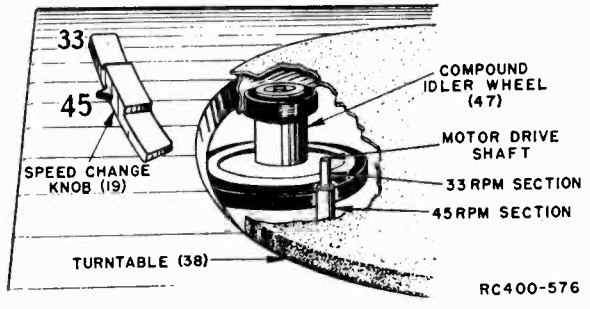


Figure 2. Compound Idler Wheel and Motor Drive Shaft.

The changer mechanism is driven through change cycle by the knurled hub of the turntable rotating the rubber tired drive wheel (36). During normal playing, the drive wheel does not touch the knurled hub of the turntable. See Figure 3A. As the needle enters the record spiral grooves and moves towards the centerpost, the pickup arm lever and stud (72) moves simultaneously and rotates the trip bracket (61) counter-clockwise. Since the trip bracket and drive wheel are

on the same shaft, the drive wheel is pivoted approximately 10 degrees counter-clockwise. The rubber tire contacts the knurled hub of the turntable, and is rotated in a counter-clockwise direction. See Figure 3B.

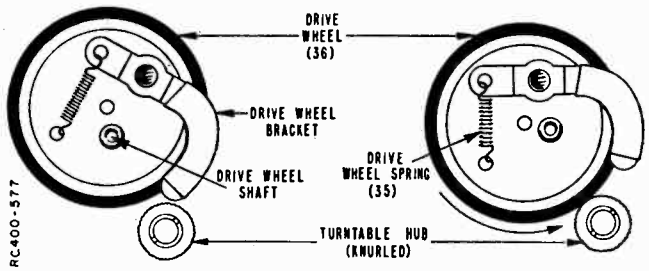


Figure 3A Figure 3B

Drive Wheel Positions.

The drive wheel shaft is fitted through the drive bracket (78) and is mounted OFF CENTER on the drive wheel (36). Due to the cam action of the "off-center" drive wheel (36), rotation of the drive wheel, by the knurled hub of the turntable, forces the drive shaft out. Since the drive shaft is fitted through the drive bracket (78), the drive bracket is pivoted around the drive bracket hub. The cycle spring (76) maintains pressure on the drive bracket so that the drive wheel tire is kept in contact with the knurled hub. After the changer has been tripped and the drive bracket begins to be pivoted by the movement of the drive wheel, the arm lift incline (78A) on the drive bracket moves across the lift rod moving it upward. This lifts the pickup arm off of the record. Stud (78C) on the drive bracket now contacts the pickup arm lever and begins to move it so the pickup arm moves out from the center of the record.

At about this time, the push-off adjusting shaft (15) on the 45 RPM centerpost (2) starts moving up the push-off incline (78B) on the drive bracket (78). See figure 12. This causes the push-off shaft to move up into the centerpost. As the push-off shaft moves into the centerpost. As the push-off shaft moves into the centerpost, the slicers (5 and 6) ride on the incline of the slicer cam and consequently move out of the centerpost. The record supports (8) are also brought into the centerpost as each slicer is hooked to the record support on the opposite side of the centerpost.

As the drive bracket continues to pivot, the pickup arm continues to move away from the record, the slicers (5 and 6) continue to come out, and the record supports continue to pull in. When the pickup arm has moved to the right almost as far as it will go, the record supports (8) have pulled into the centerpost enough to drop the bottom record to the turntable and the slicers are out far enough to hold up the remainder of the stack of records.

The pickup arm lever control stud (72A) riding against the indexing edge of the index bracket (65) controls the movement of the pickup arm. The index bracket (65) and set down spring (64) prevent the pickup arm from moving out too far. (Later in the change cycle the index bracket (65) and set-down spring (64) control the set-down point.)

At this point, the drive wheel (36) has gone through one-half of its rotation and as the drive wheel continues to rotate, the drive bracket (78) will begin to return to its normal (out of change cycle) position.

The set-down spring (64) keeps the pickup arm lever (72) in contact with the arm control stud (78C) on the drive bracket. Therefore as the drive bracket moves back toward its normal position, the pickup arm is moved in toward the set-down point. When the pick-up arm lever stud (72A) has reached the indexing point (notch) in the index bracket, the pickup arm has reached the set-down point and stops moving in toward the centerpost. At this time, the drive bracket has pivoted to a point where the lift rod (32) starts moving down the arm lift incline (78A) in the drive bracket and the pickup arm starts moving down toward the record. When the arm has moved down about halfway, the second stud on the drive bracket (78D) moves the index bracket (65) away from the stud on the pick-up arm lever so that the pickup arm is free to travel in on the lead in grooves on the record.

Almost simultaneously, the push-off adjusting shaft (15) is riding down the push-off incline (78B) on the drive bracket. This allows the push-off return spring (11) on the centerpost to pull the cam and shaft assembly (9) down.

The record supports are forced out of the centerpost by their return spring (7) and the slicers are moved into the centerpost by the slicer return springs (4). When the slicers are all the way in, the stack drops to the record supports (8).

The drive wheel is no longer in contact with the knurled hub but it is rotated approximately 20 degrees further by the drive wheel bracket, which is held against the knurled hub of the turntable by the drive wheel bracket spring (35).

When the drive wheel bracket has rotated past the knurled hub, the drive wheel must be rotated another 10 degrees by the trip bracket (61), or reject lever (43), before it will contact the knurled hub and begin the change cycle. When the reject knob (42) is moved to the "Rej" position, the reject lever roller rotates the drive wheel the necessary 10 degrees and the change cycle begins.

33 RPM OPERATION

The change cycle for 33 RPM operation is exactly the same as for 45 RPM operation, except for change cycle time and the fact that 33 RPM records are supported by the offset on the 33 RPM centerpost and the

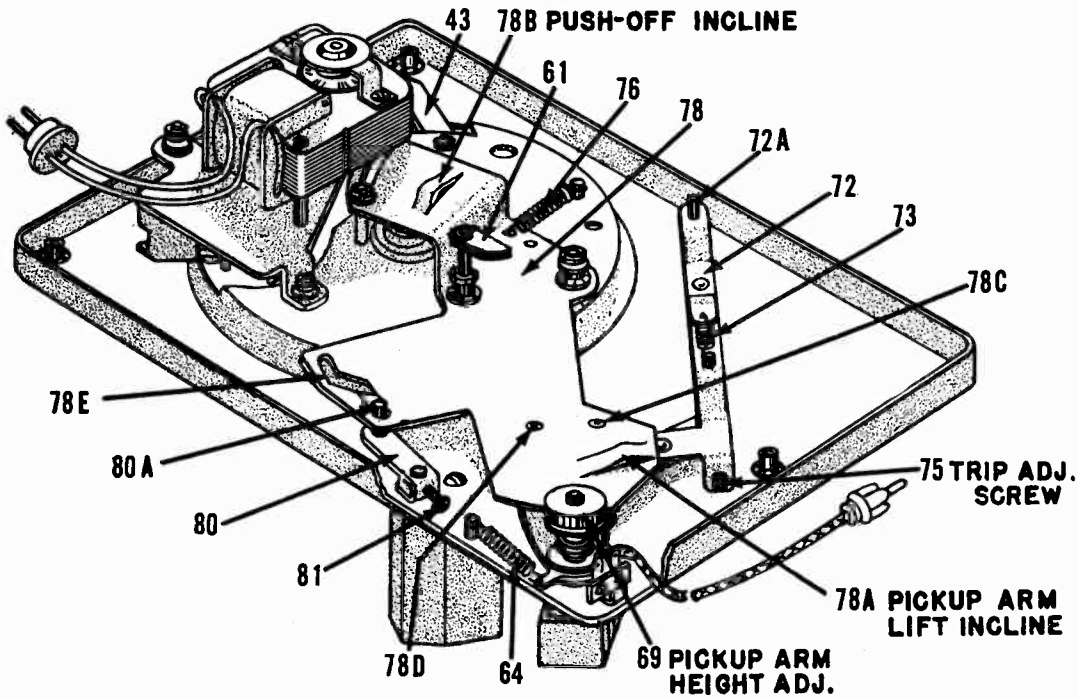


Figure 4. RC400 Bottom View (Assembled).

33 RPM record support (17), and are pushed off by the push-off plate (16).

When the drive bracket (78) has pivoted to the point where the pickup arm is clear of the record, the stud (80A) on the push-off bracket (80) is moved by the slot (78E) in the drive bracket. This movement causes the push-off plate (16) to pivot and push-off the bottom record. The remainder of the records are held back by the small sliding piece at the top of the centerpost. When the drive bracket pivots back to its normal playing position, the push-off bracket stud (80A) follows the slot in the drive bracket and causes the push-off plate to pivot back to its normal position. Then the record stack drops to the record support (17) from the push-off plate (16).

ADJUSTMENTS

TRIP ADJUSTMENT

This record changer employs the position type trip; that is, it trips into change cycle when the needle in the pickup arm reaches a given distance from the center of the record. If the trip is properly adjusted, the record changer will trip into change cycle when the needle is between 2" to 2-3/16" from the center of the hole in the turntable or approximately half way in on the spiral groove in the center of the record.

If the record changer does not trip at the proper position, it will be necessary to adjust the trip adjusting screw (75). See figure 4. Turning this screw in (clockwise) moves the trip point away from the centerpost. Turning it out, moves the trip point nearer to the centerpost.

If the screw is turned all the way out, the changer may not trip. If it is turned in too far, the changer may trip before the record finishes playing.

33 RPM PUSH-OFF ADJUSTMENT (See Figures 1 and 4)

If 33 RPM records do not drop to the turntable during change cycle, it may be necessary to correct the push-off adjustment.

The push-off is properly adjusted when the leading edge of the push-off plate (16) extends to a maximum of 1/32" beyond the edge of the record support (17) during change cycle.

To make this adjustment, proceed as follows:

1. With the record changer in change cycle, rotate the turntable by hand until the pickup arm STOPS moving away from the centerpost.
2. Loosen the set screw (81) on the push-off bracket (80) and move the push-off plate (16) so that its leading edge extends 1/32" beyond the edge of the record support (17). Then tighten the set screw (81).
3. Load the record changer with 33 RPM records,

place the changer in operation and keep rejecting records until the stack has been dropped to the turntable.

4. If records still do not drop properly, repeat steps 1 through 3.

ADJUSTMENT OF SET-DOWN POINT
(See Figures 4 and 5)

This record changer does not have a conventional set-down screw adjustment. The pickup arm should set-down properly unless the Allen set screw (34) on the pivot collar (33) is loosened, or excessive pressure has been applied to the pickup arm.

When properly adjusted for correct set-down, the needle point will set-down between 2-9/16" and 2-10/16" from the near side of the 45 RPM centerpost. (Between 3-5/16" and 3-6/16" from center of the hole in the turntable.) Making this adjustment for 45 RPM records, automatically provides correct set-down for 33 RPM records.

If the pickup arm does not set-down properly, the set-down point adjustment should be made as follows:

1. Insert the 45 RPM centerpost (2); set the speed change knob (19) to the "45" position; move the reject knob (42) to the "Rej" position and then rotate the turntable (clockwise) by hand JUST to the point where the pickup arm stops moving in toward the centerpost and starts moving downward. DO NOT ROTATE THE TURNTABLE BEYOND THIS POINT.

2. Insert a #6 Allen wrench into the Allen set screw (34) on the pivot collar (33) as shown in Figure 5. Do NOT loosen the Allen set screw.

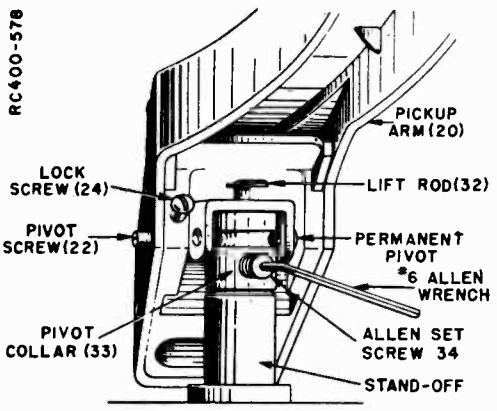


Figure 5. Pickup Arm Mounting Detail.

3. From the underside of the changer, hold the pickup arm lever and trip bracket assembly (72) STATIONARY so that it can not move down or to either side.

4. Slightly loosen the Allen set screw (34).

5. Place a ruler against the near side of the 45 RPM centerpost and then move the pickup arm until the distance between the needle and centerpost is from 2-9/16" to 2-10/16".

6. Tighten the Allen set screw (34) VERY CAREFULLY to avoid moving the pickup arm. Before firmly tightening the Allen set screw, make sure that there is a little space (ten thousandths of an inch) between the pivot collar (33) and the stand-off.

7. Run the record changer through change cycle a few times to make certain that the set-down point adjustment has been properly made.

ADJUSTING THE PICKUP ARM HEIGHT

This record changer is designed so that when the needle rests 1/16" above the changer pan, the pickup arm will automatically lift high enough during change cycle to clear the top record of a stack of ten 33 RPM records on the turntable and will not lift high enough to strike the bottom record of a stack of 33 RPM records to be played.

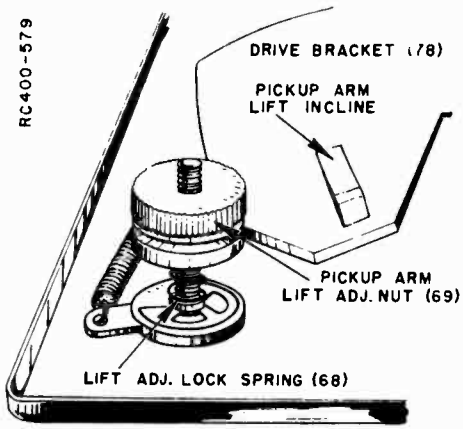


Figure 6. Adjusting Pickup Arm Height.

With the record changer out of change cycle and the pickup arm clear of the turntable, adjust the pickup arm lift adjusting nut (69) (see figure 6), so that the needle rests 1/16" above the top of the changer pan. Turning the nut (69) clockwise raises the pickup arm; turning it counter-clockwise lowers the pickup arm.

To check this adjustment, load the record changer with ten 33 RPM records. Turn the changer on and reject records until the stack has been dropped to the turntable. The pickup arm should not lift high enough

to strike the bottom record (of the stack about to be played) but should lift high enough to play the tenth record on the turntable.

If, for some reason, the arm strikes the bottom record or will not lift high enough to play the tenth record, a compromise adjustment should be made. That is, raise the arm slightly to make the arm lift higher or lower the arm slightly to prevent it from striking the bottom record.

45 RPM CENTERPOST ADJUSTMENT

NOTE

This 45 RPM centerpost (G400B410) is very similar to, but is not interchangeable with, the 45 RPM centerpost (G400B329) used in models RC221, RC222. The centerposts can be readily identified by noting that the length of the un-threaded portion of the push-off adjusting shaft (15) is approximately 5/16" in G400B410, and ¾" in G400B239.

If 45 RPM records do not drop to the turntable as they should, or if the turntable stalls during change cycle, it will be necessary to adjust the 45 RPM centerpost (2).

The push-off adjusting shaft (15) is the only adjustment on this centerpost. When properly adjusted, the dimension from the bottom of the adjusting nut (14) to the end of the push-off adjusting shaft (15) is approximately ½ inch. To make an adjustment, proceed as follows:

1. Turn the set off. Push the Reject knob (42) to the "Rej" position. Then rotate the turntable clockwise (to the right) by hand until the pick-up arm moves as far away from the turntable as it will go. Do not continue to rotate the turntable beyond this point.

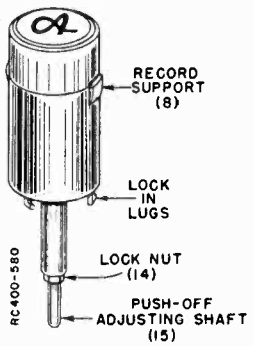
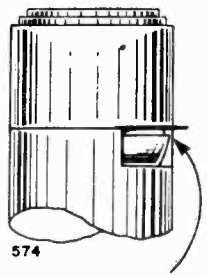


Figure 7. 45 RPM Centerpost.

2. Insert the 45 RPM centerpost and lock it in place.

3. In this position the record supports (8) should be pulled into the centerpost until the top edge of the record supports are just inside the centerpost. You should only be able to see approximately 1/32 of an inch of the centerpost wall. See figure 8.



Corner of record support (8) must be slightly (1/32") inside centerpost wall.

Figure 8. 45 RPM Centerpost Adjustment.

4. If the record supports do not pull into the centerpost as far as the position shown in figure 8, remove centerpost, loosen the locknut (14) and turn the push-off adjusting shaft out (counter-clockwise) approximately one half turn.

5. Insert the centerpost and check to see if the record supports "pull in" to the proper position. If they do not, repeat step 4. If they pull in far enough, proceed with step 6.

6. Place a stack of 45 RPM records on the centerpost and turn the record changer on. Push the Reject knob to the "Rej" position and then keep rejecting records until the whole stack has been dropped to the turntable. If each record slides smoothly down the centerpost, the adjustment is satisfactory.

IMPORTANT: If the turntable stalls during change cycle, the push-off adjusting shaft may have been turned out too far. Remove the 45 RPM centerpost and run the changer through change cycle. If the changer does not stall with the centerpost removed, turn the push-off adjusting shaft in about four or five full turns and repeat steps 1 through 6 above.

SERVICE AND REPAIR

DISASSEMBLING THE 45 RPM CENTERPOST (See Figure 9)

To disassemble the centerpost for parts replacement etc., proceed as follows:

1. Remove screws (12) from underside of centerpost and lift up the centerpost cap (3). See figure 9. *CAUTION: When the centerpost cap (3) is off, use extra care to keep from accidentally pushing up on the push-off adjusting shaft (15). If this shaft is puhed up, the slicer return springs (4) and slicers may fly off and be lost.*

MODEL RC400

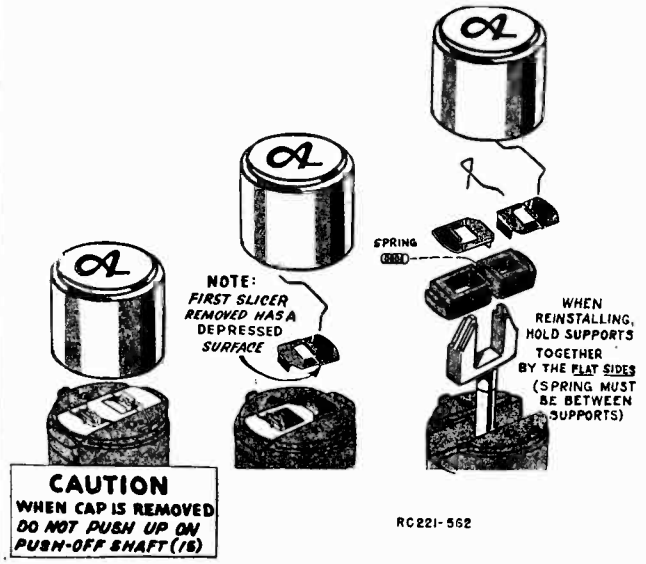


Figure 9. Disassembly of 45 RPM Centerpost.

2. Using a "long nose" pliers or tweezers, remove the slicer spring (4) which holds the top slicer (5) in place. Then remove the top slicer. (NOTE: This slicer has an offset. It must be removed first when disassembling and installed last when reassembling).
3. Remove the other slicer return spring and the bottom slicer (6).
4. Now, push up on the push-off adjusting shaft (15) until the record supports (8) come up over the top of the centerpost.
5. Grasp both record supports with the thumb and two forefingers and lift them off of the slicer cam (9A). Release record supports carefully so record support return spring (7) is not lost.
6. To remove the slicer cam and push-off assembly (9), remove the retaining ring (13) and the push-off return spring (11) from the underside of the centerpost and lift the assembly off from the top of the centerpost.

When assembling the centerpost, merely reverse the above procedure. When installing the record supports (8) and their return spring (7), place the spring between the record supports and compress the spring enough so the record supports can be slid down over the slicer cam (9A). When installing the slicers (5 and 6) be sure to install the flat slicer (5) first, and then the slicer with the offset (it also has a smaller cut-out).

REMOVING THE PICKUP ARM (See Figure 5)

If the pickup arm must be removed for any reason, proceed as follows:

Important

Do NOT loosen the Allen set screw (34) in the pivot collar (33). If the screw is loosened, it will be necessary to make the set-down point adjustment.

1. Loosen the pivot locking screw (24) at the front of the pickup arm counterweight (21).
2. Turn the pivot screw (22) almost all the way out.
3. Move the pickup arm to the right to free the permanent pivot (part of the counterweight) from the pivot hole in the pivot collar (33). In early production changers, it may be necessary to use a slight twisting or "wiggling" motion to free the permanent pivot. When the permanent pivot has been freed, merely lift the pickup arm assembly up and off.

To reinstall the pickup arm assembly proceed as follows:

1. Slide the counterweight down on the pivot collar (33) until the permanent pivot point falls into the pivot hole in the pivot collar. In early production changers, it may be necessary to set the permanent pivot point in the pivot hole and then twist or "wiggle" the arm until the counterweight falls into the proper position.
2. Tighten the pivot screw (22) until it is tight and then back it off just enough so the pickup arm can move up and down freely.
3. Tighten the pivot locking screw (24).

REMOVING TURNTABLE (38) AND THRUST BEARING ASSEMBLY (40)

To remove the turntable first place the speed change knob (19) in the "neutral" position. Being sure that the changer is not in change cycle, move the pickup arm away from the turntable. Then remove the retaining clip (37) on top of the turntable and lift the turntable straight up.

Before replacing the turntable, see that the drive wheel (36) is not against the centerpost socket and move the pickup arm as far as possible from the centerpost. Be sure the speed change knob (19) is in the "neutral" position.

No force is needed to seat the turntable.

Replace the turntable retaining clip (37) on the centerpost socket so that its "turned-up" ends are facing upward and away from the pickup arm.

The cork washers (39) and thrust bearing assembly (40) are removed by sliding them over the centerpost socket. Replace them in the order shown in figure 12.

LUBRICATION

Under normal operating conditions, the motor should never require oiling. Also, do NOT use oil on the 45 RPM centerpost and do NOT oil the roller on the reject lever (43). Any oil on this roller will be transferred to the drive wheel tire when the reject knob is moved to the "Rej" position, which might cause the drive wheel (36) to slip during change cycle. The

drive shaft is fitted through an oilite bearing on the drive bracket (78); it also should not require oil.

The rest of the changer, however, should be lubricated with grease whenever it comes into the shop for repairs or adjustment. All pivot and friction points should be greased adequately but not excessively. A good automobile chassis grease may be used for this purpose.

The push-off shaft (16) and the bearing in the turntable hub may be lubricated with SAE No. 20 oil.

Care should be taken to prevent any of the lubricant from coming into contact with the drive or idler wheel tires. Also, be careful when using oil, not to let an excess seep into the felt of the turntable.

CARTRIDGE AND NEEDLE REPLACEMENT

Alternate cartridges, interchangeable when complete with needle, are used in this changer.

In models having cartridge (27), part number 409A300, replace the needle (28), part number 98A15-6, by loosening the knurled nut (29) and withdrawing the old needle. Insert the new needle and tighten the knurled nut. See figure 10.

In models having cartridge (27), part number 409A301, replace the needle (28), part number 98A15-14, by prying downward on the back edge of the needle. Insert the new needle by pressing it into the cartridge. See figure 11.

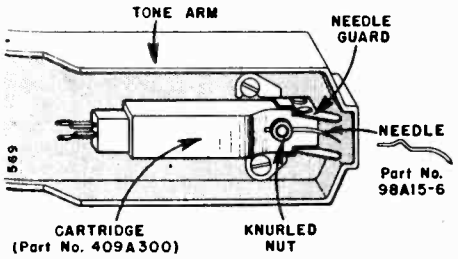


Figure 10. Cartridge 409A300 and Needle Detail.

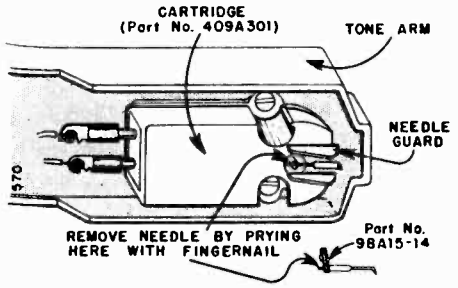


Figure 11. Cartridge 409A301 and Needle Detail.

PARTS LIST

Ref. No.	Part Number	Description
1	G400B 409	33 RPM Centerpost
2	G400B 410	†45 RPM Centerpost Complete
3	403A 1	45 RPM Centerpost Cap
4	414A 35	Slicer Return Spring
5	401A 276	Top Slicer
6	401A 275	Bottom Slicer
7	405A 125	Record Supports Return Spring
8	403A 40	Record Supports
9	G400A 411	Slicer Cam and Shaft
10	403B 43	45 RPM Centerpost Base
11	405A 124	45 RPM Push-Off Return Spring
12	60-1000-C2-47	Screw, #6-32x1" R.H.M.S. (2 req.)
13	401A 229	Retaining Ring
14	402A 312	Lock Nut
15	402A 313	45 RPM Push-Off Adjusting Shaft
16	G400A 417	33 RPM Push-Off Plate and Shaft
17	401A 311	33 RPM Record Support
18	G400A 418	Record Support Housing and Sleeve
19	403A 42	Speed Change Knob
20	403B 300	Pickup Arm
21	G400A 433	Pickup Arm Counterweight
22	402A 320	Pickup Arm Pivot Screw
23	1A73-10	Screw, #6x3/8 Shakeproof Type (2 req.)
24	42-187-C2-47	Lock Screw, #4-40x3/16 F.H.M.S
25	G400A 439	Cable and Pin Jack Assembly
26	2B10-5-59	Speed Nut
27	409A 300 or 409A 301	Cartridge with needle (See Figure 10) / Cartridge with needle (See Figure 11)
28	98A 15-6 or 98A 15-14	Needle (See Figure 10) / Needle (See Figure 11)
29	98A 54-2	Needle Nut (Knurled)
30	4B 1-7-47	Flat Washer, .096x3/16x1/32 (2 req.)
31	402A 335	Screw, #2x1/4 Fil. Hd. (2 req.)
32	G400A 401	Pickup Arm Lift Rod and Plate
33	G400A 432	Pivot Bracket and Collar (includes Allen screw)
34	1A 43-9	Allen Hd. Set Screw, #6-32x1/4
35	405A 303	Drive Wheel Spring
36	G400A 407	Drive Wheel Assembly (less spring)
37	414A 300	Turntable Retaining Clip
38	G400A 403	Turntable and Hub Assembly
39	412A 300	Cork Washer (2 req.)
40	415A 300	Thrust Bearing Assembly
41	G400C 438	Changer Pan and Stud Assembly
42	403A 302	Reject Knob
43	G400A 414	Reject Lever and Studs
44	405A 127	Reject Lever Return Spring
45	98A 54-5	Idler Wheel Retaining Spring
46	98A 54-6	Fibre Washer, 3/16" ID x 9/32" OD (4 req.)
	98A 54-11	Metal Washer, 3/16" ID x 9/32" OD (Quantity required varies; replace as found in changer.)
47	98A 54-7	Compound Idler Wheel
48	98A 54-8	Fibre Washer (5/32 ID x 3/8" OD)
49	98A 54-9	Metal Washer (5/32" ID x 5/16" OD)
50	98A 54-10	Idler Wheel Spring
51	407C 300	*Motor; 33 and 45 RPM; 60 cycle
52	3A 4-5-47	#6 Split Lock Washer
53	2A 1-11-47	Hex. Nut, #6-32
54	88A 8-1	Motor Plug (male)
55	406A 301	Motor Mounting Grommet (3 req.)
56	4B 1-68-47	Flat Washer, .196x3/8x1/32 (5 req.)
57	401A 317	Retaining Ring (3 req.)
58	405A 308	Changer Mtg. Spring (3 req.)
59	402A 334	Changer Mtg. Screw (3 req.)
60	402A 115	Plastiscrew, #6x3/8
61	401A 307	Trip Bracket
62	401A 173	Flat Washer
63	401A 177	Retaining Ring (7 req.)
64	405A 302	Set-Down Spring
65	401A 315	Index Bracket
66	4B 1-87-47	Flat Washer, .25x3/8x1/32
67	401A 229	Retaining Ring
68	405A 307	Lift Adjusting Lock Spring
69	402A 306	Pick Up Arm Lift Adjusting Nut
70	88A 2-3	Plug, Male (for shielded cable)
71	413A 11-1	Shielded Cable and Plug
72	G400A 427	Pickup Arm Lever and Trip Bracket (less springs)
73	405A 127	Trip Tension Spring
74	405A 305	Trip Adjusting Lock Spring
75	402A 328	Trip Adjusting Screw
76	405A 92	Cycle Spring
77	4B 1-178-0	Flat Washer, .196x3/8x1/64
78	G400B 416	Drive Bracket (includes hub and studs)
79	4B 1-67-47	Flat Washer, .196x5/16x1/32
80	G400A 420	Push-Off Bracket Assembly
81	65-375-C2-47	Push-Off Adjustment Lock
	41A 17-40	Operating Instructions for Models 5W11, 5W12
	S275	Service Manual for RC400 Record Changer
	1A45-2	Allen Wrench, #6

†This 45 RPM centerpost (G400B410) is very similar to, but is not interchangeable with, the 45 RPM centerpost (G400B329) used in models RC221, RC222. The centerposts can be readily identified by noting that the length of the un-threaded portion of the push-off adjusting shaft (15) is approximately 5/16" in G400B410, and 3/4" in G400B329.

*At the time of publication, 50 cycle conversion parts were not available.

MODEL RC400

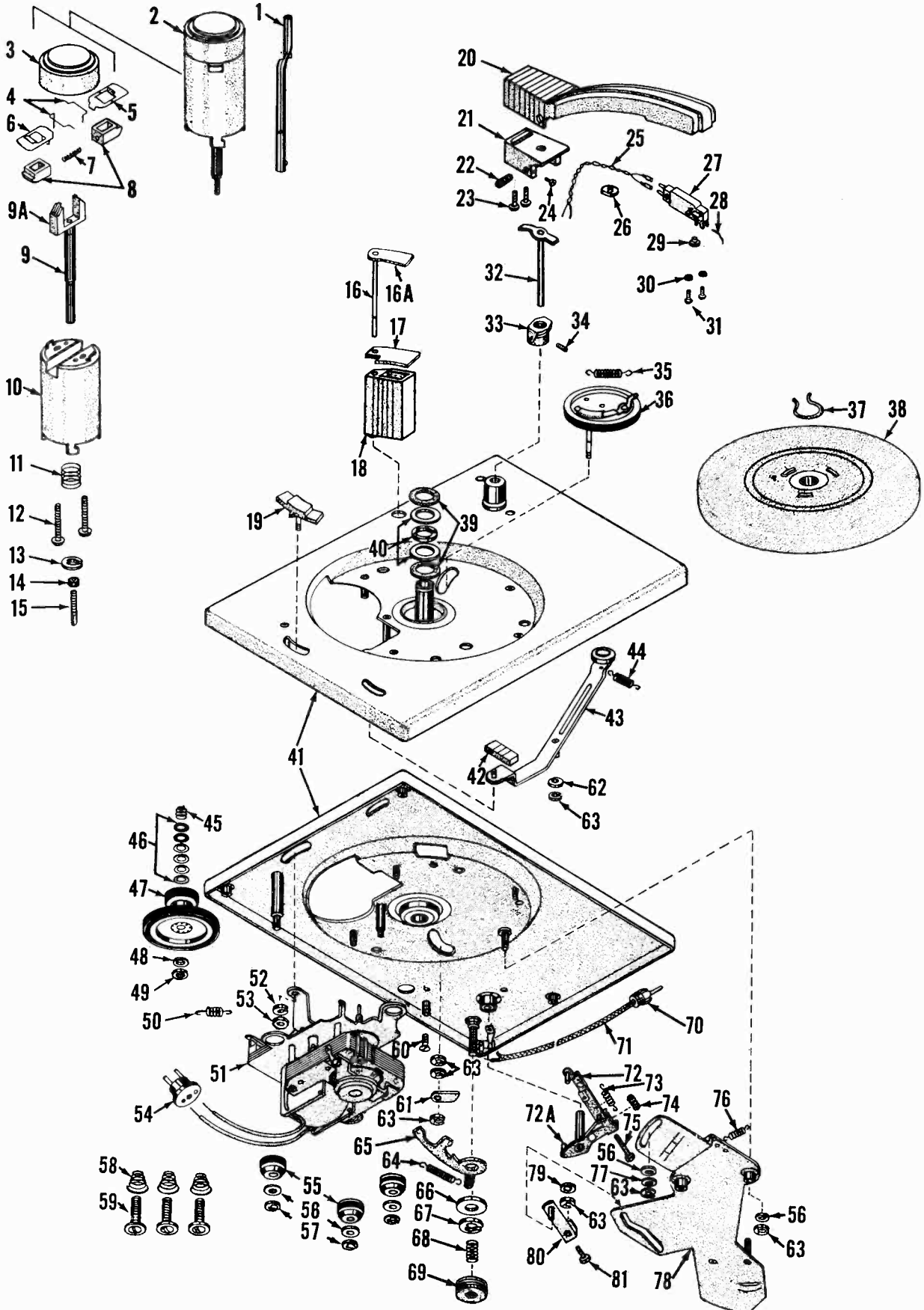


Figure 12. RC400 Exploded View.

RECORD CHANGER TROUBLE SHOOTING

Changer Will Not Trip Into Change Cycle.

1. Check adjustment of trip adjusting screw (75).
2. Check for broken, loose or weak trip tension spring (73).
3. Check for broken, missing or loose trip adjusting lock spring (74).
4. Check for oil or foreign material on the drive wheel tire (36).
5. Check to see that the drive bracket (78) is free (not binding) to pivot around drive bracket hub.
6. Check for broken cycle spring (76).

Changer Trips Into Change Cycle Before Finishing Record.

1. Check adjustment of trip adjusting screw. (75). See paragraph under heading "Trip Adjustment."

Changer Will Not Reject.

1. Check for oil or foreign material on the drive wheel tire (36).
2. Check to see that the drive bracket (78) is free to pivot around the drive bracket hub.

Pickup Arm Does Not Set Down Properly.

1. Check set-down adjustment. See paragraph under "Adjustment of Set-down Point".

Records Do Not Drop to Turntable.

1. If 45 RPM records do not drop, adjust push-off adjusting shaft (15). See paragraph under heading "45 RPM Centerpost Adjustment".
2. If 33 RPM records do not drop, check the push-off adjustment. See paragraph under heading "Push-off Adjustment".

Changer Stalls in Change Cycle.

1. Check for parts binding.
2. If changer stalls with 45 RPM centerpost in place, adjust push-off adjusting shaft (15). See paragraph under heading "45 RPM Centerpost Adjustment".

Turntable Will Not Revolve When Changer Is Turned On.

1. Check position of speed change knob (19). If it is in "neutral" position, the turntable will not revolve.
2. Check for oil or foreign material on the tires of the compound idler wheel (47).
3. Check for broken idler wheel spring (50).

Changer Causes Rumble or Noise.

1. Check for broken or missing "float" springs (58).
2. Check for speed change knob shaft (19) rubbing against the edge of the cut-out in the changer pan.

Pickup Arm "Skips" Across Records.

1. Check to be sure that cabinet is level.
2. Check for worn needle.

CAUTIONS AND SERVICE HINTS

1. See that the rubber tires on both the drive wheel (36) and the compound idler wheel (47) are kept clean and free from oil, grease, dirt or any foreign material. Carbona or carbon tetrachloride may be used for cleaning these parts.
2. When handling the idler wheel or drive wheel, keep fingers and hands away from the rubber tires. Natural body oils on these parts may possibly cause slippage.
3. When the turntable is off, do NOT push the drive wheel (26) against the centerpost socket.
4. If the record changer is not going to be used for some time, place the speed-change knob (19) in the "neutral" position. This will eliminate the possibility of denting the idler wheel tires (47).
5. When disassembling the 45 RPM centerpost, do not push up on push-off adjusting shaft (15), just after removing the centerpost cap (3).
6. When removing the pickup arm, do NOT loosen the Allen set screw (34) in the pivot collar (33).
7. Do not oil the roller on the reject bracket (43). Oil will be transferred to the drive wheel tire (26) possibly causing slippage during change cycle.
8. When replacing the turntable retaining clip (37) be sure to slip it on with the "turned-up" ends facing upward.
9. When removing or reinstalling turntable, make sure that the record changer is not in change cycle and that the speed change knob (19) is in the "neutral" position.

Due to the fact that a complete understanding of the proper operation of a record changer is necessary before any attempt be made to repair or effect Service adjustments; we are giving a description of the change cycle of the P-43 Series Capehart Record Changers.

The record shelves are set for the size record to be played (either 10" or 12") by turning either shelf to the position indicated on the decal, then the correct number of records should be placed on the record shelves. (Twelve 10" or ten 12"). The tone arm should be on its rest.

Before loading the records on the shelves they should be examined for rough edges (burrs, flash or chips) and if any burrs are found they should be removed with fine sandpaper.

Move the control switch which starts the phonograph and move the reject button sidewise. The changer will go into cycle lifting the tone arm off the rest and swinging it under the stack. The tone arm should swing clear of the record stack, a record should drop to the hooks, pause, then gently settle to the turntable. The tone arm should swing back and be lowered to the starting groove on the record. When the record is played the above cycle is repeated until the records have been played.

Now let's follow the above cycle through the mechanism.

When the reject button is moved, the Reject Lever (56-877) pushes the Start Lever and Release Trip Assembly (64215) far enough to disengage it from the Starting Lever Assembly (13-38). Due to its construction the Starting Lever (which is part of the Main Cam Assembly) (13-296) tilts down and engages with the Starting Pin (34309) to make the Main Cam Gear mesh with the Spindle Gear (part of 13-297).

The Turntable is screwed onto the Spindle Gear and both are driven through the Idler Pulley (3672) by the Motor. When the cycle is completed the Main Cam Gear disengages from the Spindle Gear because several teeth are left off the Main Cam Gear, this is called the playing position, see Fig. A,

When the Starting Lever engages with the Starting Pin (see above) the Main Cam Assembly is moved forward at the right speed and the correct distance to cause the gears to mesh properly. Then the Main Cam goes through a complete revolution.

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First the Tone Arm is lifted off the record through the Tone Arm Lift Lever (13-303). As soon as it is elevated both the Record Plungers move toward the Spindle to center the record for the drop to the Turntable; if no record is on the shelves the Automatic Switch is turned off, however the cycling switch makes the changer complete the cycle with the Tone Arm in playing position and needle resting on the record. As this happens the Tone Arm Return Lever (09-119) moves the Tone Arm from under the record stack. The Rear Record Plunger moves forward at the same rate of speed as the eccentric portion of the Spindle and the Front Plunger does. This pushes the record off the Rear Shelf where the Rear Record Hook catches it. Both Front and Rear Plunger move backwards at the same rate as the Spindle does, pushing the record off the Front Shelf and dropping it to the Front Hooks, the record pauses here until the Hooks move to center the record in respect to the Spindle. Then both Hooks snap back out of the way, allowing the record to settle gently to the turntable. Next the Tone Arm swings into the proper position and is lowered to the record. A wire feed-in spring acts against the Tone Arm Crank to feed the Tone Arm into the music grooves in case there is no feed-in groove on the record.

To accomplish the record feed there are three sections of the Main Cam, together with the Centering Lever and Rocker Arm Assembly involved. The first section of the Main Cam is a "Boss" illustrated at the end of the Tone Arm Lift Lever in Fig. A. The Second section is the Trip Roller Assembly on top of the Main Cam. The third section is the "slot" in the Tone Arm Lift portion of the cam adjacent to the Trip Roller Assembly.

The action is as follows; As the Main Cam rotates, the "Boss" strikes the Centering Lever and Rocker as shown in Fig. B, this moves the Record Plungers toward the Spindle. Because this pressure is applied through a spring, variations in record diameter are of little consequence. After the Boss passes the Centering Lever, the Trip Roller strikes the Rear Rocker the first time moving the Rear Record Plunger forward and the Front Record Plunger is also moved forward, Fig. C. As the Main Cam moves on, the Record Plungers go to a central position then both move backward, Fig. D, then resume the central position, this is while the record rests on the Hooks. Then the Centering Lever drops into the "Slot" in the Main Cam, Fig. E, the Front and Rear Hooks are suddenly withdrawn from the record and it drops to the Turntable.

As the Tone Arm moves over the record, its motion is transmitted through the Friction Trip to the Friction Trip Lever. When the needle enters the change groove the Starting Lever Release Trip is released by the Friction Trip Lever, this allows the Starting Lever to drop and engage the Starting Pin.

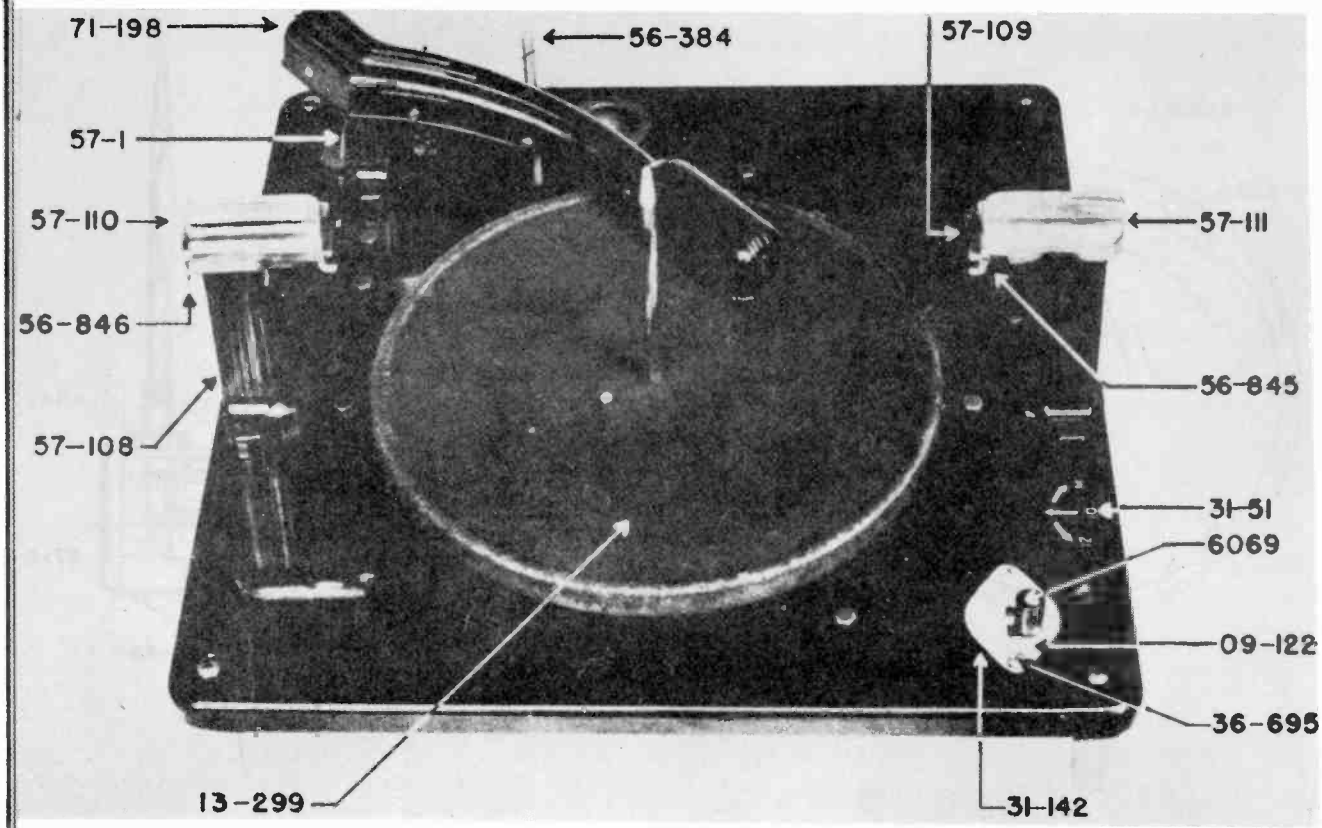

FIGURE 1

09-122	Automatic Stop Switch & Bracket Assembly
09-123	Tone Arm Return Lever & Spring Assembly
13-299	Turntable
13-303	Tone Arm Lift Lever & Bracket Assembly
13-305	Center Lever & Rocker Assembly
31-51	Decalcomania
31-142	Stop Switch Escutcheon
36-695	#6-32x3/8 Phil. Oven H.M.S. St
56-384	Tone Arm Rest Pin
56-845	10" Record Plunger, Fig. 5A
56-846	12" Record Plunger, Fig. 5A
56-868	Switch Lifting Lever
57-1	Tone Arm Support Housing, Fig. 4
57-108	Record Support Housing, Fig. 5A
57-109	Record Support Shelf & Tube Ass'y Fig. 5A
57-110	Record Shelf Cover, Rear, Fig. 5A
57-111	Record Shelf Cover, Front, Fig. 5A
71-198	Tone Arm Assembly, Fig. 4
6069	Reject Button
46293	Trip Finger Stop, Fig. 2
99-12-1	8-32 Hex Nut
99-33-3	#8 S.P. Washer

MODEL P-43

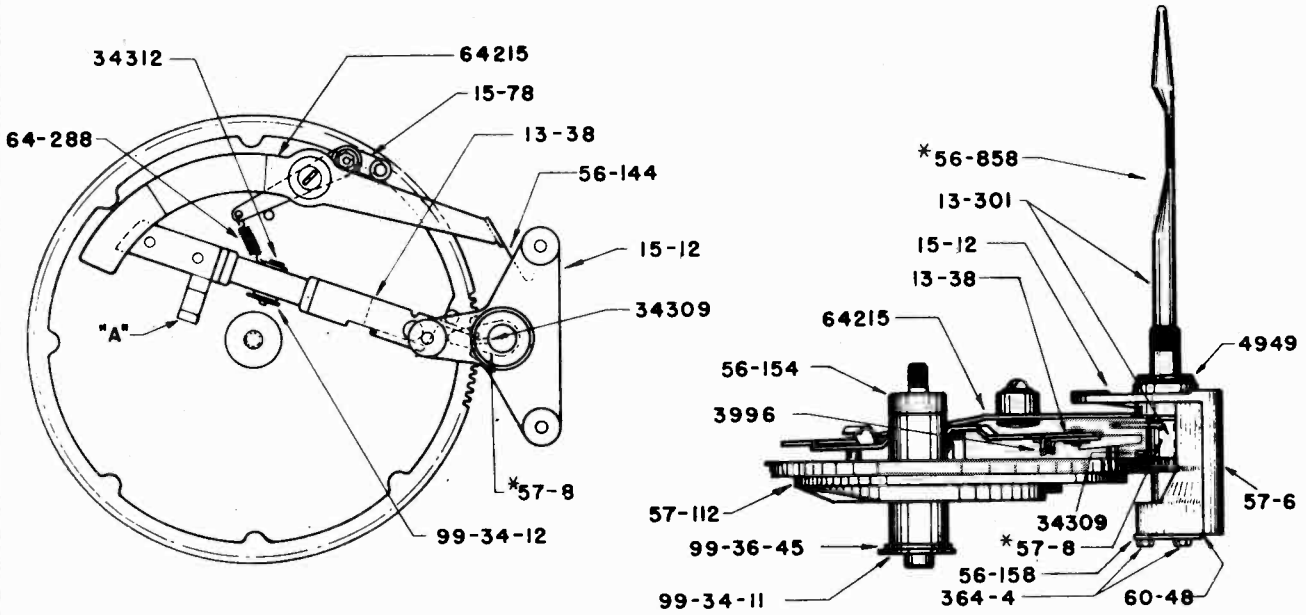

FIGURE 2

07-26 **Front Locking Lever Assembly**

Mounting Parts

36-117	10-32x1" H.H. Screw
36-136	#10 Flat Washer
368-7	10-32 Hex Nut
56-112	Spacer
99-33-4	#10 S.P. Washer

07-27 **Rear Locking Lever Assembly**

Mounting Parts

36-114	10-32x21/32" H.H. Screw
36-136	#10 Flat Washer
368-7	10-32 Hex Nut
56-112	Spacer
99-33-4	#10 S.P. Washer

07-28 **Connecting Link Assembly**

56-104	Connecting Link
56-106	Connecting Link Rivet
56-124	Gear Sector, Front
56-191	Gear Sector, Rear
56-263	Gear Spacer
99-36-28	Brass Washer
99-37-2	Wave Washer

Mounting Parts

36-114	10-32x21/32" H.H. Screw
36-136	#10 Flat Washer

Mounting Parts--Continued

36-231	10-32x1/2" H.H. Screw
368-7	10-32 Hex Nut
99-33-4	#10 S.P. Washer

09-119 **Tone Arm Return Lever and Spring Assembly**

11-180	Feed-In Spring Assembly
36-141	6-32x1/4" R.H.M.S.
36-465	6-32x5/8" R.H.M.S.
3612-4	#6 S.P. Washer
3624-2	#6 Flat Washer
56-166	Ratchet Pawl
56-167	Shoulder Rivet
3996	Pawl Spring
99-11-6	6-32 Hex Nut
99-40-6	#0x3/16" Drive Screw

Mounting Parts

36-112	#10 Flat Washer 1" O.D.
36-115	10-32x1/2" H.H.M.S.
368-7	10-32 Hex Nut
56-155	Spacer
99-33-4	#10 S.P. Washer

13-296 **Main Cam Assembly**

13-38 Starting Lever Assembly

15-78 **Trip Roller Assembly**

		Mounting Parts
	36-119	8-32x3/8" B.H.M.S.
	368-4	8-32 Hex Nut
	99-33-3	#8 S.P. Washer
	99-36-20	#8 Flat Washer
	56-100	Starting Lever End
	56-105	Rivet
	57-112	Main Cam
	3996	Spring
	99-36-1	Washer
		Mounting Parts
	34312	Pivot Pin
	99-34-12	H.P. Cotter
		Mounting Parts, Main Cam
	36-129	1/4"-28 Hex Nut
	56-154	Main Cam Stud
	99-33-5	1/4" S.P. Washer
	99-34-11	H.P. Cotter
	99-36-45	Washer
13-297		**Spindle Gear and Bracket Assembly**
	13-301	Spindle and Gear Assembly
	56-858	Spindle *
	57-8	Spindle Gear *
		* Not Sold Separately
	34309	Starting Pin
	4949	Felt Washer
	99-42-10	3/16" Ball Bearing
	99-42-11	Turntable Stop Washer
		Mounting Parts
	36-303	8/32x7/16 R.H.M.S.
	56-102	Spacer
	50206	Rubber Grommet
	99-36-21	#8 Flat Washer
13-298		**Centering Lever & Rocker Assembly**
	36-690	#10 Flat Washer 1/2" O.D.x .042" St.
	368-7	#10-32 Hex Nut 3/8" A.F.x1/8" Hi. St.
	56-841	Centering Lever
	56-844	Plunger Rocker
	56-848	Rocker Lever Spacer
	56-852	Rocker Connecting Link Rivet
	56-853	Centering Lever Return Arm
	56-857	Centering Lever Rivet and Guide Pin
	56-860	Rocker Connecting Link
	56-878	Centering Lever Guide Pin
	64-13	Centering Lever Return Arm Spring
	64-290	Centering Lever Equalizing Spring
	99-20-31	#10-32x7/8" R.H.M.S. - St.
	99-33-4	#10 S.P. Int. Lockwasher
13-300		**Play Control Assembly**
	13-302	Switch, Cam, Ratchet and Hub
	13-153	Switch Cover
13-300		**Play Control Assembly--Continued**
	15-16	Switch Cam & Hub
	15-80	Ratchet, Hub and Pin Assembly
	36-143	Taper Pin
	36-593	#2x1/4" Drive Screw
	56-168	Shaft
	56-169	Ratchet Locking Plunger
	56-171	Switch Cam Spacer
	56-173	Switch Bracket
	64-18	Ratchet Plunger Spring
	64-19	Switch Cam Spring
	90-12	Switch
	99-18-1	6-32x3/16" R.H.M.S.
	99-36-7	Plain Washer
	3612-4	#6 S.P. Washer
		Mounting Parts
	36-236	6-32x1/4" Philips O.H.
13-303		**Tone Arm Lift Lever & Bracket Assembly**
15-10		**Front Gear & Cam Assembly, See Fig. 7**
	99-28-31	6-32x3/16" Bristol Set Screw
15-11		**Rear Gear & Cam Assembly**
	99-28-31	6-32x3/16" Bristol Set Screw
44-27		**Phono Motor 60 Cycles**
	3671	Motor Pulley 60 cycles
44-28		**Phono Motor 50 Cycles**
	3681	Motor Pulley 50 cycles
		Mounting Parts
	45176	Tension Spring Holder
	99-19-3	8-32x3/8" R.H.M.S.
	99-33-3	#8 S.P. Washer
	99-36-36	#8 Flat Washer
56-877 *		**Reject Lever**
	3160	"Reject" Tab
	59-48	Reject Button
	39236	Reject Lever Spring
		Mounting Parts
	36-114	10-32x21/32" H.H. Screw
	36-136	#10 Flat Washer
	368-7	10-32 Hex Nut
	99-33-4	#10 S.P. Washer
90-84		**Cycle Switch**
	60-205	Switch Cover
		Mounting Parts
	36-624	6-32x1/2" Philips B.H.M.S.
	56-881	Spacer
46293		**Trip Finger Stop**
64215		**Trip Lever Release Lever**
66351		**Friction Trip Assembly Springs**
64-13		**Rear Shelf Lock Lever or Centering Lever Return Spring**
6416		**Front Shelf Lock Lever**
64-290		**Centering Lever Equalizing Spring**
39234		**Tone Arm Swing Lever**
39236		**Reject Lever Spring**

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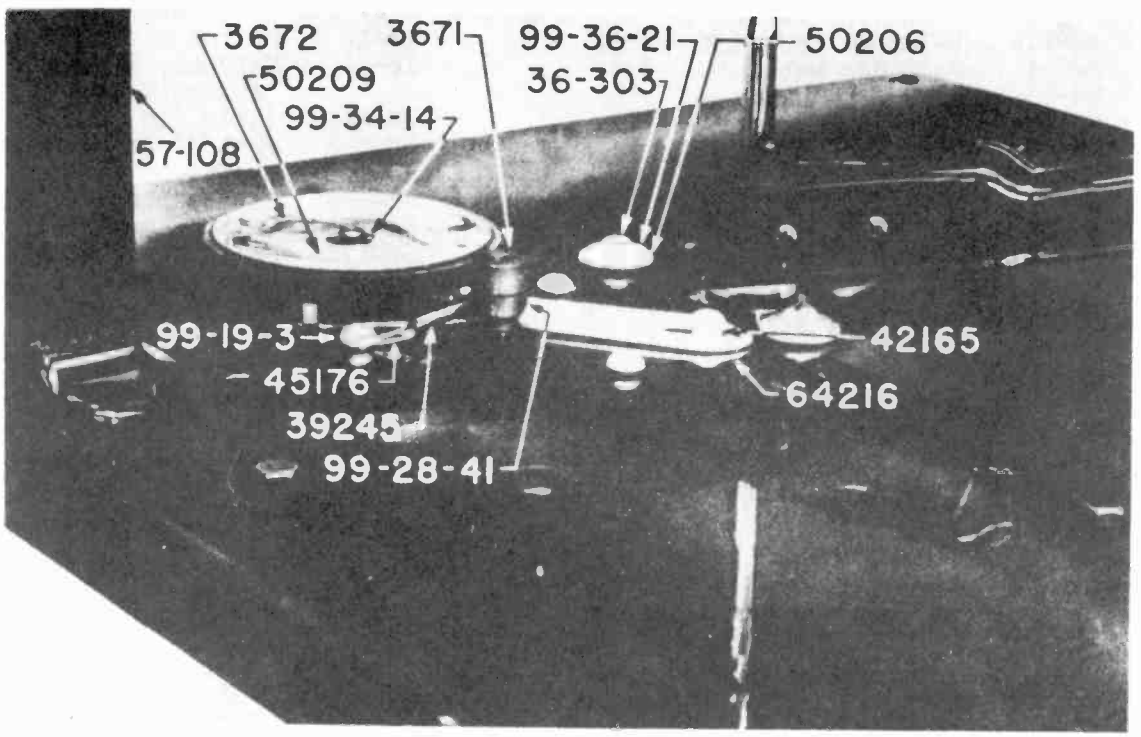

FIGURE 3

36-303	8-32x7/16" R.H.M.S.
368-4	8-32x1/4" Hex Nut
57-108	Record Support Post, See Fig. 5A
3671	Motor Pulley 60 Cycle
3672	Idler Pulley
39245	Idler Spring
42165	Spacer
45176	Spring Holder
50206	Rubber Grommet
50209	Thrust Washer
64216	Idler Bracket and Stud Assembly
99-12-1	8-32x11/32" Hex Nut
99-19-3	8-32x3/8" R.H.M.S.
99-28-41	6-32x1/8" Bristol Set Screw
99-34-14	H.P. Cotter
99-36-21	#8 Flat Washer
99-36-38	Flat Brass Washer

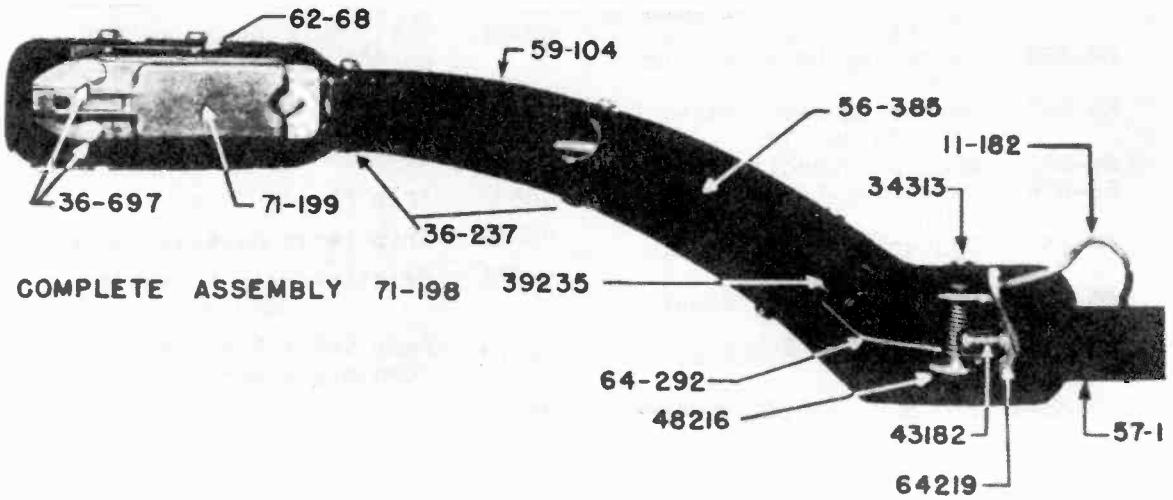

FIGURE 4

71-198	**Complete Tone Arm Assembly**	
	11-182	Lead and Plug Assembly
	61269	Plug
	36-140	#4x1/4" Philips B.H.S.T.S.
	36-268	4-36x1/8" Philips B.H.M.S.
	36-504	4-36x3/16" Philips B.H.M.S.
	36-758	Slotted Needle Set Screw
	56-252	Crystal Mounting Bracket
	56-257	Cartridge Mounting Spacer
	56-385	Tone Arm Brace
	* 57-1	Tone Arm Support Housing
	59-104	Tone Arm Only
	62-39	Dampening Shim
	48216	Tone Arm Bushing
	64-292	Counterbalance Spring
	71-199	Crystal Cartridge
	34313	Hinge Pin
	39235	Spring Clip
	64219	Tone Arm Bracket Assembly
	99-10-8	4-36 Hex Nut
	99-17-11	4-36x5/8" R.H.M.S.
	99-33-1	#4 S.P. Washer

Mounting Parts

36-120	8-32x5/16" B.H.M.S.
56-251	Wire Clamp
43182	Tone Arm Lift Rod
50204	Cork Washer

* Replaced by 57-122

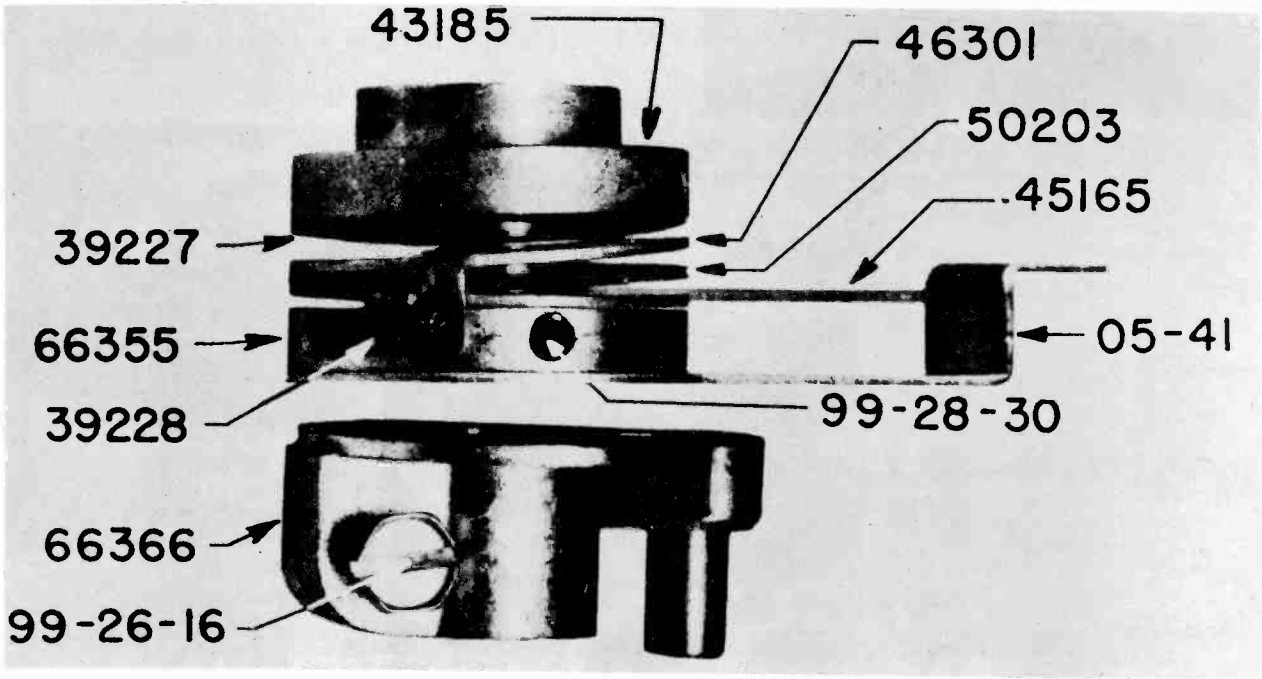

FIGURE 5

66351	**Friction Trip Assembly**	
	05-41	Trip Finger
	39227	Spring Washer
	39228	Coil Spring
	43185	Upper Collar
	99-28-30	6-32x1/4" Bristol Set Screw
	45165	Friction Trip Lever
	46301	Friction Trip Stop Disc

66351	**Friction Trip Assembly--Continued**	
	50203	Cork Washer
	66355	Lower Collar, Pin and Screw
	99-28-30	6-32x1/4" Bristol Set Screw
	66366	Tone Arm Crank Assembly
	99-26-16	Tone Arm Crank Set Screw

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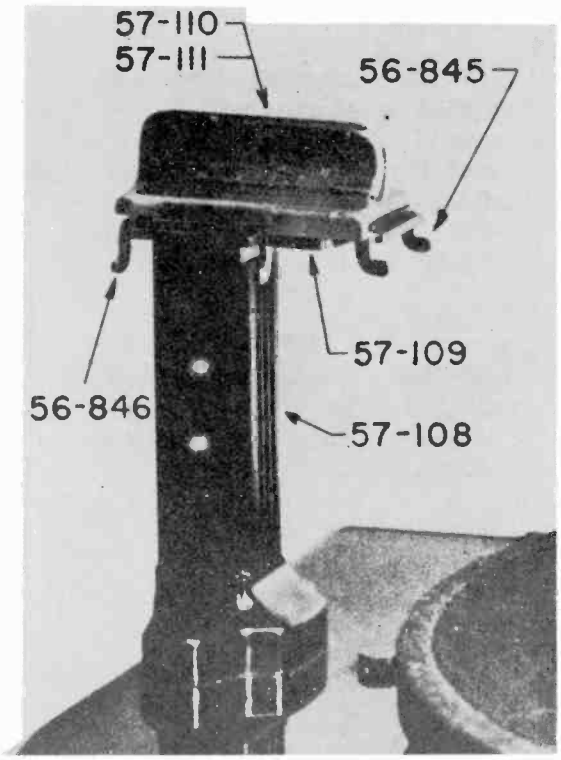


FIGURE 5A

	56-845	10" Plunger
	56-846	12" Plunger
*	57-108	Record Support Post
	57-109	Record Support Shelf and Tube Assembly
	57-110	Record Shelf Cover Rear
	57-111	Record Shelf Cover Front

Mounting Parts

	36-119	8-32x3/8" Philips B.H.M.S. Post to Base
	36-687	4-36x9/16" Philips F.H.M.S.
	36-688	6-32x9/16" Philips B.H.M.S.

* Replaced by 57-121

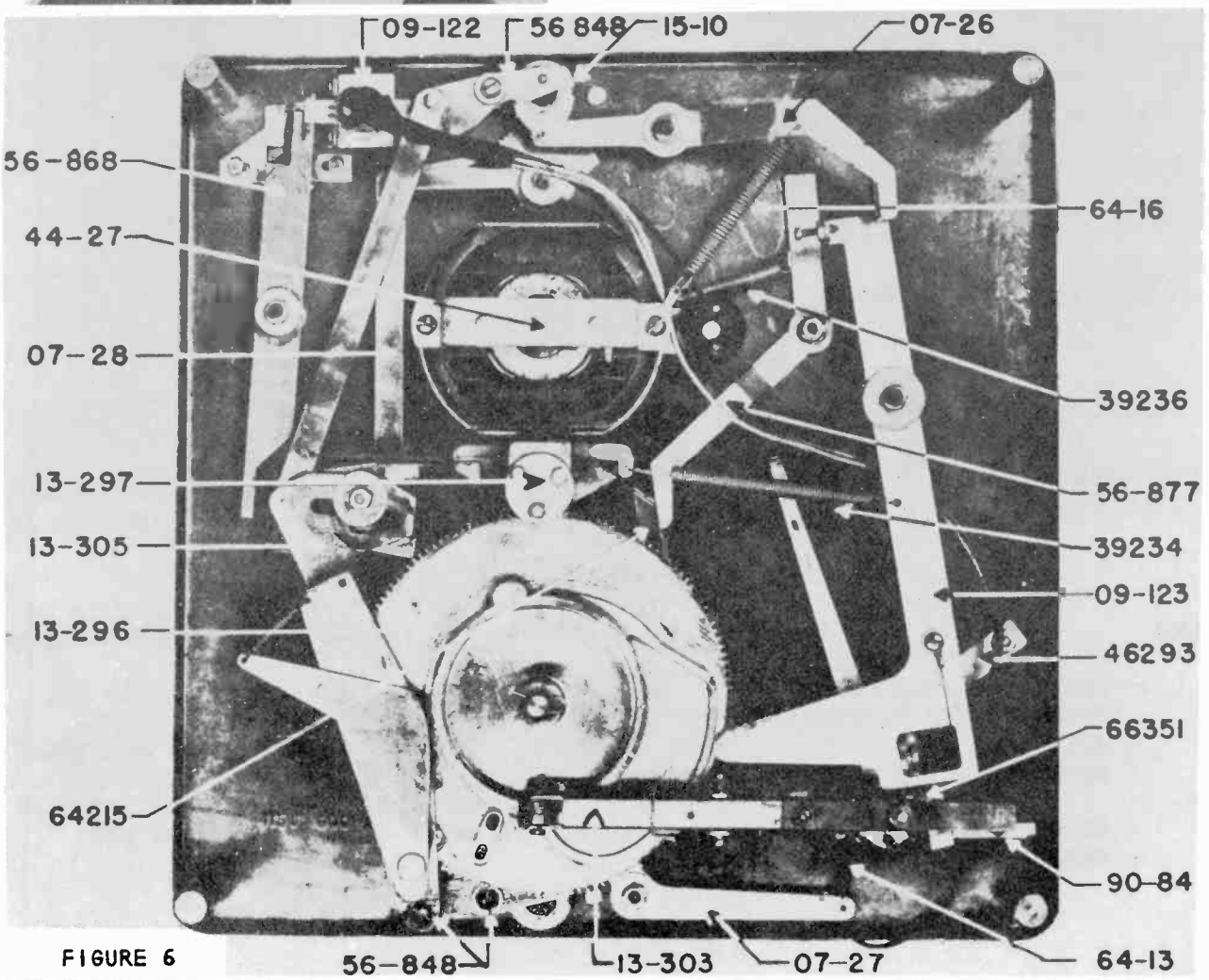


FIGURE 6

09-122 Automatic Stop Switch Assembly
09-123 Tone Arm Return Lever & Spring Assembly
13-297 Spindle, Gear and Bracket Assembly
13-301 Spindle and Gear Assembly
34309 Starting Pin (needed to complete 13-301
15-12 Spindle Support Bracket
31-142 Stop Switch Escutcheon
36-695 #6-32x3/8" Phil. Oven H.M.S. St.
364-4 6-32x1/4" H.H.M.S.
56-158 Spindle Thrust Plate
56-384 Tone Arm Rest Pin
57-6 Spindle Support Bracket
6048 Paper Gasket
4948 Felt Washer
99-42-10 3/16" Thrust Ball
99-42-11 Turntable Stop Washer

Mounting Parts

36-303 8-32x7/16" R.H.M.S.
56-102 Spacer, Spindle Bracket to Base

Mounting Parts--Continued

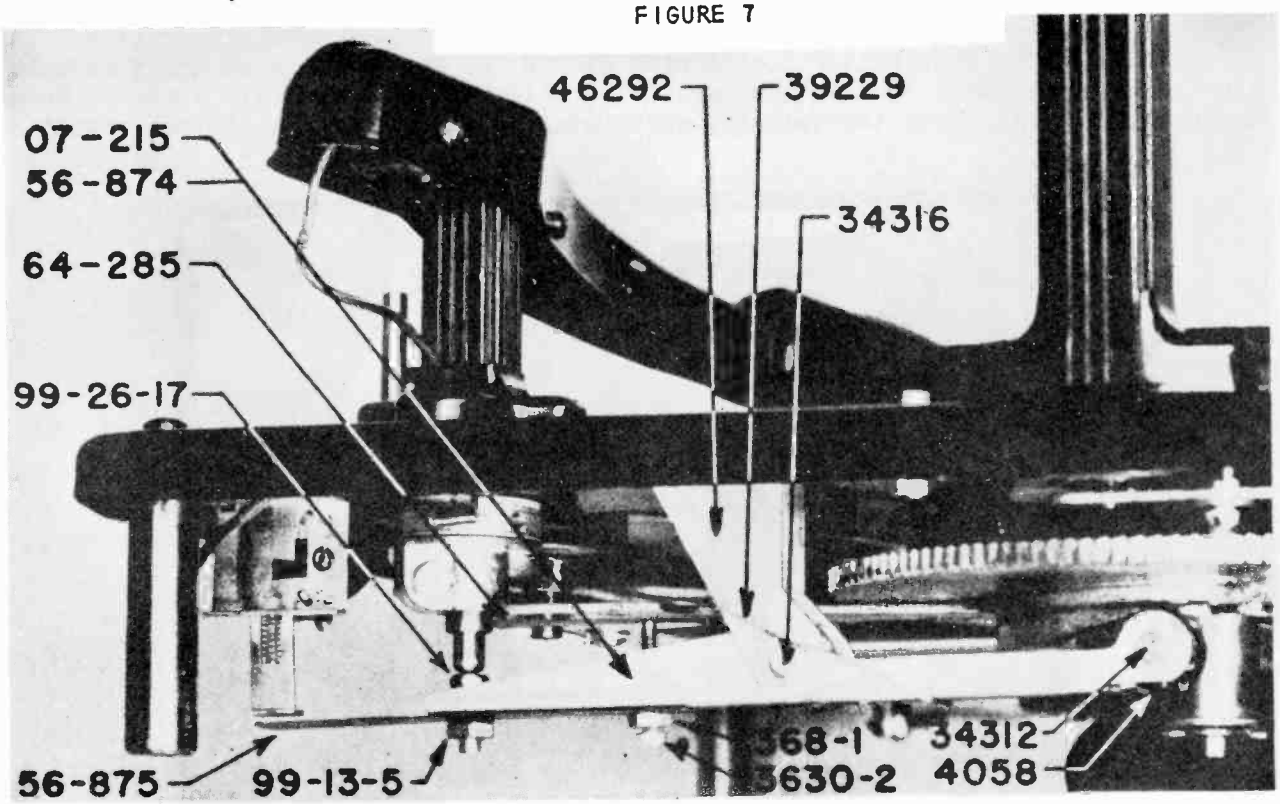
50206 Rubber Grommet
99-36-21 Flat Washers

13-296 Main Cam Assembly
13-38 Starting Lever Assembly
15-78 Trip Roller Assembly
56-100 Starting Lever End
56-105 Starting Lever End Rivet
56-868
71-198 Tone Arm & Pick Up Assembly
3996 Starting Lever End Spring
34312 Starting Lever Pin
99-34-12 H.P. Cotter for 34312
99-36-1 Starting Lever End Rivet Washer

Mounting Parts

36-129 1/4"-28x7/16" Hex Nut
56-154 Main Cam Stud
99-33-5 1/4" S.P. Washer
99-34-11 H.P. Cotter for 56-154
99-36-45 Main Cam Stud Washer

FIGURE 7



13-303 **Tone Arm Lift Lever and Brake Assembly**

07-215 Lever and Brake Spring Assembly
56-874 Lever only
64-285 Brake Spring
362-1 Rivet
368-1 6-32 Hex Nut
3630-2 6-32x7/8" R.H.M.S.
56-875 Switch Trip Finger
34312 Pin
34316 Pin
39229 Spring
4058 Roller
46292 Lever Mounting Bracket
99-13-5 10-32x3/8" Hex Nut
99-26-17 10-32x1/2" H.H.M.S.
99-33-4 #10 S.P. Washer
99-34-12 H.P. Cotter for 34312
99-34-13 H.P. Cotter for 31316

Mounting Parts

36-116 10-32x1/4" H.H.M.S.

MODEL P-43

In the following five illustrations we are showing the cycle of operation of a P-43 Series Capehart Changer.

Figure A is known as the playing position.

In Figure B the Main Cam has advanced so the "Boss" on the Main Cam has moved the Centering Lever Return Arm away from the cam, which because of the Return Spring causes the Centering Arm thru the Rocker Levers and Plunger Shafts to move the Record Plungers toward the Spindle. Due to the motion being transmitted thru the Return Spring different diameter records are handled equally well. The equalizer spring aids in exactly centering the record in regard to the Spindle. Note, in this illustration the Tone Arm Swing Lever is part way up the Cam Shoulder.

In Fig. C the Trip Roller (part of Main Cam) has advanced to move the rear plunger rocker away from the spindle, at the same time moving the front plunger rocker toward the spindle. Due to the Plunger Shafts, which transmit the motion of the Rockers to the Record Plungers the Record Plungers move in the opposite direction from the Rockers, i.e. Front Record Plunger moves away from the Spindle. This causes the record to be pushed off the Rear Shelf and drop to the Rear Hooks.

Between C & D the Record Plungers go through the central position and assume the position shown in Fig. D where the Rear Record Plunger moves away from the Spindle causing the record to drop to the Front Hooks.

In Fig. E the Centering Lever Return Arm has dropped into the "Slot" in the Main Cam, moving both Plungers Rockers toward the Spindle, causing the Front and Rear Hooks to snap back, permitting the record to settle flat on the turntable. In this illustration the Tone Arm Swing Lever is returning to the normal position.

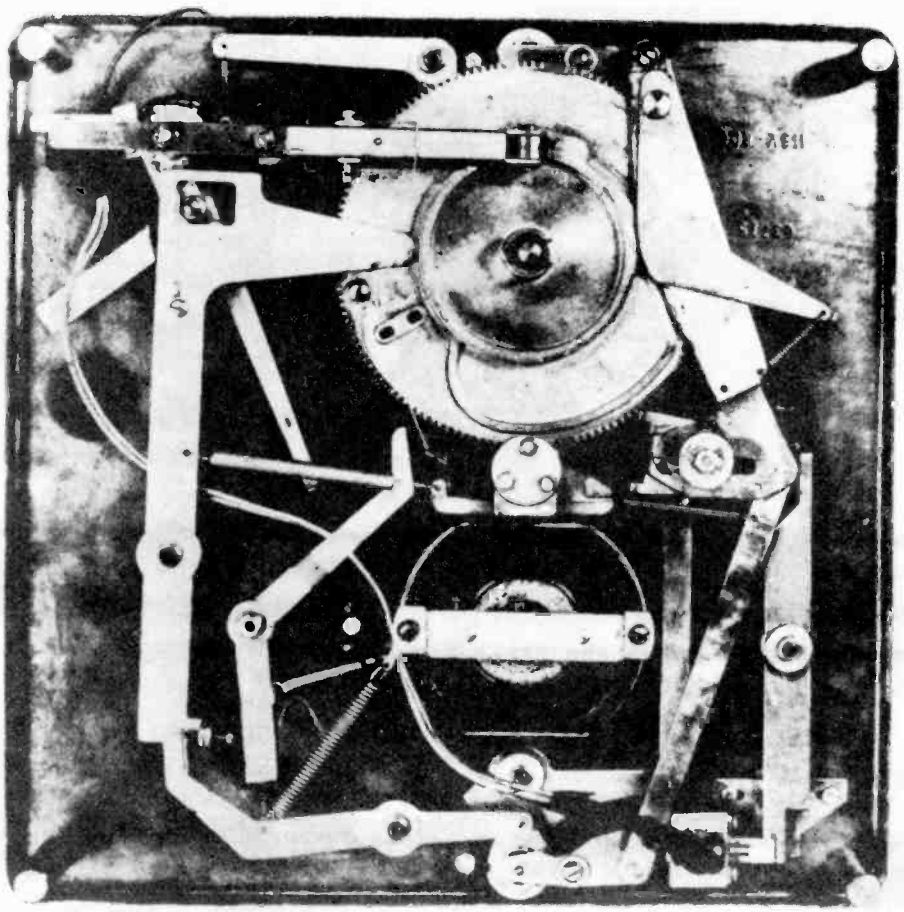


FIGURE A

SERVICE SUGGESTIONS

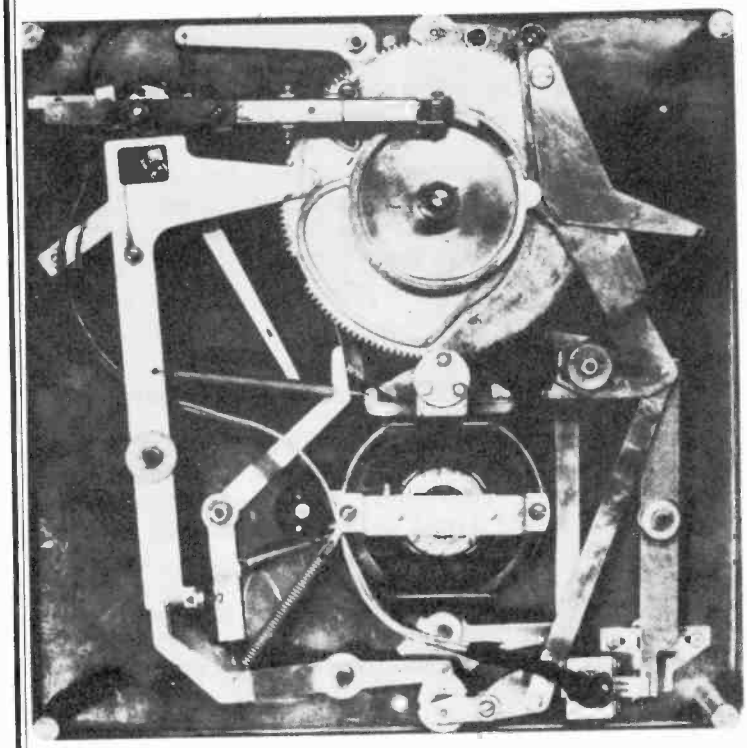


FIGURE B

1. TO REMOVE TURNTABLE 13-299

The Spindle Gear may be wedged, by a screwdriver between it and the Main Cam, to prevent its turning, the Turntable should be unscrewed from the Spindle. When removing the Turntable make certain one of the Spacer Washers is not lost. These Washers often adhere to the Turntable because of an oil film from the Felt Washer 4949. When replacing Turntable make sure it is properly tightened. NEVER USE GAS PLIERS TO HOLD SPINDLE.

2. TO REPLACE OR ADJUST IDLER PULLEY 3672.

First remove Turntable. The Idler Pulley is used to transfer power from the Motor Pulley 3671 to the Turntable. If the Idler Spring tension is incorrect the Turntable speed may be too high or too low, it should fall between 76.59 R.P.M. and 80.00 R.P.M. This tension is adjusted by loosening the Motor Mounting Screw holding the Spring Holder 45176 and turning the Spring Holder until the required tension is secured.

If it is necessary to replace the Idler Pulley remove the Hair Pin Cotter 99-34-14 and the Thrust Washer 50209. After removing the Idler Pulley also remove the Thrust Washer used underneath the pulley. If the Idler Pulley is replaced both Thrust Washers should be also.

When replacing the Pulley a single drop of oil should be used on the Pulley Stud.

CAUTION--Do not allow oil to get on either the Idler Pulley or the Turntable Rim.

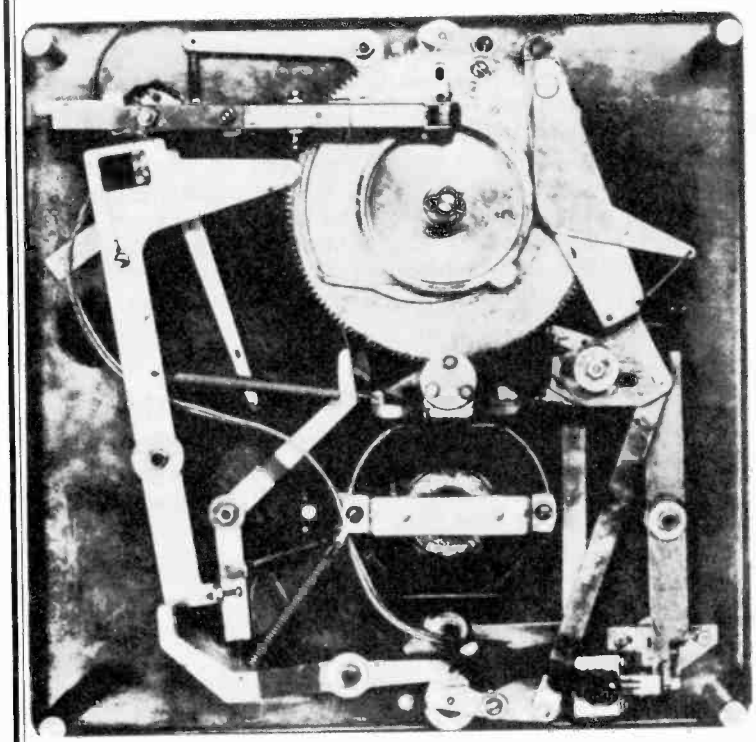


FIGURE C

3. ALIGNMENT OF RECORD SUPPORT SHELVES

The center line of the record shelves should form a straight line, in 10" position which passes through the center of the spindle. The shelves should be exactly 9 and 41/64 inches apart, plus or minus .005", and should be equidistant from the spindle. In the event it becomes necessary to change the spacing of the record shelves it is recommended that shims be used to adjust them. In some cases if oversized or undersized records are used it may be necessary to change the spacing of the shelves.

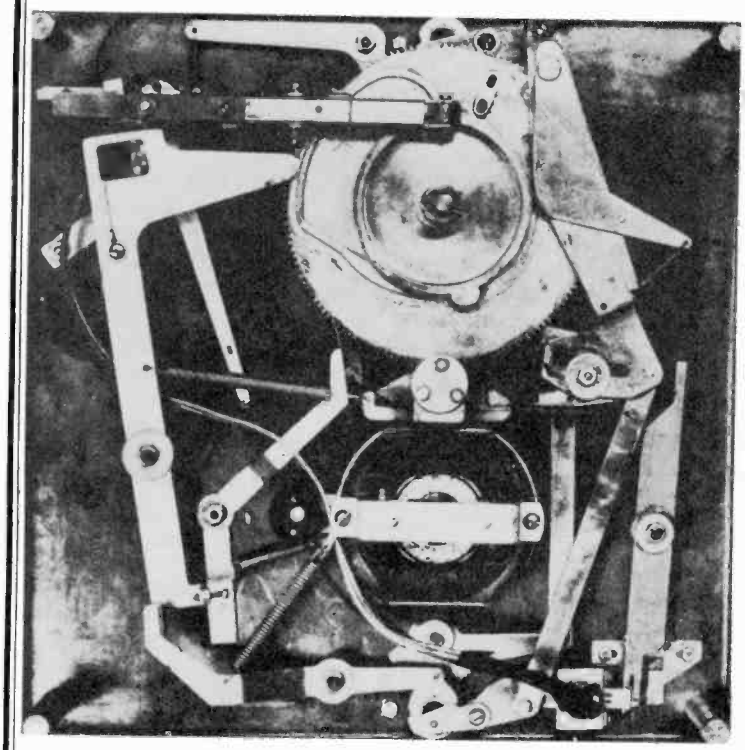


FIGURE D

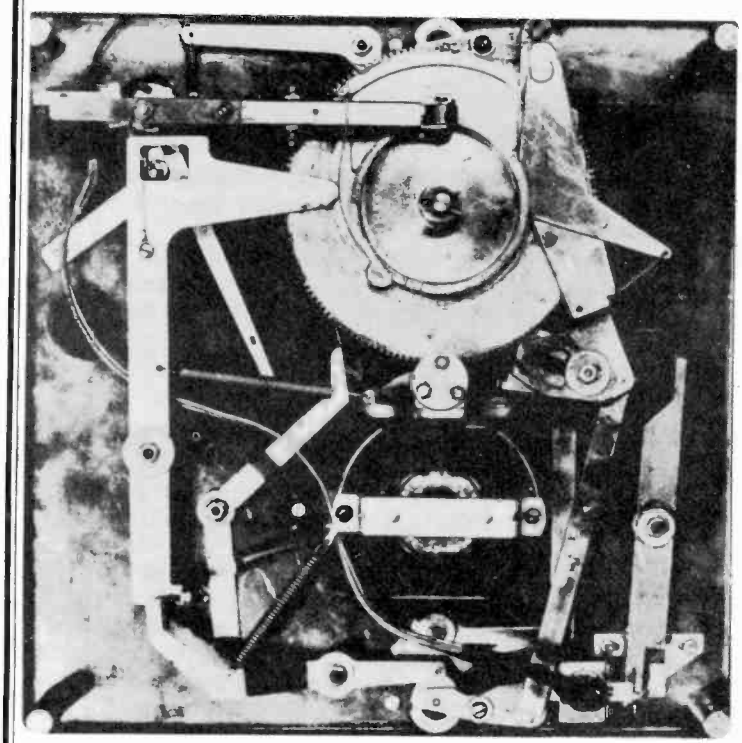


FIGURE E

4. ALIGNMENT OF RECORD SPINDLE

To prevent feedback the Spindle, Gear and Bracket Assembly is rubber mounted and can shift in transit. To reposition the spindle loosen all three mounting screws, position the spindle and tighten all three mounting screws equally; so as not to force the spindle out of place which may happen if one screw is tightened first.

5. SHELF LOCKING LEVER ADJUSTMENTS

The Front Record Shelf 57-111 should be lined up with the record spindle in the 10" position. The Shelf Locking Cam 15-10 is lined up with the center line of the Gear Sector Assembly and adjusted until the Locking Lever 07-26 is properly seated in the Shelf Locking Cam. The Record Shelf should not be permitted to slip when adjusting these parts.

When aligning the Rear Shelf Locking Cam the Locking Lever Hex Head Mounting screw may be loosened to permit the necessary adjustment to properly align the Shelf Locking Cam and Shelf Locking Lever.

6. ADJUSTMENT OF NON TRIP CAM OF STARTING LEVER 13-38 (Fig. 6)

This Cam shown at "A" in (Fig. 6) should be adjusted so that when the machine is in the "Manual" position, the Starting Lever Release Trip 64215 (Fig. 6) will pass over the end of the Starting Lever 13-38 (Fig. 6) without touching. The front end of the Starting Lever must also clear the bottom of the Resetting Dog and the top of the Starting Pin both part of the Spindle Gear 57-8 (Fig. 6).

7. THE TRIP FINGER STOP 46293 (Fig. 2)

The Trip Finger Stop 46293 should be 2-1/4" from the inside of the base plate to the inside face of the 90° bend at the end of the Stop.

8. NEEDLE LANDING

In 10" position, adjust the Tone Arm Crank 66366 (Fig. 5) so the needle lands

4-7/8" from center of the Record Spindle. To adjust have record changer in playing position, loosen Tone Arm Set Screw 99-26-16 (Fig. 5) set needle 4-7/8" from center of Record Spindle. Hold Tone Arm Crank firmly against Tone Arm Swing Lever 09-119 (Fig. 2) at the same time hold the Tone Arm Crank firmly up against the Trip finger 46287 (Fig. 5). Tighten the Set Screw 99-26-16. There should be a small amount of play up and down in the tone arm. Next set the 12" drop. To adjust set the record shelves for 12" records and have record changer in playing position. Loosen Lock Nut 99-11-6; which is part of 09-119 and adjust Screw 36-465 until the needle drops 5-7/8" from the center of the Record Spindle. Be sure nut 99-11-6 is tightened after adjustment is made.

9. ADJUSTMENT OF TONE ARM 71-195 (Fig. 4)

With records on the shelves, the top of the pickup arm at the highest point in its return should be 3/16" below the bottom of the bottom record on the shelves.

10. TRIP MECHANISM (Fig. 5)

The proper adjustment of the Trip Mechanism is, when the needle is 1-7/8" from the center of the record spindle, the Trip Finger 05-41 (Fig. 5) trips the Starting Lever Release Trip 64215 (Fig. 6).

To adjust tension loosen Bristol Set Screw 99-28-30 in Upper Collar 43185 (Fig. 5). Turn collar counter clockwise to increase friction (if changer does not trip at end of record) and clockwise to decrease friction (if changer trips before the end of the record). There should never be any more friction than is necessary to move Starting Lever Release Trip 64215 (Fig. 6) off the end of the Starting Lever 13-38 (Fig. 6).

Excessive friction will cause a loud click each revolution of the turntable after a part of the record has been played.

11. STARTING PIN 34309 AND STARTING LEVER 13-38 (Fig. 6)

The Starting Pin 34309 (Fig. 6) is normally driven into the Spindle Gear 57-8 (Fig. 6) until the square end is flush and the pointed end projects about 1/8" and should engage the end of the Starting Lever 13-38 to allow the teeth of the Main Cam to mesh with the Spindle Gear without topping. Two adjustments are possible if the teeth do not engage properly, either drive the Starting Pin in further or bend the end of the Starting Lever.

12. MOTOR SPEED

Due to commercial tolerances it is impossible to secure motors which will run at exactly 78.26 R.P.M. Our limits are from 76.59 R.P.M. to 80.00 R.P.M.

In the event it becomes necessary to get exact speed on one of these changers choose a motor pulley that gives a slightly higher speed than required. Using a fine file reduce the diameter of the motor pulley a little at a time until the required speed is secured.

13. The following simple OILING INSTRUCTIONS will result in a minimum of service calls---

Every six months or once each year, two or three drops of oil should be put on the two felt washers in the Spindle Gear Bracket. One washer is located at the bottom of the Spindle Gear, the other is at the top of the bracket and is accessible by removing the Turntable. Two or three drops of oil on the felts in the Motor. One drop of oil on the Pin for the roller of the Tone Arm Lift Lever. A very light application of White Vaseline on the teeth of the Main Cam, also some on the face of this Cam where the Tone Arm Swing Lever rides. A single drop of oil on the 10" and 12" plungers. Care should be exercised to prevent an excess of oil being used on any part.

No further lubrication on the tone arm bearing will be necessary unless a replacement is made. In this case a thin film of vaseline may be used.

Care should be taken to see that no oil gets on the motor pulley, idler pulley or rim of the turntable. No oil should be used on the Friction Trip Assembly.

Use only a good grade of machine oil with a viscosity of SAE 10.

PARTS LIST

Old Part No.	New Part No.	DESCRIPTION
07-26	07026	Front Locking Lever Assembly
07-27	07027	Rear Locking Lever Assembly
07-28	07028	Connecting Link Assembly
07-216	07216	Lever and Brake Spring Assembly
09-122	09122	Automatic Stop Switch and Bracket Ass'y
09-123	09123	Tone Arm Return Lever and Spring Assembly
11-86	11086	Lead and Plug Assembly, Tone Arm
11-180	11180	Feed-in Spring Assembly
13-38	13038	Starting Lever Assembly
13-296	13296	Main Cam Assembly
13-297	13297	Spindle Gear and Bracket Assembly
13-299	13299	Turntable
13-301	13301	Spindle and Gear Assembly
13-303	13303	Tone Arm Lift Lever and Bracket Ass'y
13-305	13305	Center Lever and Rocker Assembly
15-10	15010	Front Gear and Cam Assembly
15-11	15011	Rear Gear and Cam Assembly
15-12	15012	Spindle Support Bracket Assembly
15-76	15076	Front Plunger Shaft Assembly
15-77	15077	Rear Plunger Shaft Assembly
15-78	15078	Trip Roller Assembly
31-51	31051	Decalcomania
31-60	31060	"Reject" Tab
31-142	31142	Stop Switch Escutcheon 1½"
36-112	36112	#10 Flat Washer 1" O. D.
36-114	36114	10-32 x 21/32" H. H. Screw
36-115	36115	10-32 x ½" H. H. Mach. Screw
36-116	36116	10-32 x ¼" H. H. Mach. Screw
36-117	36117	10-32 x 1" H. H. Screw Front Locking Lever
36-118	36118	Turntable Washer
36-119	2012-209	8-32 x ⅜" B. H. M. S.
36-120	2012-207	8-32 x 5/16" B. H. M. S.
36-129	36129	¼" -28 Hex Nut
36-136	36136	#10 Flat Washer ¾" O. D.
36-141	2000-155	6-32 x ¼" R.H.M.S.
36-231	36231	10-32 x ½" H. H. Screw
36-237	36237	#4-32 x 3/18" Oven Head M. S. ST.
36-303	2000-211	8-32 x 7/16" R.H.M.S.
36-454	2000-205	8-32 x ¼" R.H.M.S.
36-465	36465	6-32 x ⅝" R.H.M.S.
36-624	36624	6-32 x ½" Philips B.H.M.S.
36-688	36688	6-32 x 9/16" B.H.M.S.
36-693	36693	Flat Washer ¾" O.D. x 17/64" I.D. x .050 C.R.S.
36-690	36690	#10 Flat Washer ½" O.D. x .042", Steel
36-695	2085-209	#6-32 x ⅜" Phil. Oven Hd., M.S. St.
36-697	36697	#4-6 x 7/16" R.H.M.S. St.
36-769	36769	#4-32 x ½" Phil. F.H.M.S. St.
36-758	36758	Special Slotted Screw Needle Screw, Pkg. 10
362-1	2091-003	Rivet, Brake Spring
364-4	36871	6-32 x ¼" H.H.M.S.
368-1	2016-004	6-32 Hex Nut
368-4	2016-005	8-32 Hex Nut
368-7	2015-007	10-32 Hex Nut
3612-4	2019-004	#6 S. P. Washer
3624-2	36945	#6 Flat Washer
3630-2	2000-169	6-32 x ⅞" R.H.M.S.
44-27	44027	Motor, 60 Cycle
44-28	44028	Motor, 50 Cycle
56-100	56100	Starting Lever End
56-102	56102	Spacer, Spindle, Gear and Bracket
56-103	56103	Tone Arm Swing Lever Spacer
56-104	56104	Connecting Link
56-105	56105	Rivet, Starting Lever
56-106	56106	Connecting Link Rivet
57-108	57108	Record Support Post
56-109	56109	Record Support Shelf and Tube
56-112	56112	Spacer, Front Rocking Lever
56-122	56122	Spacer
56-124	56124	Gear Sector, Front
56-144	56144	Starting Lever Spring
56-154	56154	Main Cam Stud
56-155	56155	Spacer (Tone Arm Swing Lever)
56-158	56158	Spindle Thrust Plate
56-191	56191	Gear Sector, Rear
56-251	56251	Wire Clamp
56-263	56263	Gear Sector Spacer
56-384	56384	Tone Arm Rest Pin
56-385	56385	Tone Arm Brace
56-481	56481	Spring Clip
56-841	56841	Centering Lever
56-844	56844	Plunger Rocker
56-845	56845	10" Record Plunger
56-846	56846	12" Record Plunger
56-848	56848	Rocker Lever Spacer
56-849	56849	Centering Lever Washer
56-850	56850	Centering Lever Guide Stud
56-852	56852	Rocker Connecting Link Rivet
56-853	56853	Centering Lever Return Arm
56-857	56857	Centering Lever Rivet and Guide Pin
56-860	56860	Rocker Connecting Link
56-865	56865	Spacer Sleeve
56-868	56868	Switch Shifting Lever
56-870	56870	Switch Mtg. Brkt.
56-874	56874	Tone Arm Lift Lever, Only
56-875	56875	Switch Trip Finger
56-877	56877	Reject Lever (for use with Die Case Spindle Bracket
56-878	56878	Centering Lever Guide Pin
56-881	56881	Spacer
56-1045	561045	Reject Lever
57-1	57001	See 57122
57-108	57108	See 57121
57-109	57109	Record Support Shelf, Tube Assembly
57-110	57110	Record Shelf Cover, Rear
57-111	57111	Record Shelf Cover, Front
57-112	57112	Main Cam Only
57-121	57121	Record Support Post
57-122	57122	Tone Arm Support Housing
59-48	59048	Reject Knob
59-104	59104	Tone Arm
60-48	60048	Paper Gasket
60-205	60205	Cycle Switch Cover
62-13	62013	Bushing for Crystal Lead
62-68	62068	Crystal Shim
64-13	64013	Spring, Rear Locking Lever
64-16	64016	Spring, Shelf Lock Lever, Front
64-288	64288	Spring, Trip Roller
64-290	64290	Spring, Centering Lever Equalizing
64-291	64291	Switch Trip Lever Spring
64-292	64292	Counter-balance Spring
71-198	71198	Tone Arm and Pick Up Assembly
71-199	71199	Crystal Cart
71-204	71204	White Sapphire Needle

PARTS LIST

Old Part No.	New Part No.	DESCRIPTION
71-206	71206	Pfanstiehl Needle
90-82	90082	Switch
90-84	90084	Switch, Cycle
99-11-6	2015-004	6-32 Hex Nut
99-12-1	2015-005	8-32 Hex Nut
99-13-5	2015-007	10-32 x 3/8" Hex Nut
99-18-1	2000-153	6-32 x 3/16" R.H.M.S. Play Control
99-19-17	2000-207	8-32 x 3/4" Mach. Screw, Rd., Hd., Nickel
99-19-3	2000-209	8-32 x 3/8" R.H.M.S.
99-19-8	2000-221	8-32 x 1" R.H.M.S.
99-20-31	2000-319	10-32 x 7/8" R.H.M.S.
99-26-16	36865	Tone Arm Crank Set Screw
99-26-17	36881	10-32 x 1/2" H.H.M.S.
99-28-30	36696	6-32 x 1/4" Bristol Set Screw
99-33-3	2019-005	#8 S. P. Washer
99-33-4	2019-006	#10 S. P. Washer
99-33-5	2019-007	1/4" S. P. Washer
99-34-11	36876	H. P. Cotter, Main Cam Stud
99-34-12	36882	H. P. Cotter, Starting Lever
99-34-13	36883	H. P. Cotter, Tone Arm Lift Lever
99-36-1	2017-002	Washer Starting Lever
99-36-9	36905	Washer
99-36-12	36874	Flat Washer 17/16" x 3/4"
99-36-20	2018-009	#8 Flat Washer
99-36-21	36830	#8 Flat Washer 1/2" O. D.
99-36-28	36872	Brass Washer
99-36-36	36867	#10 Flat Washer
99-36-38	36868	Brass Washer, Idler Bracket
99-36-45	36875	Washer, Main Cam Stud
99-37-2	36873	Wave Washer
99-42-10	561415	3/16" Ball Bearing
99-42-11	36870	Washer, Turntable Stop
3294	37158	Shoulder Bearing, Clutch Locking Lever
3671	55106	Pulley, 60 Cycle Motor
3672	13441	Idler Pulley
3681	55081	Pulley, 50 Cycle Motor
3996	64379	Spring, Start Lever
4058	55001	Tone Arm Roller
4949	92189	Felt Washer
6069	67388	Reject Knob
34309	34309	Starting Pin
34312	34312	Pivot Pin
34313	34313	Hinge Pin, Tone Arm
34316	34316	Hinge Pin, Tone Arm Lift Lever
39227	39227	Spring Washer
39228	39228	Coil Spring
39229	39229	Spring, Tone Arm Lift Lever
39234	39234	Spring, Tone Arm Swing Lever
39235	39235	Spring Clip
39236	39236	Spring, Reject Lever
39245	39245	Spring Idler Pulley
42165	42165	Spacer Idler Bracket
43182	43182	Tone Arm Lift Rod
43185	43185	Upper Collar
45165	45165	Friction Trip Lever
45176	45176	Tension Spring Holder
46287	46287	Trip Finger
46292	46292	Bracket, Tone Arm Lift
46293	46293	Trip Finger Stop
48216	48216	Insulating Washer Tone Arm
50203	50203	Cork Washer
50204	50204	Cork Washer
50206	50206	Rubber Grommet
50209	50209	Thrust Washer, Drive Disc.
61269	61269	Phono Plug
64215	64215	Trip Lever Release
64216	54216	Idler Bracket and Stud Assembly
64219	64219	Bracket, Tone Arm
66351	66351	Friction Trip Assembly
66355	66355	Lower Collar, Pin and Screw
66366	66366	Tone Arm Crank Assembly
36-128	36128	Mounting Bolts
64-14	64014	Spring Top
64-15	64015	Spring Lower
36-127	36127	Spring Mounting Cup
36-137	36137	Bottom Spring Retainer
5637-1	58021	Shipping Clamp
56-149	56149	Retainer Channel
368-7	2015-007	10 x 32 H.H.M.
3611-4	2019-005	10 S. P. Ext. Lockwasher

MODELS P-77, P-777

The Capehart P-77 Record Changer is a dual speed changer designed to operate at either 33 1/3 r.p.m. or 78 r.p.m. This changer is capable of playing 12-inch, 10-inch, or 7-inch records automatically at either speed. Furthermore, 12- and 10-inch records can be played intermixed

The information herein presented is published in an effort to assist the serviceman in properly preparing the instrument for operation and in effecting any replacement or adjustment which he may be called upon to perform on the long play section of the subject model record changer.

Information or adjustments that are not covered herein are the same as those required for the standard version of this changer (Model P-71), and are already covered in the maintenance manual for the Model P-71 record changer, previously published.

SPECIFICATIONS

Voltage Rating	105 to 125 volts at 60 c.p.s.
Speed	78 r.p.m. and 33 1/3 r.p.m.
Type Pickup	Variable Reluctance
Type Needle	Osmium Point

MICROGROOVE 33 1/3 r.p.m.	MAXIMUM RECORD CAPACITY	STANDARD 78 r.p.m.
10	12-inch records	10
12	10-inch records	12
10	12-inch and 10-inch records intermixed	10
12	7-inch records	12

IMPORTANT

WHEN PUTTING TONE ARMS INTO POSITION ON THEIR MOUNTING - DO NOT PRESS IN ON THE RELEASE BUTTONS. THESE BUTTONS SHOULD ONLY BE COMPRESSED WHEN REMOVING THE TONE ARMS!

IF YOU PRESS THE BUTTONS WHEN TONE ARM IS BEING PRESSED INTO POSITION ON ITS MOUNTING YOU ARE LIKELY TO BEND THE BRONZE LOCKING CATCH!

PREPARING FOR OPERATION

CHECKING

After carefully uncrating the instrument, the following checks should be made before attempting to operate the record changer:

1. Remove all packing material and pieces of tape from the changer compartment.
2. Remove the shipping bolts from the floating mounting panel.
3. See that the changer and mounting panel float freely upon the spring mountings.
4. Check the sliding drawer to see that there is no binding in the roller and that the leads to the changer do not interfere with the action of the drawer.
5. Check both the 78 r.p.m. and 33 1/3 r.p.m. tone arm to see that the needle and pickup has not been damaged.
6. Run changer by hand through cycle to make sure action is free from binding.
7. See that the changer is level. If the changer is not level, use the simple method, described herein, to correct the condition.
8. Check the turntable speed at both 78 r.p.m. and 33 1/3 r.p.m. with a stroboscope record.

LEVELING

1. Remove the four acorn palnuts which hold the changer mounting board to the spring mounts.
2. Lift the changer up from the front. It may or may not be necessary to remove the changer; however, if it is, be sure to remove the electrical connections from the underside before removing the changer.
3. Place a small washer, which can be easily made of soft cardboard (such as a blotter), on the spring mounts on the side which is the lowest. One or more of these washers may be used, depending on the amount the changer was off-level.
4. Set the changer back on the spring mounts, and replace the four acorn palnuts. In this operation, be sure that the wires do not become fouled by either the changer or the slide mechanism.

DESCRIPTION OF SPEED CHANGING ACTION

In order to describe the action of the mechanical motor speed changing action, consider the changer in position for playing standard 78 r.p m. records. The action of changing the speed from 78 r.p.m. to 33 1/3 r.p.m. and placing the correct tone arm on the changer is actually accomplished with one physical movement.

The Long Play Tone Arm is placed on the Tone Arm Support and pressed down until a definite "click" is heard.

In this one operation, the following action takes place:

1. The Tone Arm being pressed down on the Tone Arm Support causes inter-connection of the contacts from the pickup and the phono-output jack, thus the pickup is connected electrically.
2. The Tone Arm, in addition, when pressed down contacts one of the two switching rods. In this case (switching from 78 r.p.m. to 33 1/3 r.p.m.), it will contact the rod closest to the control button. One of these two rods, depending on which speed the changer is operating at, will at all times be protruding through the top of the main frame, near the tone arm support bracket. The rod is pressed down, by the force exerted by the tone arm being pressed, thus actuating a mechanical switch on the underside of the changer. The action of the rods at one end transmit the rotary motion by means of a drive shaft to a switch arm which is connected to the other end of the drive shaft. This switch arm (or lever) in turn acts to raise or lower the idler pulley (in this case, raise) so that it contacts the proper section of the motor drive shaft for the desired turntable speed.

For additional data: See Farnsworth Model P71, Pages RCD.CH. 19-1 through RCD.CH. 19-10

PARTS IDENTIFICATION

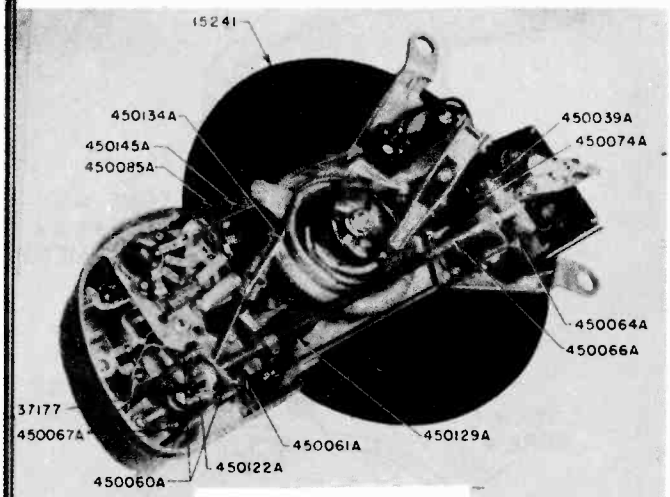


FIGURE 1

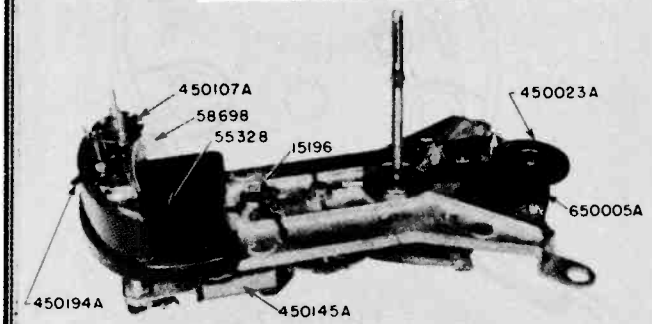


FIGURE 2

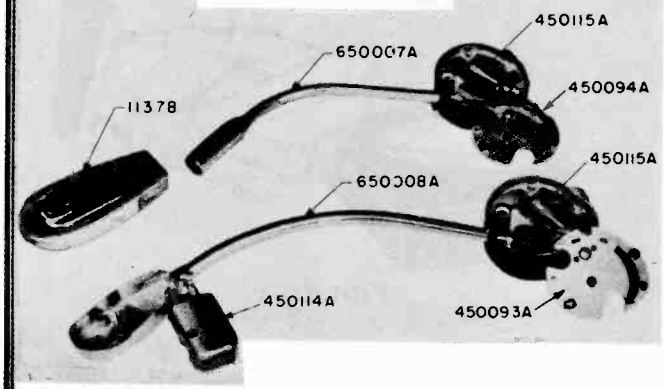


FIGURE 3

ADJUSTMENTS

TONE ARM SET DOWN

When it is necessary to adjust the Tone Arm Set Down so that after the changing cycle is completed, the tone arm will set down properly in the lead-in grooves of the record, the adjustment should be made first for the 7-inch position and at 33 1/3 r.p.m. speed. The procedure to be followed is outlined below:

1. Place the 33 1/3 r.p.m. tone arm in place on the tone arm support.

2. Set the 7-inch Set Down Lever in position against the Tone Arm Interceptor Lever.

3. Make sure that the changer is in the playing position.

4. Loosen the set screw on the Tone Arm Crank (located on the underside of the changer).

It should be stated here that .006 inch spacing is required between the Crank and the main frame (in other words, .006 inch "play" is needed in the tone arm support bracket). It has been found that a small shim, as shown in the sketch following, placed between the crank and the frame will assist in holding this tolerance while the set down adjustment is being made.

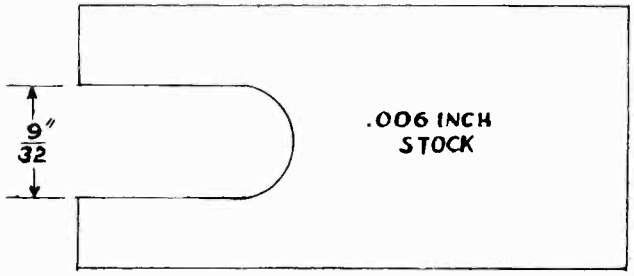


FIGURE 4

5. If the tone arm sets in too far on the record, rotate the tone arm outward slightly while holding the Tone Arm Crank. If the tone arm does not set in far enough, rotate the tone arm inward slightly.

6. Tighten the Tone Arm Crank set screw.

7. Check the set down for a 7-inch record. If the adjustment is not correct, repeat steps 4 and 5.

8. Set the 7-inch Set Down Lever to the 10- and 12-inch record position.

9. Check the tone arm set down for 10-inch and 12-inch records at 33 1/3 r.p.m.

10. If the set down is not correct, adjust by means of the Tone Arm Adjusting Stud (located on the changer base). This adjustment will have no effect on the 7-inch adjustment already made.

11. Set the 78 r.p.m. Tone Arm in place on the Tone Arm Support.

12. Check the set down on 10- and 12-inch records. If the adjustment is not correct, the 78 r.p.m. tone arm may have become slightly bent in handling, and it will be necessary to rebend the arm slightly to provide the proper set down.

THE PUSH RODS

The Push Rods, as shown in Figure 5, should be adjusted between two limits. When the rod is in the "up" position, it should not extend any higher than one-half the thickness of the support bracket plate. This is to insure that the rod does not bind on the Tone Arm Housing. The other limit is that the rod be high enough that when the tone arm housing is pressed down, the switching action will be completed.

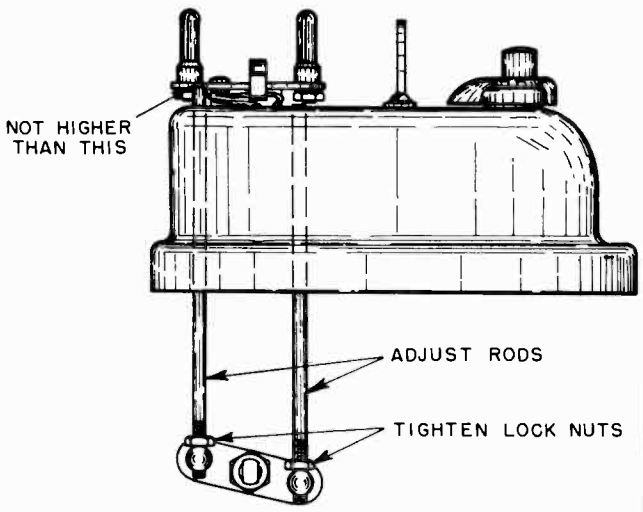


FIGURE 5

MODELS P-77, P-777

The rods are adjusted at the factory, and the lock nuts are tightened and secured with Glyptal. If it is necessary to readjust these rods, be sure to tighten the lock nuts and coat them with Glyptal or some similar securing agent.

NEEDLE PRESSURE

This adjustment is accurately made at the factory; therefore, it should not be necessary to readjust the needle pressure under normal operating conditions.

If, for some reason the factory adjustment no longer holds true, the following procedure should be used in readjusting.

The procedure for adjusting the 78 r.p.m. tone arm is the same as for the 33 1/3 r.p.m. tone arm, with exception of the pressure specifications.

There are two adjustments to be made in setting the tone arm for correct needle pressure. These are: The Tone Arm Spring Adjustment (located on the outer side of the tone arm housing), which is adjustable with a small screw driver, and the Tone Arm Sideplay Adjustment (located directly opposite the spring adjustment), which requires a No. 8 Allen Wrench for adjustment. Both adjustments utilize a No. 6 Allen Head Locking Screw to maintain adjustment. The locking screws are located on the underside of the tone arm housing. *See Figure 7.*

Detailed Procedure:

1. Loosen the locking screws on both adjustments.
2. Loosen slightly the Tone Arm Sideplay Adjustment.
3. With a Gram Scale (if adjustment is being made for the 33 1/3 r.p.m. tone arm), test the up and down pressure of the tone arm. *See Figures 8 and 9.* This should be within the limits of 5 to 7 grams. If it is not, adjust the Tone Arm Spring Adjustment screw to provide the correct pressure.

Note: With the 78 r.p.m. Tone Arm, the up and down pressure should be 1⅛ ounce ± ⅛ ounce.

4. Tighten the locking screw for the spring adjustment.
5. Adjust the Tone Arm Sideplay screw to provide approximately 1/32" horizontal play, measured at the pickup.

CAUTION: Do not tighten this screw beyond this limit, as added friction will be exerted which will effect the needle pressure.

6. Tighten the locking screw for the sideplay adjustment.

Lift the micro-groove 33 1/3 r.p.m. tone arm, as shown in Figure 8, approximately ½ inch and make a note of the gram scale reading. Then lower the tone arm approximately ½ inch and again note the reading of the scale, as in Figure 9. The two readings noted are the limits of needle pressure. The actual needle pressure is taken as the average of these two readings. The difference between the two readings is referred to as the Vertical Friction. This should not be more than 2 grams.

WOW AND RUMBLE

The condition known as "wow" is in actuality the result of a variation in speed within each revolution of the turntable. The most common cause of wow in rim drive motors is found to be in the idler drive wheel, either in the bearing or the rubber drive tire. Proper lubrication and elimination of "gumming" will eliminate the bearing as a source of trouble. Some faults of the drive tire which may cause wow are listed as follows:

Oil or grease on the tire—clean with a cloth saturated in carbon tetrachloride.

Dent formed or worn in the tire. This can be caused by pressure of the motor pulley if the changer has remained idle for a long period of time or by the motor pulley if the turntable should become stalled. The remedy in this case is replacement of the idler drive wheel.

Another possible source of wow is in the bearing support washer and its relationship with the turntable hub. This washer is held in place by two screws, the same two screws that are used to fasten the Turntable Hold Down Levers. The washer must be concentric with the turntable hub, otherwise, friction may result. Concentricity of the washer and turntable hub is accurately set at the factory; however, it is possible that the washer will become misaligned when the turntable is removed for servicing purposes. Therefore, it is recommended (to eliminate this source of "wow") when removing or replacing the turntable to loosen only one of the hold down lever screws at a time. In this way the support

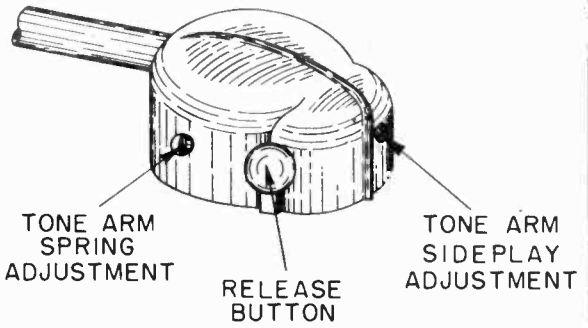


FIGURE 6

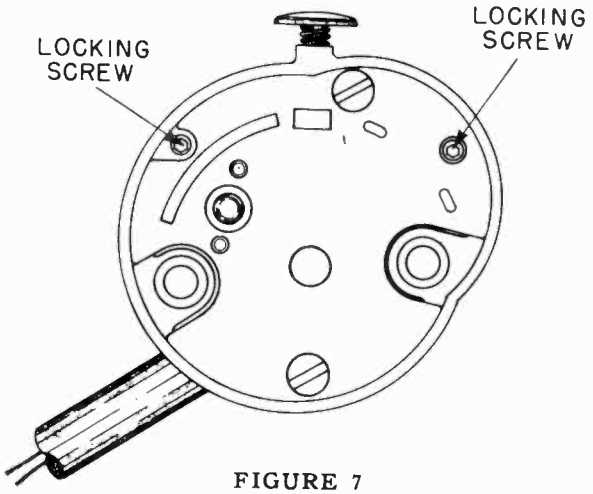


FIGURE 7

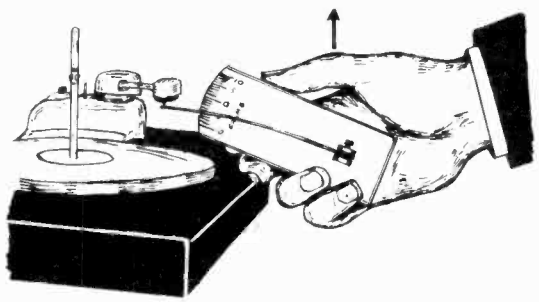


FIGURE 8

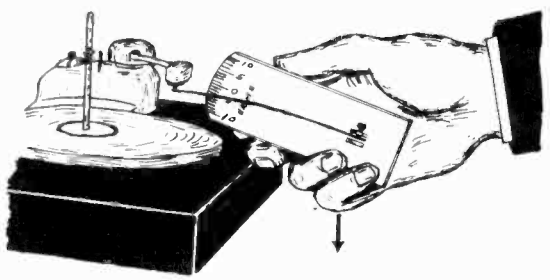


FIGURE 9

washer will be at all times held fast by at least one screw. Also it is recommended that care be exercised when replacing the turntable so as not to damage the cork washer and to check the turntable hold down levers to make certain they are not binding on the turntable hub. Both of these points are possible sources of "wow".

"Wow" can also be caused by a warped or dented turntable or by a bent turntable spindle. Care in removing and handling the turntable will tend to eliminate these sources.

"Wow" may also emanate from sources other than the changer itself, for example, the records. Badly warped records will cause a noticeable "wow".

Rumble is a form of amplified noise vibrations resulting from insufficient cushioning of the rotating parts. This results from the fact that a motor will transmit vibration to surroundng objects unless it is adequately "floated". Even then a certain amount of vibration is transmitted to the changer, and it becomes necessary to spring mount the entire changer mounting board. It can be readily seen that when something destroys this cushioning, such as in the condition where the changer drawer is not pushed all the way in and the compartment door touches the drawer pull, or if the power or phono cables to the changer become fouled and are drawn taut, the vibrations will be amplified by the entire cabinet acting as a sounding board.

HORIZONTAL FRICTION

Hold the gram scale in the right hand with the scale divisions facing up.

Press the control button to put the changer in the playing position. As soon as the Tone Arm is set down, turn the instrument off with the On-Off Control on the receiver. This turns the changer off and leaves it in the playing position.

Place a small piece of folded cardboard between the tone arm tube and the tone arm housing to hold the pickup above the turntable.

With the scale pointer bearing against the pickup housing, move the tone arm in toward the spindle (by moving the gram scale) and note the reading of the gram scale in so doing. This reading should not be more than 2 grams.

If the reading is more than 2 grams, it will usually be found that the .006 inch spacing (mentioned in step 4 of Tone Arm Set Down Adjustment) of the tone arm support bracket has not been maintained.

REPLACEMENT OF PICKUP UNITS

The Standard 78 r.p.m. Tone Arm

The *entire pickup housing* on the 78 r.p.m. tone arm is easily removable as the housing plugs into a fixture in the end of the tone arm tube. This facilitates removal and replacement since there are no screws to be removed and solder connections to be made. If it is desired to replace just the pickup cartridge, this can be done by first removing the small spring clip which holds the cartridge in its housing. Next, unsolder the pickup leads from the plug pins in the end of pickup housing. When the new pickup cartridge is placed in the housing, its leads must be soldered to the same plug pins as were those of the old cartridge.

The Micro-Groove 33 1/3 r.p.m. Tone Arm

The pickup housing on this tone arm is not removable. Replacement of the pickup cartridge in the 33 1/3 r.p.m. tone arm is accomplished by removing the two small screws from the underside of the pickup. NO UNSOLDERING is necessary since slip-on connectors are used for connecting the leads to the terminals on the pickup cartridge.

REPLACEMENT OF THE MICROGROOVE NEEDLE

The needle in this 33 1/3 r.p.m. pickup is replaceable. In order to replace the needle, the unit is first removed as described above. An ejecting tool is needed. This can be a straightened paper clip or similar object. Holding the pickup unit in the left hand, with the needle facing down, insert the ejecting tool in the hole in the brass eyelet in the center of the unit, and gently push the needle out. To insert a new needle, place the base pin of the needle in the center hole of the pickup and press down at the *base* of the needle. *Do not* press down on the stylus itself or its shaft. The needle aligns itself properly when pressed down.

CIRCUIT MODIFICATIONS

CAPEHART P-4 INSTRUMENTS

A circuit change is to be incorporated in instruments using the P-4 chassis, when used with the P-77 Long Play Record Changer. The change increases the frequency range of these instruments, and provides increased gain in the Pre-Amplifier. The change follows:

The .01 mfd. condenser (Ref. No. 41), which is connected in series with a 68K resistor from ground to the junction of the 220K and 100K resistors (Ref. Nos. 12 and 5 respectively), in the plate circuit of the 2nd pre-amp stage, has been changed to a .005 mfd., 600V condenser.

CAPEHART P-7 INSTRUMENTS

The Pre-Amplifier Circuit used with P-7 instruments when incorporating the P-77 Long Play Record Changer will be modified in production to provide increased frequency range and audio gain. The change follows:

On the Pre-Amplifier Equalizer Can, the two .01 mfd. condensers (one connected in series with a 33K resistor from the grid of the 2nd pre-amp stage to ground, and the other connected in series with a 68K resistor from the phono output cable to ground), have been changed to .005 mfd., 200V condensers.

PARTS LIST

(Parts not listed here are same as those used in P-71)

Part No.	Description
650005A	Dual Speed Motor and Mtg. Brkt. Assy.
450023A	Idler Assembly
450074A	Idler Block Assy. (Inc. in 450023A)
450142A	Record Lift Brkt. Assy.
450134A	Tone Arm Lift Lever, Brkt. & Pin Assy.
450129A	Tone Arm Swing Lever Assy.
450132A	Tone Arm Lever & Pin Assy.
450107A	Tone Arm Support
650007A	Tone Arm Assy. (78 r.p.m.) less pickup
650008A	Tone Arm Assy. (33 1/3 r.p.m.) less pickup
450114A	Pickup and Lead Assy. (33 1/3 r p.m.)
11378	Pickup & Housing Assy. (78 r.p.m.)
450094A	Tone Arm Housing Cover Plate (78 r.p.m.)
450093A	Tone Arm Housing Cover Plate (33 1/3 r.p.m.)
450122A	Tone Arm Crank & Pin Assy.
450066A	Speed Change Shaft & Lever
450145A	Cycle Completing Switch Housing & Lead Assy.
450085A	Switch Cover & Bearing
450064A	Speed Change Detent Spring
450039A	Connecting Link
450061A	Speed Change Shaft Yoke
450067A	Speed Change Push Rod
450060A	Push Rod Pin
37177	Hex Nut
450115A	Tone Arm Pressure Adjusting Spring
450194A	7" Tone Arm Set Down Lever
15241	Turntable
55328	Tone Arm Adjusting Stud
58698	Tone Arm Interceptor Lever
15169	Automatic Stop Switch Assy.
450275A-1	Replacement Needle for Microgroove Pickup

MODEL P-777

The Capehart Model P-777 Automatic Record Changer is a three-speed changer, designed to play, automatically, all types of records currently being made. 12-inch, 10-inch or 7-inch records can be played at 78 r.p.m., 45 r.p.m. or 33-1/3 r.p.m. In addition, 12-inch and 10-inch records, designed for the same speed, can be played intermixed.

The information presented herein is intended to supplement the Maintenance Information already issued covering the Model P-77 two-speed record changer. The combination of the two then presents up-to-date preliminary service information on the P-777 record changer. The P-777 is similar to the P-77 in all respects except two; these are the motor assembly and tone arm swing lever assembly. Later production of the P-77 included the revisions to the swing lever assembly; therefore, these changers will differ from the P-777 only in the motor assembly.

A complete parts and price list for the P-777 Record Changer is included herewith.

TONE ARM SET DOWN ADJUSTMENT

(This information applies to P-777 and late production P-77 Changers.)

When it becomes necessary to adjust the Tone Arm Set Down so that, after the changing cycle has been completed, the tone arm will set down properly in the lead-in grooves of the record, the following procedure should be used.

7-INCH RECORDS:

1. Place the Microgroove Tone Arm in position on the tone arm support.
2. Set the 7-inch record Set-Down Lever in position against the Tone Arm Interceptor Lever.
3. Place a 7-inch record (either 33-1/3 r.p.m. or 45 r.p.m.) on the spindle shelf and press the reject button.
4. Observe whether or not the needle lands in the starting groove of the record.
5. If the needle does not land properly, make adjustment to the eccentric stop nut located on the tone arm swing lever spring bracket. This adjustment is accessible from the underside of the changer.
   a. Loosen the small lock nut which secures the eccentric stop.
   b. If the needle lands too far in on the record, rotate the eccentric stop so as to move the swing lever toward the axis of the eccentric stop.
   c. If the needle lands off the edge of the record, rotate the eccentric stop so as to move the swing lever away from the axis of the eccentric stop.
   d. Tighten the lock-nut and secure with Glyptol or a similar fixative.
6. Check the adjustment by observing the set down with a full stack of records.

10-INCH AND 12-INCH RECORDS:

1. Check the needle landing for 10-inch records with both tone arms.
2. If needle landing is not correct, adjust by means of the Tone Arm Adjusting Stud (located on the changer base). This adjustment has no affect on the 7-inch record adjustment already made.
3. Check the needle landing for 12-inch records with both tone arms. This, normally, will not require re-adjustment, if the 10-inch adjustment has been properly made.
4. Check the adjustment by observing the set down with a full stack of intermixed 10 and 12-inch records.

POSSIBLE SERVICE PROBLEMS

TONE ARM SET DOWN

1. If the Microgroove Tone Arm cannot be adjusted for proper set down on a 7-inch record, there are two possible causes, as follows:

   a. The tone arm crank has slipped on the tone arm support bracket tube. To be certain of this possibility, place the standard tone arm on the support bracket and observe the needle landing. If the standard tone arm also cannot be adjusted for proper set down, then adjustment should be made by loosening the set screw on the Tone Arm Crank. There is a .006-inch spacing required between the tone arm crank and the main frame; therefore, a .006-inch shim should be used to maintain this spacing while adjustment is being made. After loosening the set screw, hold the crank firmly with one hand and with the other rotate the tone arm in the direction necessary for proper set down. Tighten the set screw on the tone arm crank. A finer adjustment can now be made by the procedure given in Step 5 under "7-inch Records."

   b. The second possible cause is that the Microgroove Tone Arm has become misshapened. This possibility can either be eliminated or proven as in Step 2 by observing the needle landing of the standard tone arm. If the standard tone arm does set down properly and the Microgroove does not, then it is proven that the tone arm crank is in its proper position. Therefore, the Microgroove Tone Arm is not shaped correctly. The remedy is to reshape the Microgroove tone arm by bending the tube slightly until it does set down properly.

2. If the Microgroove Tone Arm can be adjusted properly for 7-inch records, no difficulty will be experienced in adjusting this tone arm for 10-inch and 12-inch records. However, if the standard tone arm cannot be made to set down properly (while the Microgroove arm does set down properly) it can be assumed that the standard tone arm has become misshapened. The remedy in this case is to reshape the standard tone arm to provide proper set down.

BENT TONE ARMS

The possibility of P-777 tone arms (particularly the Microgroove arm) becoming bent in shipment (resulting in improper set down when the instruments are unpacked and checked) is quite unlikely, for the tone arms are carefully packed in a separate carton.

It is possible that there is some slight variation in the relative shapes of the tone arms. It is important that the persons who unpack and check the instruments do not intermix the tone arms from various instruments at the time of unpacking. To have the changer operate with the least amount of prior adjustment, the tone arms which are packed with each particular instrument should be used with that instrument only. The record changer in each instrument is adjusted (at the factory) using the tone arms that are shipped with it.

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BROKEN TONE ARM LOCK SPRINGS

The main cause of breakage of this lock-on spring results from improper methods of placing and removing the tone arms. The small release button on the tone arm housing is to be used only when removing the tone arm. If this button is depressed when placing the tone arm on the support bracket, the shaft of the button will exert pressure on the top of the lock-on spring, thus bending it as the tone arm is pressed down. It is probable then that when the tone arm is placed on the support again, the spring will not line-up with the hole in the cover plate; therefore, the spring is bent down and broken. Damage to the spring can also result from removal of the tone arm without pressing the release button.

IMPORTANT! Do not press the release button when placing the tone arm on the changer. Do press the release button when removing the tone arm.

MISALIGNED MOTOR BEARINGS

It is possible that the floating bearings in the motor may become misaligned in shipment, resulting in motor noise. This is possible if the changer or instrument is subjected to excessively rough handling in shipment. The bearings can be easily re-aligned by tapping the motor (with the handle of a screwdriver or light tack hammer) while the motor is running.

P-777 PARTS

Ref. No.	Part No.	Description
1	07651	Record Lift Lever Assembly.
2	09353	Reject Button and Plunger Assembly.
3	11378	Pickup & Housing Assembly (78 r.p.m.)
4	11495	Inner Spindle Assembly.
5	13672	Main Cam Assembly
6	13674	Upper Spindle Assembly.
8	13816	Ball Bearing Retainer (for turntable)
9	13825	Tone Switch & Brkt. Assembly (Complete)
10	15195	Compression Lever Assembly.
11	15196	Automatic Stop Switch Assembly.
12	25112	Capacitor, .01 mfd., 200 volt
13	25182	Capacitor, .1 mfd., 200 volt.
14	36857	Hex Nut 1/4-28 (for cam mtg.)
15	36882	H. P. Cotter (1/8" shaft)
16	37155	Spade Bolt (for tone arm lift lever spring)
17	37177-2	Hex Nut 5-40 (for speed change shaft)
18	37203	Spring Washer
19	37332	Special Flat Washer #6 (mtg. reject lever assy.)
20	37333	"E" Washer (for tone arm adj. stud)
21	37334	Hex Head Screw #10-32x7/8" (to mount outer spindle)
22	37335	Flat Washer #4 (for mtg. levers on main cam).
23	37338	Shim Washer (to mount main cam)
24	37339	Flat Washer (to mount main cam)
25	37344	Special Hex Head Nut #3-48 (Spindle height adj.)
26	37390	"E" Washer (small, for upper spindle)
27	37511	Hex Head Screw #10-32x5/8" (on tone arm lift lever)
28	37512	"E" Washer (large, for inner spindle)
29	37683	Set Screw (used in tone arm assy.)

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30	37688	"E" Washer (used in 450039A Assy.). . . . .
31	54307	Motor Plug Insulator. . . . .
32	55193	Ball Bearing 1/8" Dia. (tone arm sup. bear. 10 used)
33	55249	Brass Collar (for speed change shaft) . . . . .
34	55328	Tone Arm Set Down Adjustment Stud . . . . .
35	55329	Hinge Pin (for tone arm interceptor lever) . . . .
38	55332	Hinge Pin (for compression lever) . . . . .
39	55333	Hinge Pin (for record lift lever) . . . . .
40	55335	Cam Spacer (inside Main Cam Hub). . . . .
41	55336	Cam Bolt (for mounting Main Cam). . . . .
42	55345	Sleeve Support Washer (for record spindle). . . . .
43	55395	Hinge Pin (for manual reject link). . . . .
44	55397	Trip Adjusting Screw. . . . .
45	55420	Manual Reject Plunger Rod . . . . .
46	55446	Outer Spindle . . . . .
47	57248	Main Cam Switch (on Main Cam) . . . . .
48	57262	Surfa-Sonic Control Knob. . . . .
49	58692	Interceptor Reset Lever . . . . .
50	58693	Switch & Reject Lever . . . . .
51	58697	Tone Arm Adjustment Lever . . . . .
52	58698	Tone Arm Interceptor Lever. . . . .
53	58701	Turntable Holddown Brkt. (2 used) . . . . .
54	58702	Bearing Support Washer (turntable bearing). . . . .
55	58706	Starting Lever (on Main Cam). . . . .
56	58707	Reject Lever (on Main Cam). . . . .
57	58708	Tone Arm Holdout Lever (on Main Cam). . . . .
58	58709	Holdout Locking Lever (on Main Cam) . . . . .
59	58716	Bearing Race Washer (for turntable). . . . .
60	58789	Compression Spring (spindle height adj.). . . . .
61	58852	Manual Reject Link. . . . .
62	58853	Starting Lever Reset Lever. . . . .
63	58854	Trip Adjustment Spring (on Starting Lever). . . . .
64	58863	Pickup Retainer Spring (78 r.p.m.). . . . .
65	59472	Pickup Housing (78 r.p.m.). . . . .
66	59486	Reject Button . . . . .
67	60597	Cork Bearing Damper (for turntable) . . . . .
68	62152	Rubber Sleeve (for record spindle). . . . .
69	62173	Rubber Motor Mtg. Grommet . . . . .
70	64324	Spring (on compression lever) . . . . .
71	64429	Reset Spring (for interceptor reset lever). . . . .
72	64430	Reject Spring (for switch & reject lever) . . . . .
73	64431	Tone Arm Lift Lever Spring. . . . .
74	64433	Tone Arm Adj. Stud Spring . . . . .
75	64434	Tone Arm Interceptor Lever Spring . . . . .
76	64452	Cam Switch Spring (on Main Cam) . . . . .
77	64464	Switch Release Spring (on switch & reject lever). .
78	64465	Tone Switch Coupling Link . . . . .
79	64466	Tone Arm Holdout Lever Spring (on Main Cam) . . . .
80	64467	Trip Spring (on reject lever on main cam) . . . . .
81	64474	Reject Button Spring. . . . .
82	71238	Magnetic Pickup (78 r.p.m. less housing). . . . .
83	71244	Magnetic Pickup (Microgroove) . . . . .
84	77184	Resistor 2.2K 1/2 watt. . . . .
85	77246	Resistor 15K 1/2 watt . . . . .
86	80030	Phono Output Jack . . . . .
87	80150	Motor Plug (4-prong, male). . . . .
88	80327	Pickup Socket (78 r.p.m., 2-prong molded) . . . . .

MODELS P-777

89	90243	Surfa-Sonic Control Switch.
90	2006-011	Fil. H.M.S. #2-56x7/16" (to mount cam switch)
91	2015-001	Std. Hex Nut #2-56 (to mount cam switch).
92	2015-002	Std. Hex Nut #3-48 (lock nut spindle height adj.)
93	2019-009	Lockwasher Shakeproof
94	2041-012	Allen Set Screw (for tone arm sideplay adj.).
95	2216A-105	Phillips T.H.M.S. #4-40x1/4" (to mt. 7" setdown lever)
96	450004A	Shaft Pin
97	450009A	Idler Arm Assembly.
98	450013A	Idler Wheel Assembly.
99	450020A	Idler Arm Spring.
100	450023A	Idler Assembly (including #450009A & #450013A).
101	450024A	Motor Mtg. Spacer Nut
102	450058A	Speed Change Shaft Mtg. Brkt.
103	450060A	Push Rod Pin.
104	450061A	Speed Change Shaft Yoke
105	450062A	Speed Change Shaft Mtg. Brkt.
106	450063A	Spacer Plate (for mtg. brkt. #450062A).
107	450064A	Speed Change Detent Spring.
108	450065A	Backup Plate (for detent spring).
109	450066A	Speed Change Shaft Lever.
110	450067A	Speed Change Push Rod
111	450074A	Idler Block Assembly.
112	450076A	Connecting Link Assembly.
113	450089A	Hinge Pin Pivot (for needle pressure adj.).
114	450093A	Cover Plate (for microgroove tone arm).
115	450094A	Cover Plate (for standard tone arm)
117	450098A	Tone Arm Release Button
118	450107B	Tone Arm Support Assembly
119	450112A	Tone Crank & Pin Assembly
120	450114A	Pickup & Lead Assembly (microgroove).
121	450115B	Tone Arm Pressure Adjusting Spring.
122	450117A	Guide Pin (on tone arm support)
123	450118A	Tone Arm Release Button Spring.
124	450121A	Swing Lever Mtg. Stud
125	450123A	Tone Arm Support Bearing Washer
126	450124B	Tone Arm Lift Rod
127	450127A	Washer.
128	450128B	Tone Arm Swing Lever.
129	450132B	Tone Arm Lever & Pin Assembly
130	450134A	Tone Arm Lift Lever Brkt. & Pin Assembly.
131	450142A	Record Lift Brkt. Assembly.
132	450145B	Cycle Completing Switch Assembly.
133	450193A	Spacer (for 7" Setdown Lever)
134	450194A	7" Set Down Lever
135	450220A	Compression Ring.
136	450241A-G1	Tone Arm Brake Assy. (on tone arm lift lever)
137	450254A	Eccentric Stop (on #450256A).
138	450255A	Spring (used with #450256A)
139	450256A	Spring Brkt. Assy. (used with #450128B)
140	450259A	Retaining Ring (used on tone arm release button).
141	450275A-1	Replacement Needle for Microgroove Pickup
142	450298A	Pulley Drive Belt
143	650007A	Tone Arm Assy. (78 r.p.m. less pickup).
144	650008A	Tone Arm Assy. (Microgroove less pickup).
145	650074A	Turntable Assembly.
146	650075A	Motor Assembly.

PRELIMINARY MAINTENANCE INFORMATION

This information is published for the purpose of aiding the serviceman in properly setting the instrument up for operation and in effecting replacements or adjustments which he may be called upon to perform on those sections of the changer which have to do with its dual speed feature. Information or adjustments which are not covered herein are the same as those required for the standard version of this changer, and are already covered in the maintenance manual for the Capehart Model 41-E Record Changer, previously published.

SPECIFICATIONS

Power Consumption at 117 volts	
Turntable Motor	22 Watts
Cycling Motor	91 Watts
Voltage Rating	105 to 125 volts at 60 cycles
Turntable Speed	78 r.p.m. & 33 1/3 r.p.m.
Type Pickup	Variable Reluctance
Type Needle	Osmium Point

MAXIMUM RECORD CAPACITY

Microgroove 33 1/3 r.p.m.		Standard 78 r.p.m.
16	10 inch or 12 inch records	16
16	10 inch or 12 inch records (intermixed)	16
manual	7 inch records	manual

SETTING UP FOR OERATION

After carefully uncrating the instrument, the following checks should be made on the record changer prior to its operation:

1. Remove all packing material and pieces of tape from the changer compartment.
2. Remove the shipping bolts which hold the changer base-plate down during shipment.
3. See that the changer floats freely upon the spring mountings.
4. Check both the 78 r.p.m. and 33 1/3 r.p.m. tone arms to see that the needle and pickup have not been damaged.
5. Check the turntable speed at both 78 r.p.m. and 33 1/3 r.p.m. with a stroboscope record.
6. Refer to the section "41-E2 & 41E Check List".

ADJUSTMENTS

TONE ARM SET DOWN ADJUSTMENT

Check the tone arm height. The pickup needle should barely clear the turntable cover when there is no record on the turntable. The height of the tone arm can be adjusted by means of a small screw, located on the underside of the tone arm housing. The setting of this screw should be secured with Glyptal after the adjustment is made. The adjustment is the same for both the standard and microgroove tone arms and the check should be made with both arms.

For additional data: See Farnsworth Model 41-E, Pages RCD.CH. 18-25 through RCD.CH. 18-46

MODEL 41-E2

10-INCH SET DOWN ADJUSTMENT

Allow the changer to deliver a 10" record to the turntable, and let the tone arm move over the record. Just as the changer completes its cycle and the tone arm sets down on the record, stop the changer by turning the "Off-On" switch on the changer to the "Off" position. Lift the pickup end of the tone arm up and move the tone arm away from the spindle; a definite "stop point" will be noticed in so doing. Beyond this "stop point", a spring tension will tend to return the tone arm to the set down position. Hold the tone arm against this "stop point", and turn the 10-inch indexing screw in the direction indicated depending on the direction of the set down adjustment needed. The changer should be allowed to complete at least one more cycle with a 10-inch record to check the adjustment. The adjustment should be checked with both standard and microgroove records using the correct tone arm for each.

12-INCH SET DOWN ADJUSTMENT

The adjustment procedure is the same as that described for the 10-inch adjustment with the exception that a 12-inch record is used, and the 12-inch indexing screw is rotated for adjustment. The adjustment should be checked as before with both standard and microgroove records and tone arms.

ADJUSTMENTS OF THE SPEED SELECTOR PINS

The selector pins or rods, should be adjusted so that there is always at least .015 inch clearance between the top of the pin, when it is in the up position, and the underside of the tone arm housing. This is to ensure that the pin does not bind on the Tone Arm Housing as it moves while playing a record. If both pins are too high when in the up position, the pins can be lowered by placing the paper spacer (Part No. 60674), between the speed switch mounting bracket and the bearing casting. If only one of the pins is too high, this means that the cam shaft has slipped in the cam. The shaft is held in place by two allen head set screws. To adjust, the screws should be loosened and the shaft rotated until the selector pin is at the right height. If the motor speed is set for 78 r.p.m., the selector pin on the right should be in the up position. Tighten the set screws,and switch to the other speed. Check the clearance between the tone arm housing and the other selector pin.

NEEDLE PRESSURE ADJUSTMENT

The needle pressure of both the standard and microgroove tone arms is accurately set at the factory prior to shipment of the instrument; however, if it should become necessary to readjust this setting on either of the two tone arms, the following procedure is offered.

Procedure for adjustment of the standard tone arm is the same as that for the microgroove tone arm, with exception of the pressure specifications.

The adjustment screw is located on the underside of the tone arm housing and is accessible from the rear of the tone arm housing when the tone arm is in place on the changer. A small screw driver is used for adjusting this screw which is arranged so that rotation in a clockwise direction will increase needle pressure and rotation in a counter-clockwise direction will decrease it.

NEEDLE PRESSURE ADJUSTMENT - (cont.)

1. Check the tone arm side play. The tone arm should have approx. 1/32" horizontal play, measured at the pickup. If the amount of play does not correspond with this figure, adjustment can be effected by means of the two Allen Head set screws, which form the pivot point for the tone arm tube. The screws are secured with locking nuts, which should be tightened after the side play adjustment is made. This adjustment should be checked for both tone arms.
2. Using a Gram Scale for the Microgroove tone arm, and an Ounce Scale for the standard tone arm, check the up and down pressure of the tone arm in the following manner:
   Lift the tone arm up with the scale approx. 1/2 inch and make a note of the reading. Then lower the tone arm approx. 1/2 inch, and again note the scale readings. The two readings noted are the limits of the needle pressure. The actual needle pressure is taken as the average of these two readings. In the case of the microgroove tone arm, the actual needle pressure should be within the limits of 5 to 7 grams. For the standard tone arm, the specifications are 1 1/8 oz. ± 1/8 oz.
3. If the needle pressure does not come within the specified limits, adjustment should be made on the needle pressure adjusting screws and the pressure re-checked as described in Step 2.

ADJUSTMENT OF THE CONNECTING ROD

The connecting rod should be adjusted so that positive switching is achieved at the Idler Block Assembly. There should be a small amount of play in the rod action. The rod can be shortened or elongated in the following manner:

1. Remove the hair pin cotter which fastens the motor end of the connecting rod to the switching link at the idler block.
2. Loosen the locking nut on the motor end.
3. Rotate the motor end of the connecting rod in or out, depending on whether the rod needs to be shortened or lengthened.
4. Replace the hair pin cotter, and tighten the locking nut.

MODIFICATIONS INCORPORATED IN THE 41-E2 RECORD CHANGER

Certain changes have been made to various parts of this changer, along with the added features of two speed operation. These modifications, listed herein, were incorporated to provide more accurate adjustment to accommodate microgroove records.

TRIP SLIDE ASSEMBLY (PART NO. 09387)

The trip slide assembly has been revised (previous part no. 09176), to provide a more convenient method of trip friction adjustment and to provide a means of adjusting the height of the assembly with respect to the baseplate. A new trip lever bushing is incorporated with a bearing adjusting screw and locking nut. To raise or lower the trip slide assembly, the nut is first loosened and the screw is rotated to provide the correct height. The nut is then tightened to secure the bearing adjustment.

MODEL 41-E2

TRIP SLIDE ASSEMBLY (PART NO. 09387) Cont.

Adjustment of the trip friction is provided by rotating the small adjusting screw (Part No. 36278), located in the center of the flat metal trip friction spring (Part No. 51166). Rotating the adjusting screw in a clockwise direction will cause the spring to exert more pressure on the trip pivot pin (Part No. 55465), thus increasing the friction between the trip slide assembly and the automatic stop trip lever.

TURNTABLE HEIGHT ADJUSTMENT

The 41E-2 incorporates an adjustable turntable bearing which enables the height of the turntable to be varied with respect to the baseplate. The new parts added to the changer for this purpose are:

55462 - TURNTABLE ADJUSTING PLATE
37690 - ADJUSTING SCREW
37691 - ADJUSTING NUT

To raise the turntable, the adjusting screw is rotated clockwise, after first loosening the adjusting or locking nut. To lower the turntable, the screw is rotated in the reverse direction. The correct height for the turntable is the same height(± 1/64"), as the milled surface on which is mounted the tone arm support housing.

MAIN CAM SHAFT (PART NO. 650013A)

The main cam shaft has been made in two sections, and a coupling has been provided between the reduction gear box section and the main cam section. The main cam section of the shaft can thus be de-coupled from the motor and reduction gears. The main cam shaft section is fastened in the coupling by means of a small set screw. The set screw should always be tightened on the flat side of the main cam shaft only. This prevents the shaft from slipping within the coupling.

This shaft de-coupling arrangement enables the serviceman to run the changer through cycle by hand, thus facilitating the checking and adjusting of the cycling mechanism.

41E-2 & 41E CHECK LIST

It is important to use a step by step method when checking either the Capehart Model 41-E2 or Model 41E Record Changers. If this method is not followed, it is possible to make one adjustment against the other, which will result in improper operation. This could be the cause for erratic conditions. Therefore, the following list should always be followed in order, referring to the Maintenance Manual on the 41E Record Changer for adjustments, which are not included herein.

TURNTABLE

1. (a). Check height of turntable with respect to the base plate. This is accomplished by placing a straight edge ruler long enough to reach the distance, taking in the diameter of the turntable, to a point along side the tone arm collar assembly. Observation will reveal the tone arm collar is mounted on a milled surface.

41E-2 & 41E CHECK LIST (Cont.)

TURNTABLE

1. (a) Cont.)
This milled surface and the ones under the hook post and buckhorn are all milled at the same time and are the same height above the base plate. We call these points bosses and are the points at which we start our measurements. The top of the turntable should be level with this boss. A tolerance of 1/64" high or low would be allowable. For 41-E2, refer to "TURNTABLE HEIGHT ADJUSTMENT".
(b). To remove turntable, remove set screw in turntable shaft housing.

RECORD TRAY

2.(a). Check centering or record lowering tray with respect to turntable. This can be accomplished by placing the record selector lever in the "one side" position, run the record changer through a cycle to a point where the record lowering tray pauses for the second time. Stop the changer by the "on-off" switch at this point. Note the distance between the lowering tray and turntable. This distance must be equal on either side of turntable. Also note the level of the tray at this time. The front points of the 10" felt in the record tray should be level with the turntable cover.
(b). Check for binding between record tray gears. To do this, it will be necessary to disengage the lever connecting the shaft with the quadrant section of the record tray gear, from the record tray slide arm assembly by removing the eccentric shoulder screw. Move tray up and down by hand.
(c). Check 10" rubber bumpers.
(d). Check 10" rubber guard for smooth operation.
(e). Clean and remove rough spots on polished edges and surfaces.

BUCKHORN

3.(a). Check distance from the center of magazine pivot pin mounted in the buckhorn section of the magazine support, to the milled section of the base plate, on which is mounted the record separator hook post. This distance should be 7 9/16", plus or minus 1/16". Also check the distance between buckhorn pivot arms, which should be 13 7/16".

MAGAZINE

4.(a). Check distance between magazine pivot arms. This should be 13 1/4".
(b). Check position of the upper record support on changers incorporating the single knife. The lower points of this support should be even and centered. Changers incorporating the double knife; check the roller and position of assembly.
(c). Check magazine position with respect to lowering tray. Channel grooves will be noted at the base end of the record lowering tray. These were cut for the purpose of allowing the two lowest points of the record magazine to pass when traveling through the change cycle to deliver a record; therefore, it is necessary that these two points are centered within these channels. It will also be noted there are two holes at the back end of these tray channels to allow the level points of the record support bracket to protrude through the record lowering tray. These points should be adjusted to an equal distance with respect to the outside edge of the holes.
(d). Clean and remove rough spots on all polished surfaces and edges.
(e). Check & oil rollers -- Rollers should roll quietly.
(f). Check record reverse arm and guide assembly. Should be parrallel and centered with a 12" record in magazine when changer is stopped at that portion of the cycle where the reverse arm has come in contact with the magazine and rubber bumper.

MODEL 41-E2

(g). Check reverse arm fork as it engages the crank pin assembly. Should be centered and engaged so that the jaws extend around the crank pin about 1/8". At this point, check the return position of the magazine with the stop screw located at center and back of the buckhorn support. This would be the adjustment that would determine the clearance of the crank pin. See the 41E manual for adjustments of the travel of the crank pin assembly.

(h). Check linkage--magazine should return against stop snugly.

(i). Check record selector knife.

(j). Check record selector knife as it engages the record separator hook.

(k). Check felts on back side of lower record support casting. If loose, can be the cause of late delivery of records which would cause chipping due to sharp contact with record lowering tray tongue.

(l). Check record "U" Guide assembly.

TONE ARM

5. (a). Check Tone Arm Height. Refer to"Tone Arm Set Down Adjustment", or the 41E

(b). Check the distance of Travel of the tone arm in toward the turntable spindle on a 12" record.

(c). Check pickup for tracking in record grooves.

(d). Check 10" and 12" landing position.

(e). Check feed-in tension spring.

TRIP SLIDE ASSEMBLY

6. (a). Height above base plate should be high enough at the rubber roller end to contact the trip clip on under side of turntable. Refer to "Trip Slide Assembly", or to the 41E Manual.

(b). Slide action should work freely and oil should never be used.

(c). Setting of stop should be set so that it is impossible for the trip clip on turntable to lock with trip slide assembly.

(d). Check rubber roller.

PLAY CONTROL

7. (a). Check play control.

BELOW CHASSIS

GEAR REDUCTION BOX

8. (a). Check adjustment of second reduction gear train. Should be no slack or bobbing of this assembly. This can be determined by under noise of gears.

(b). Check to see that oil has been put in gear box. A maximum of 1 oz. of heavy oil should be put in gear box. The gear should dip into this oil level.

(c). Check for oil leaks.
Check reverse arm mechanism.

(d). Check position of reverse segment with respect to stops and locking assembly.

41E-2 & 41E CHECK LIST (Cont.)

TONE ARM MECHANISM

9. (a). Check horizontal and vertical position of tone arm crank assembly also relation to tone arm swing lever.

(b). Check position of tone arm brake spring collar.

(c). Check action of tone arm stop bracket assembly.

(d). Check position of tone arm, lift and swing cam.

(d). Check tone arm trip pin.

MERCURY SWITCH OPERATION

10. (a). Check reset lever and timing with main cam.

(b). Check contact of reset lever & mercury dog.

(c). Check clearance between top of mercury dog and lever extending down through base plate from trip slide arm assembly.

MAIN CAM SHAFT (See "Main Cam Shaft"

11. (a). Check for underplay with record magazine tilted up.

(b). Check action of slide arms of main cam.

(c). Check record selector lever action.

(d). Check cam track switches.

(e). Check lubrication.

ADDITIONAL CHECK LIST FOR 41-E2 ONLY

1. Check Idler Wheel.
2. Check Idler Mounting Assembly .....Part No. 14108.
3. Check connection link Assembly ..... " " 09382.
   Adjust link to divide travel of 33 1/3 r.p.m. to 78 r.p.m.
4. Check Support Bracket, cam & hub assembly..... " " 09385.
   Adjust for equal throw of shift pins under tone arm key.
5. Check vertical tone arm pressure
   Adjust screw in cover plate assembly ..... " " 09381.
6. Check for clearance between tone arm hinge bracket No. 57271, and tone arm housing.
7. Check clearance on friction cork above tone arm crank - should be .005.
8. Check for dirt in tone arm bearing.
9. Check clearance of shift pins against tone arm hinge bracket on 33 1/3 and 78 r.p.m. arms.
10. Check needle--should protrude beyond guard 1/32".
11. Check needle height --
    Should be adjusted to clear turntable with no record.
12. Check trip slide assembly --not to exceed 7 grams.
13. Check motor fan blades--should run true.

MODEL 41-E2

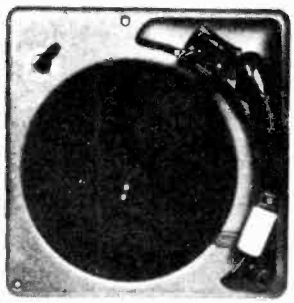
PARTS LIST

Following is a list of new parts and parts that have been revised. Parts that are not listed here are the same as those used in the standard version of this changer, the 41E.

44067 ..... Two Speed Turntable Motor
15246 ..... New Turntable
14100 ..... Tone Arm Assembly (33 1/3 r.p.m.)
14101 ..... Tone Arm Assembly (78 r.p.m.)
11378 ..... Pickup & Housing Assembly (78 r.p.m.)
05160 ..... Pickup & Lead Assembly (33 1/3 r.p.m.)
450148A..... Gear Shaft and Hub Assy.
2003-161 003 #6/32 x 7/16" F.H.M.S.
2085-215 071 #6/32 x 5/8" O.H.M.S.
14108 ..... Idler Mtg. Assy.
55456 ..... Selector Pin
37688 ..... "E" Washer
64492 ..... Selector Spring
60674 ..... Paper Spacer
36926 ..... Washer
62199 ..... Rubber Tone Arm Rest
2003-109-003 #4/40 x 3/8 F.H.M.S.
04135 ..... Tone Arm Support Housing
07721 ..... Speed Switch Support Bracket Assy.
09382 ..... Connecting Rod Ass'y.
05163 ..... Connecting Rod Motor End Assy.
55459 ..... Connecting Rod (Cam End)
55461 ..... Connecting Rod Adjusting Sleeve
54329 ..... Contact Washer
37689 ..... Washer
80528 ..... 3 pr. Plug.
15245 ..... Speed Switch Cam & Hug Assy.
57274 ..... Tone Arm End
37683 051 Pivot Screw #8/32 x 3/8"
2016-005 003 #8/32 Hex Nut
2006-053 051 3/48 x 3/16 F.H.M.S.
04134 ..... Tone Arm Hinge Bracket Assy.
05159 ..... Pickup Housing & Tone Arm Tube Assy.
71244 ..... Microgroove (33 1/3 r.p.m.) Pickup
77195 ..... Resistor (Ins. Car.) 3.3 K 1/2 W

55153..... Pickup Contact Assy.
450150A.... Spacer
650013A.... Main Cam Shaft
55449 ..... Tone Arm Locking Pin
64490 ..... Locking Pin Spring
07700 ..... Mercury Switch Mtg. Brkt. Assy.
09387 ..... Trip Slide Assembly
09381 ..... Cover Plate Assy.
51152 ..... Cover Plate
55450 ..... Spring Adj . Screw
37684 ..... Spring Adjust. Nut
37421 ..... "E" Washer
64489 ..... Adjustment Spring
04136 ..... Tone Arm Hinge Bracket, finish Assy.
2215-201-003 #4 40 x 3/16" Slotted Hex H.M.S.C.

55462... Turntable Adjusting Plate
37690...End Thrust Screw (Turntable
37691.. " " " "Adjustment
55457.. Speed Switch Cam Shaft
57273.. Speed Switch Crank
14107.. Contact "Lead & Plate Assy". (Tone Arm Support)
71238.. Pickup (78 r.p.m.)
59472.. Pickup Housing (78 r.p.m.)
58863.. Retainer Spring
51166.. Trip Friction Spring
55465.. Trip Pivot Pin
55466.. Trip Bearing Adjusting Screw
37692.. Trip Bearing Adjusting Nut
2006-113-003 #4-40 x 1/2" F.H.M.S.



GENERAL

This record changer is designed for a power supply of 105–125 volts, 60 cycles. It operates at two speeds of 78 rpm and 33⅓ rpm and is equipped with one pickup arm head for standard groove records (tan) and one pickup arm head for microgroove records (red). The changer provides manual or automatic playing and takes a one-inch stack of 10- or 12-inch records. When the last record is played, the pickup arm returns to its starting position. The motor has to be switched off manually by the Speed Control Knob.

MANUAL OPERATION

1. Turn the Record Selector Post (1, Figure 1) to the 12-inch position in the direction indicated by the arrow on the post, in order to give more clearance in loading and unloading records. Turn the Selector Switch (23, Figure 1) to Manual.
2. Place a record on the turntable. It may facilitate this operation if the record is slanted, as it is slipped over the spindle with the edge of the record held below the level of the record selector post shelf. Records may be removed in the same manner.
3. Check the pickup cartridge to make certain it is the correct type for use with the record being played. This is important as use of the wrong cartridge will cause excessive record surface wear or even immediate damage to the record.
4. Move the speed control (9, Figure 1) from the OFF position to the 33⅓ or 78 position as required by the type of record. Hereby, the motor switch connects the motor to the power supply, and the disk starts to rotate at the proper speed.
5. Push down the R button (24, Figure 1) in the front right-hand corner of the record changer and gently place the stylus of the pickup arm on the outer groove of the record. Lift the arm just sufficiently to clear the record. If it is raised too high, it may catch, restricting its travel.

AUTOMATIC OPERATION

1. Turn the Record Selector Post (1, Figure 1) to ten or twelve, according to the size of the records used, and turn the Selector Switch (23, Figure 1) to Automatic.
2. With the Record Stabilizer Weight turned back, place a stack of records (one-inch maximum height) on the spindle so that the bottom record rests on the step of the spindle and on the shelf of the Record Selector Post. Turn the record stabilizer weight forward to rest on the edge of the top record.
3. Check the pickup head assembly to make certain it is the correct type for use with the records being played. Move the Speed Control (9, Figure 1) to the 33⅓ or 78 position, as required by the type of records.
4. Depress the R button (24, Figure 1) to reject any record.
5. To stop the phonograph before all records have been played, simply turn the Speed Control (9, Figure 1) to the middle OFF position. The pickup arm may be moved without damaging the mechanism. However, after the last record has been played, the pickup arm is automatically locked in position and should not be touched until it has come to the rest post (25, Figure 1).
6. After playing, entire stack may be removed by the following procedure: Move the Record Stabilizer Weight (3, Figure 1) back out of position, place fingers of both hands under opposite edges of bottom record and lift straight up following the contours of the spindle.

OPERATING PRECAUTIONS

The microgroove records are easily scratched so that it is recommended to use utmost care in handling the pickup arm while setting it on the record.

Be sure that the right cartridge is used with the various types of records (tan for standard records, red for microgroove records).

DO NOT use warped, home-recorded, or odd-size records for automatic operation, but use manual operation.

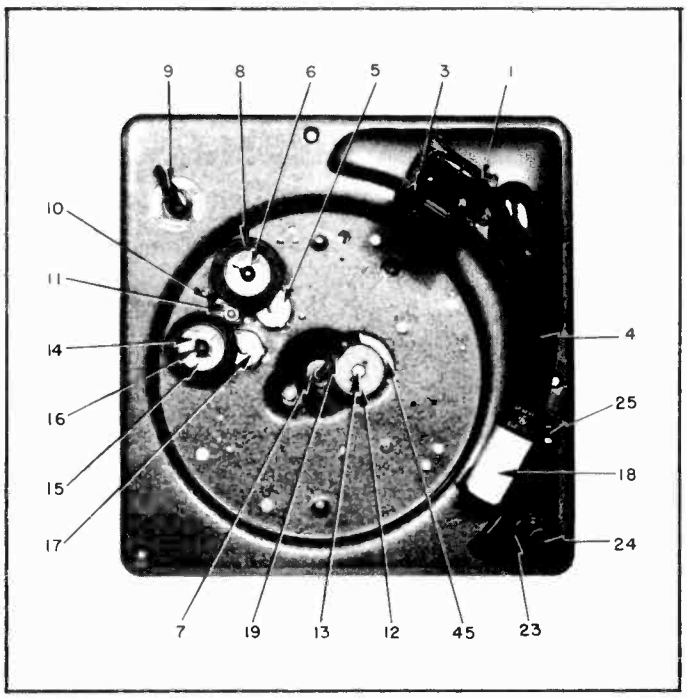


Fig. 1. Top View of Record Changer

MODEL P8

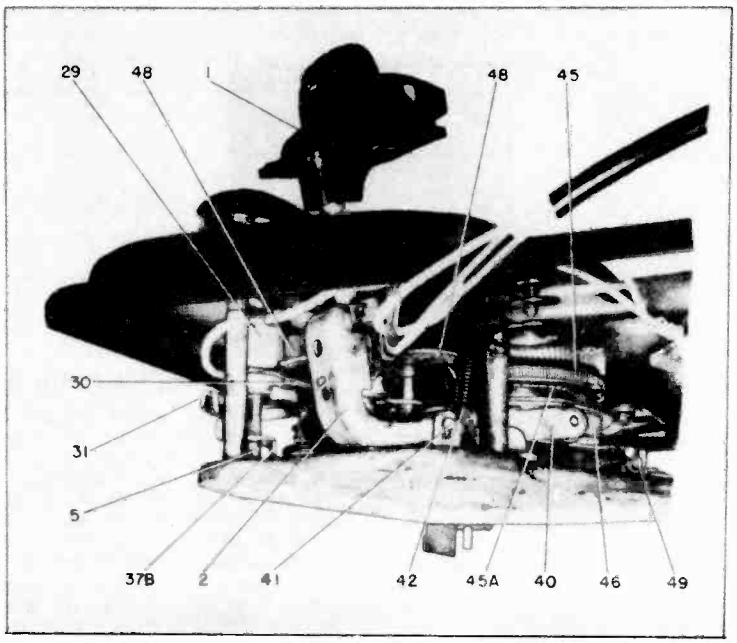


Fig. 2. Underside View of Chassis (Motor End)

DO NOT use force to start or stop the motor or any part of the record changing mechanism.
store the records on the record post or the turntable, as they may warp, especially at higher temperature.
allow any oil or grease on the drive wheel or any rubber part of the changer.
connect the motor to direct-current or to different alternating current supply.

LUBRICATION

Apply light machine oil on:

1. Motor bearings, saturate top and bottom felts.
2. Pickup arm shaft (5, Figure 3). Apply one drop each to bottom bearing point, bracket hole, and hole through main base plate.
3. Ball bearing assembly (7, Figure 1).
4. Idler wheels' felt (6 and 16, Figure 1).

Apply Lubriplate No. 110 with small brush to:

1. Idler wheel linkage (5 and 17, Figure 1).
2. Turntable shaft stud.
3. Pickup arm hinge pins.
4. Knife edge of raising lever.
5. Main cam bearing. For lubrication, the subplate assembly has to be removed.

Apply STA-PUT with a small brush:

1. Teeth of main actuating gear (45, Figure 4).
2. Track of main cam gear (46, Figure 4).
3. Teeth of large and small idler gear (12, Figure 1).
4. Raising lever bracket bearing surfaces (38, Figure 4).

PICKUP

This record changer is equipped with two head assemblies containing two different cartridges—one for standard groove, and one for microgroove records. The pickup and head assembly identified by the red color has to be used for microgroove Long Playing records (33⅓ rpm). The other pickup and head assembly for use with standard groove records is identified by tan color. The pickup head required for the type of record to be played is fitted into its socket at the end of the pickup arm. The cartridge is designed according to the variable reluctance principle which will give superior results from the standpoint of high fidelity, low surface noise, and negligible record wear. The pickup is not interchangeable with a crystal pickup as the ratio of output voltage levels of the two types is in the order of 70 to 1, due to the very low output voltage of the variable reluctance cartridge.

The stylus supplied is of a semi-permanent type. Dust and foreign matter should be removed from the stylus assembly at regular intervals with a soft brush. Make sure the stylus arm is centered between the pole pieces.

CYCLE OF OPERATION

STARTING THE CHANGE CYCLE—The motor is started by movement of the Speed Control Knob (9, Figure 1). The rotating motor bushing (11, Figure 1) drives the Idler Wheel according to the speed selected by the Speed Knob. The bushing has two sections of different diameter which are engaged with the flywheel (8 or 15, Figure 1) corresponding to the position of the Speed Control. This control operates a lever arrangement (5 and 17, Figure 7) which presses the corresponding flywheel against the motor bushing and the rim of the disk. The rotating motor drives the disk by means of the flywheel friction drive. By means of the Gear Wheel on this disk the large Idler Gear (12, Figure 1) is engaged transferring the movement to the smaller Idler Gear which drives the Main Cam Actuating Gear (45, Figure 1). The power of the motor (33, Figure 3) is transferred to the disk by means of friction which is produced by the pressure of the springs (10 and 21, Figure 7). This pressure is applied to the Idler Wheel by means of the Levers (17 and 5, Figure 1). The gear wheel of the Main Cam Actuating Gear (45, Figure 1, or 45, Figure 4) is rotating all the time the motor is switched on and only when this is coupled to the Main Cam Gear (46, Figure 4) the change cycle starts causing the Pickup Arm and the Record Selector Lever to perform the respective movements. This coupling is accomplished by means of a Pawl (46A, Figure 4 and Figure 5) mounted on the Bottom Cam Gear (46, Figure 4, and Figure 5) which presses against the bottom teeth of the Main Cam Actuating Gear (45A, Figure 2). The weight of the lever causes the Pawl (46A, Figure 5) to engage the Main Cam Actuating Gear. Only when this weight is lifted the Pawl moves out of the tooth and disengages the lower Cam Gear (46, Figure 4). This movement of the Pawl is actuated by the left end of the Trip Lever (47, Figure 4). Automatic cycling may be started by pressing on the R button. The Automatic Trip Arm (34, Figure 3) trips the Velocity Trip and Roller Assembly (47, Figure 4). This releases the Actuating Pawl (46A, Figure 5), allowing it to engage the Main Cam Actuating Gear (45, Figure 4) and couples it to the Main Cam Gear (46, Figure 4), driving the mechanism through the change cycle.

CYCLING—A single revolution of the main cam results in a complete automatic cycling of the changer. This includes selection of a record from the stack, lifting the tone arm from its rest position and setting the needle in the first groove of the record.

RECORD FEED—The outer and lower surface of the Main Cam (46, Figure 4) controls the record selection. The wheel on the rocker arm lever follows the variation of the path on the Main Cam and causes by its swinging movement the Selector Arm (2, Figure 4) to push forward and drop a record.

PICKUP ARM MOVEMENT—The shaft at the end of the lever (38, Figure 3) moves along a specially designed path in the lower surface of the automatic trip cam and guides the disk hub and with it the pickup arm. The path is so designed that it swings and

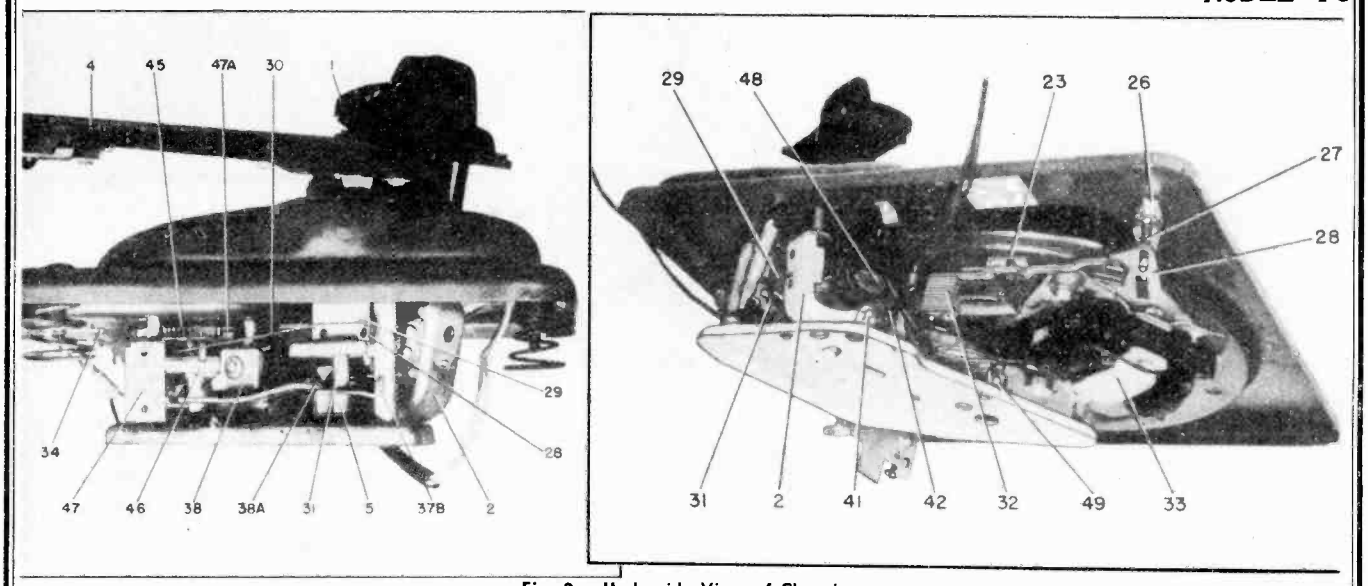


Fig. 3. Underside View of Chassis

lifts the pickup as required. If at the last groove of the record the pickup arm advances $\frac{1}{8}$ inch—$\frac{1}{2}$ inch in revolution, the lever on the pickup arm which is forced to move with it by the weight clutch (29, Figure 3) moves the trip lever which trips the pawl between the turning cam and the automatic trip cam, causing the arm to swing back again.

SERVICE ADJUSTMENTS

A. AUTOMATIC TRIP—When the movement of the Pickup Arm towards the spindle is greater than $\frac{1}{8}$ inch in $\frac{1}{2}$ revolution of the turntable, the Automatic Trip Arm (30, Figure 3) trips the Velocity Trip and Roller Assembly (47, Figure 4). This releases the Actuating Pawl on the Main Cam Assembly, coupling it with the Main Cam Actuating Gear and, therefore, driving the mechanism through the change cycle. The Automatic Trip Arm follows the movement of the pickup arm through the friction clutch (29, Figure 2). This clutch must be kept free of oil and grease.

B. AUTOMATIC LOCK LEVER—This lever (48, Figure 2) should move up and down freely with no record on spindle. Hook end of the automatic shut-off lock lever (48C, Figure 4) should catch Pickup Arm Raising Disk (31, Figure 3) at the beginning of the cycle to prevent travel of the arm and to cause it to drop on the rest post. The weight of the records moves the spindle through the hole and presses the Spring of the Automatic Lock Lever (48A, Figure 4), thereby lifting this lever. With no records on the spindle, the hook (48C, Figure 4) should clear the Pickup Arm Disk by $\frac{1}{32}$ inch with the mechanism at rest. This distance can be adjusted by bending the lip (D, Figure 6) underneath the lever.

C. VELOCITY TRIP—At the completion of the change cycle, the Actuating Pawl (46A, Figure 5) is engaged by the hook end of the Velocity Trip and Roller Assembly (47, Figure 4) which has been returned to its normal position by the reset points on the Main Cam Drive Gear (45B, Figure 4). This hook should be adjusted for about $\frac{1}{32}$ inch and $\frac{1}{64}$ inch clearance from the bottom of the Main Cam Actuating Gear (45, Figure 5). Greater clearance may permit the Pawl to bounce past the hook and re-engage, causing it to go into another cycle.

D. INDEXING—The eccentric screw, accessible through the top of the Pickup Arm should take care of any normal adjustment. Turn the screw clockwise to index the stylus in towards the spindle and counterclockwise to index the stylus out away from the spindle.

Should further adjustment be necessary, proceed as follows: Operate the mechanism by revolving the turntable manually until the stylus drops to within $\frac{1}{8}$ inch of a 10-inch record on the turntable. Check that the notch in the Pickup Arm Raising Disk engages the Pickup Arm Raising Lever (38A, Figure 4). With a No. 8 Bristol wrench in each of the setscrews (point C, Figure 6), alternately loosen one and tighten the other until the stylus rests above the records lead-in groove at the desired point. After completion of this adjustment, see that both setscrews are tightened.

E. PICKUP ARM LIFT—The stylus should approach the top record of a full stack on the turntable with approximately $\frac{1}{8}$-inch clearance. Adjust by bending the pickup arm raising lever (38A, Figure 3) at point B (Figure 6). Do not attempt to move Pickup Arm Raising Disk up or down because it would influence the correct working of the Automatic Lock Lever (48, Figure 2). The pickup arm is prevented from falling off the Rest Post (25, Figure 1) by the upturned end of the pickup arm pivot shaft bracket (37B, Figure 4). The clearance between the tongue of the pickup arm raising disk (31, Figure 2) and the bottom of the groove formed by the bracket and the Base Plate Post should be $\frac{1}{64}$ inch. In order to obtain proper positioning, bend the bracket up or down. If the bracket is too high, the disk tongue will rub on it when the needle approaches the edge of a 12-inch record. This will have the undesired effect of causing "glide in" on the first grooves of the record.

F. RECORD DROP ADJUSTMENT—As the change cycle is started, the first motion of the inclined outer bottom surface of the Main Cam (46, Figure 4) causes the Record Selector Post (2, Figure 4) to move towards the Spindle about $\frac{3}{32}$ inch. This position is maintained until the Pickup Arm has made its full outward lateral excursion, at which time the Record Selector Post again moves towards the spindle, causing the bottom record to drop into playing position. The distance between the Selector Post and the Spindle should be such that with a standard record ($9\frac{7}{8}$ inches for 10-inch and $11\frac{7}{8}$ inches for 12-inch) the distance between the edge of the record and the front of the selector arm groove is approximately $\frac{1}{32}$ inch. If this distance is too great, records of minimum diameter will not be pushed off the Spindle Step and if it is too short records will be pushed against the Spindle with undue force, causing center hole damage. If the Record Selector Post (1, Figure 1) has been bent back away from the Record Spindle, a standard record might rest on the spindle step with its edge just over the edge of the Record Selector Post shelf. Then at the beginning of the change cycle, the record is pushed off the spindle by the initial movement of the Record Selector Post, so that the record drops on the Pickup Arm. The push-off distance can be easily adjusted by the Screw on the rocker arm (40, Figure 5) which is accessible through the top of the main plate (remove disk!). Turning the screw clockwise diminishes the distance.

G. TO REMOVE THE PICKUP ARM—While holding the Pickup Arm firmly, bend in one end of the blue steel pickup arm hinge brackets while lifting up on the arm. This will release the pickup arm hinge pin. Repeat on the other pickup arm bracket, so that the released arm may be turned over and laid on the turntable.

H. TO REMOVE THE SUB-PLATE ASSEMBLY—In case it is necessary to replace any of the major parts of the sub-plate assembly, this can be removed by the following procedure:

1. Remove the Spindle which is held in by a clip under the sub-plate.
2. Remove the Turntable and the Pickup Arm.
3. Unhook the Rocker Arm Return Spring (42, Figure 2), and remove the Rocker Arm Pivot Pin (41, Figure 2).
4. Remove the holding screws.

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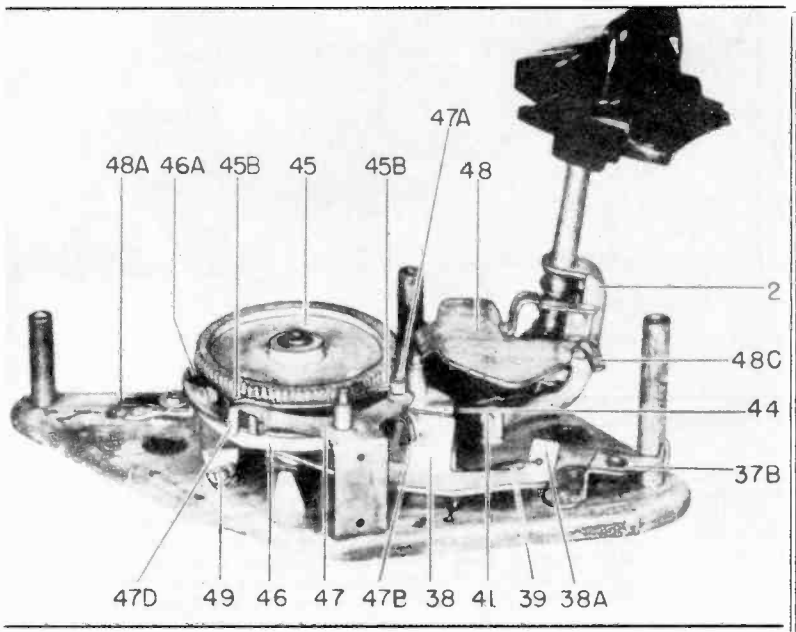

Fig. 4. Main Cam Gear Assembly

Cat. No.	Ref.	Description
RMS-177	27	SPRING—Tension spring for two-speed shaft
RMS-179		SPRING—Spring for weight RWP-003
RMS-180		SPRING—Tension spring for stabilizer
RMS-181		SPRING—Shock mounting spring
RMT-008		TURNTABLE BASE ASSEMBLY
RMU-020		SPINDLE—Spindle assembly
RMW-053		IDLER WHEEL—Idler wheel assembly (78 rpm)
RMW-055	23	DRIVE SLEEVE—Drive sleeve and set-screw
RMW-056		IDLER WHEEL—Idler wheel assembly (33⅓ rpm)
RMX-071		BEARING—Ball and retainer assembly
RMX-072		NUT—Post and nut assembly
RMX-075	31	DISC AND HUB ASSEMBLY—For pick-up arm raising
RMX-076	29	COLLAR—Collar assembly
RMX-077	46	CAM—Main cam assembly
RMX-078	47	TRIP—Velocity trip and roller assembly
RMX-080		SPRING—Collar clutch tension spring
RMX-081		IDLER GEAR ASSEMBLY
RMX-084	3	RECORD SHELF ASSEMBLY
RMX-098		NEEDLE PAD
RMX-102		PICKUP ARM LEVER AND BRACKET
RMX-128		HINGE—Pickup arm mount hinge
RMX-129		POST—Pickup arm pivot post assembly
RMX-135	26	TWO-SPEED SHAFT ASSEMBLY
RMX-137		COUNTERBALANCE—Pickup counter-balance assembly
RMX-139	47	VELOCITY TRIP AND ROLLER ASSEMBLY
RPA-009	4	ARM—Phono pickup arm
RPH-003		HOUSING—Housing for pickup assembly, 78 rpm (tan)
RPH-004		HOUSING—Housing for pickup assembly, 33⅓ rpm (red)
RPJ-001		STYLUS—Replaceable stylus, 3 mils (78 rpm)
RPJ-005		STYLUS—Replaceable stylus, 1 mil (33⅓ rpm)
RPX-040		CARTRIDGE—Magnetic pickup, 3 mils (78 rpm)
RPX-041		CARTRIDGE—Magnetic pickup, I mil (33⅓ rpm)
RSS-004	32	SWITCH—A-C power switch
RSX-017		SPEED CHANGER—Switch assembly, less button
RWP-003		WEIGHT—Weight for RPH-003

MODEL P8 REPLACEMENT PARTS LIST

Cat. No.	Ref.	Description
RBX-017	33	MOTOR—Motor assembly
RDB-017	24	REJECT BUTTON
RDB-018	25	BUTTON—Rest button
RDE-050	23	ESCUTCHEON BUTTON—Control escutcheon
RDF-007	16	WASHER—Felt washer for idler wheel
RDK-167	9	KNOB—Speed lever knob
RHC-011	22	CLIP—Retaining clip for idler wheel
RHC-019		BRACKET—Spring retainer bracket
RHG-024		COLLAR—Rubber collar for chassis mounting screws
RHM-031		RUBBER—Rubber shock mount for motor
RHR-001		RIVET—Idler mounting rivet
RHS-003		CONE POINT SETSCREW—For motor bushing
RHS-030		SCREW—Chassis mounting screw
RHS-009	13	SCREW—Idler gear mounting
RHW-003	7	WASHER—Bearing race washer
RHW-004		WASHER—Idler wheel (fiber)
RMG-005	45	GEAR—Main cam actuating gear
RMG-007	11	GEAR—Small idler gear (fiber)
RMG-008	12	GEAR—Larger idler gear (fiber)
RMK-003		COUPLING—Idler gear coupling
RML-006	34	MANUAL TRIP LEVER—Lever and wire assembly
RML-008		ROCKER ARM ASSEMBLY
RML-009		STOP—Selector lever stop
RML-010	48	AUTOMATIC "SHUT-OFF" LOCK LEVER
RML-016		LEVER ASSEMBLY PICKUP ARM
RML-017		LEVER—Rocker arm lever assembly
RML-022	34	LEVER—Lever and wire assembly manual trip
RML-024	17	LINK—Idler link
RML-025	28	LEVER—Two-speed lever assembly
RML-026		RELEASE—Link release
RMM-023	1	POST—Record selector post
RMM-024		RECORD STABILIZER
RMM-038		COVER—Switch cover
RMM-079		BRACKET—Hub assembly for pickup arm
RMP-008	41	PIN—Rocker arm pivot pin
RMS-071	39	SPRING—Raising lever tension spring
RMS-073		SPRING—Selector shaft compression spring
RMS-074	44	SPRING—Selector lever compression spring
RMS-075	42	SPRING—Rocker arm return spring
RMS-175		SPRING—Idler link tension spring (idler wheel 78 rpm)
RMS-176		SPRING—Idler wheel (tension spring 33⅓ rpm)

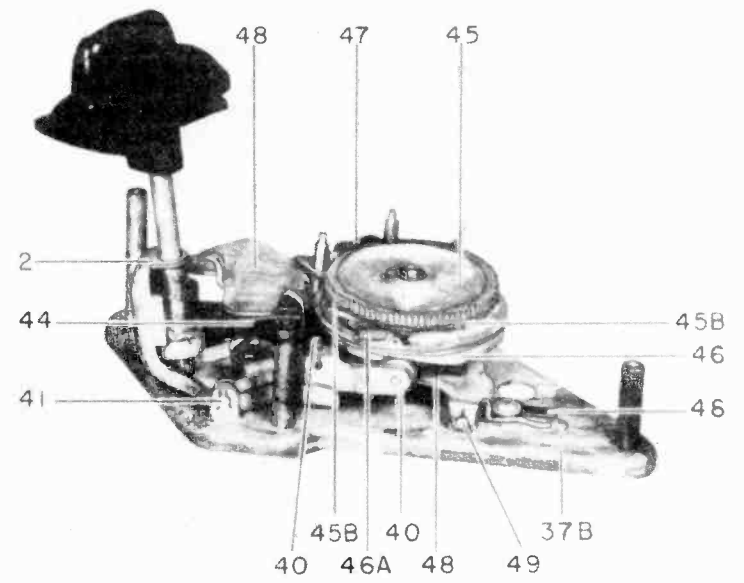

Fig. 5. Main Cam Gear Assembly

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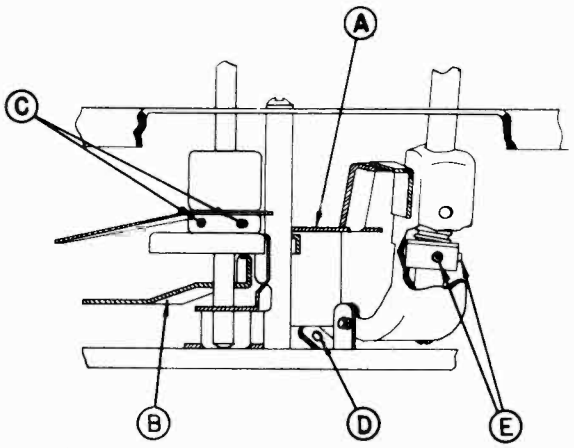


Fig. 6. Adjustment Points

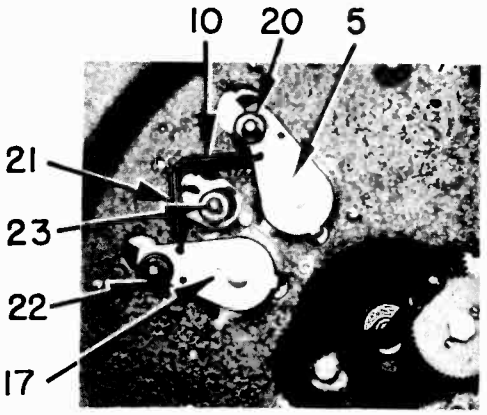


Fig. 7. Idler Wheel Links

TROUBLE SHOOTING CHART

SYMPTOMS	REMEDIES OR CAUSES
TRIPPING	
1. Changer Fails to Trip.	1. Check: (a) Adjustment A. (b) Velocity Trip and Roller Assembly binding (47, Figure 4). (c) Actuating Pawl (46A, Figure 5) stuck. (d) Automatic Trip Lever (30, Figure 3) bent and not hitting the Velocity Trip and Roller Assembly (47, Figure 3). (e) Velocity Trip and Roller Assembly rubbing on the underside of the Main Cam Actuating Gear. (f) Manual trip lever binding. (g) No velocity lead-in groove in center of record. (h) Worn record or needle. (i) Foreign matter in record groove.
2. Changer Trips Continuously.	2. Check: (a) Velocity and Roller Assembly (47, Figure 3) rubbing on Main Cam Actuating Gear (46, Figure 3). (b) Manual Trip Lever binding. (c) Hook end of Velocity Trip and Roller Assembly (47, Figure 3) bent and not engaging Pawl (46A, Figure 5). To be adjusted for about $\frac{1}{64}$ inch clearance from the bottom of the Main Cam Drive Gear. (d) Bakelite Disengage Roller broken on Velocity Trip and Roller Assembly (47A, Figure 4).
3. Changer continues to play last record and does not switch off.	3. Check: (a) Floating Spindle (free up and down movement). (b) Automatic Shut-off Lock Lever (48, Figure 4). Hook end of this arm (48C, Figure 4) should catch the Pickup Arm Rising Disk (31, Figure 3) at the beginning of the cycle to prevent travel of the arm and cause it to drop on the Rest button. This hook should clear the Pickup Arm Rising Disk (31, Figure 3) by $\frac{1}{32}$ inch with the mechanism at rest. Bend lip (D, Figure 6) if necessary to make this adjustment.
4. Manual Trip Fails.	4. (a) Manual Trip Lever Hair Spring bent or broken. (b) Velocity Trip and Roller Assembly binding (47, Figure 4). (c) Actuating Pawl stuck (46A, Figure 5).
GLIDE IN ON 12" RECORDS	Check tension of compression spring (44, Figure 4).
RECORD DROP.	Check adjustment E.
MORE THAN ONE RECORD IS DROPPED.	Check adjustment F.
INDEXING OF ARM.	Check latch of record spindle.
SELECTOR POST ANGLE INCORRECT.	Check adjustment D.
PICKUP ARM MOVEMENT.	Check adjustment F.
NEEDLE SKIPS GROOVES.	Check adjustment E.
	Check: (a) Record changer not level. (b) Pickup Arm binding. Check vertical and lateral friction. (c) Badly worn record or needle.
PICKUP ARM DROPS OFF THE REST POST.	Check adjustment E.
MOTOR	
1. Motor Does Not Switch Off.	1. (a) Defective Switch mechanism. (b) Defective Switch (do not attempt to repair).
2. Changer is Sluggish or Motor Overheats.	2. (a) Check lubrication—oil, old or gummy. (b) Incorrect line voltage. (c) Defective motor winding.

MODEL P10

GENERAL

This single post and single tone arm record changer is designed for dual speed operation (33⅓ or 78 revolutions per minute) from a power source of 110 volts at 60 cycles. It will play the Standard Groove or Microgroove type records for these speeds, a single record at a time or a series of twelve 10-inch or ten 12-inch records or ten records of the two sizes intermixed. *Note: Never stack together the Standard and Microgroove records intermixed for automatic operation* as playing of each type record requires special attention to the pick-up discussed below.

The tone arm is designed to use either of two pick-up heads which are interchanged by a plug arrangement at the end of the tone arm. The pick-up heads are finished in color for identification. The TAN head is used to play Standard Groove records while the RED colored head is for Microgroove reproduction. *Always use the TAN head with Standard Groove records and the RED head with Microgroove records.* Use of the wrong head is certain to result in damage to records and pick-up stylus.

MANUAL OPERATION

1. Turn the Selector switch (23) to the "M" position.

2. With the Record Stabilizer Weight (1) turned back and the spindle in position, place the record on the spindle. The record is then moved slightly to slip over the step in the spindle and lowered to the turntable.

3. Attach to the pick-up arm the correct pick-up head (19) required for the particular type record to be played.

4. Set the Turntable Speed Control (32) to correspond to the speed required by the type of record.

5. Depress the "ON" button (24).

6. Gently place the stylus of the pick-up on the outer groove of record.

7. Upon the end of record playing or to stop recording during manual play, lift the pick-up arm from record and return it to "rest" position. A slight pressure upon the pick-up arm at the rest position will depress the "OFF" button (25) to stop the mechanism.

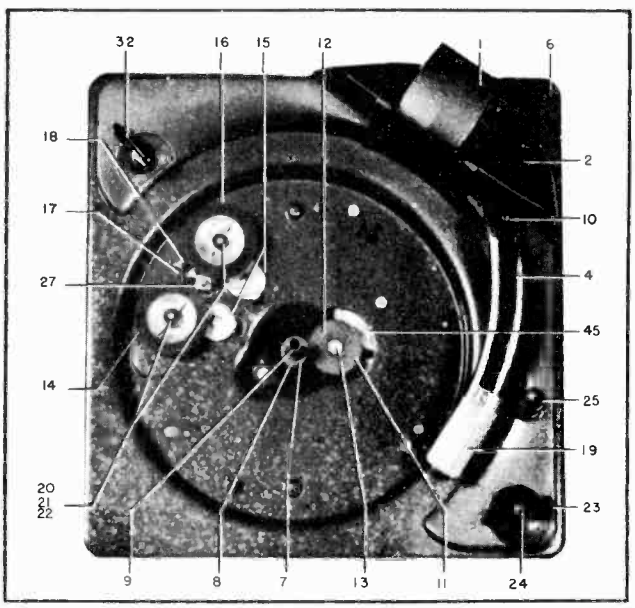


Fig. 1. Top View of Record Changer

8. When through operating the record changer, set the Speed control to the "OFF" position.

AUTOMATIC OPERATION

1. Turn the Selector switch (23) to "A" position.

2. Turn back the Record Stabilizer Weight (1). Place upon the record spindle not more than twelve of the 10-inch records, ten of the 12-inch, or ten records intermixed. The bottom record will rest on the step of the spindle and the record selector shelf (62). Set the Stabilizer Weight (1) forward so that it rests on the edge of the top record.

3. Attach to the pick-up arm the correct pick-up head (19) required for the type records to be played.

4. Set the Speed Control (32) to the setting as required by the type of records used.

5. Depress the "ON" button (24). The record changer will operate automatically without further attention and when the last record has been played, the pickup arm will automatically come to rest upon the "OFF" button (25) turning off the changer mechanism. The automatic shut-off feature applies to standard groove record operation only. The TAN pick-up head, balanced to give a greater needle pressure than required for the RED head as applied to microgroove records, has sufficient weight to trip the "OFF" button mechanism.

6. If it is desired to reject a record selection being played, push down the ON button. The record changer will then immediately shift to play the next record.

7. To stop operation of the record changer at any time during automatic play, lift the pick-up arm off the record and return it to the "rest" position on the OFF button, however, after the last record is being played, the pick-up arm mechanism is automatically locked in position and must either complete the cycle or the "ON" button must be depressed.

8. To remove a stack of records from the turntable, pull out the record spindle, lift off the entire stack of records, and replace spindle.

9. When through operating the record changer, set the Speed control to the "OFF" position.

OPERATING PRECAUTIONS

1. Do not, under any circumstances, connect the motor to a source of direct current or to alternating current other than that specified by the label.

2. Do not allow oil or grease to come in contact with the rubber tired friction drive wheels (14 and 16) or the Automatic Trip Arm (30) and Clutch (29) parts.

3. Never use force to start or stop the motor, or any part of the record changer mechanism.

4. Do not intermix Microgroove records with the Standard Groove type.

5. Make certain the correct pick-up head (19) is used to play the desired records. The TAN head is for Standard Groove recordings, while the RED head is used to reproduce Microgroove recordings.

6. Always make certain that the Speed Control (32) is set to the proper speed position as required for the type of record.

7. Use only records in good condition for automatic operation. For warped, odd size, or home recorded records, play as for manual operation.

8. Do not store the records upon the record post and spindle or on the turntable as they may warp, especially if the temperature is high.

9. When through operating the record changer, make certain the Speed Control (32) is returned to the "OFF" position. This pre-

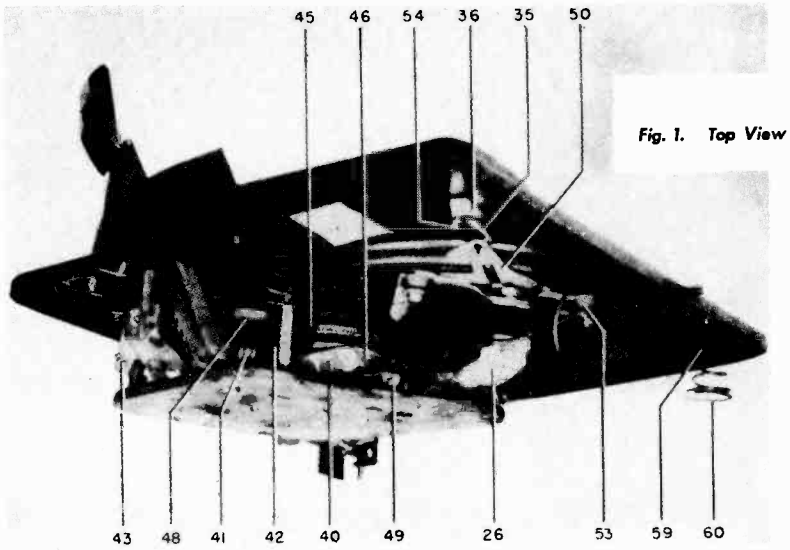
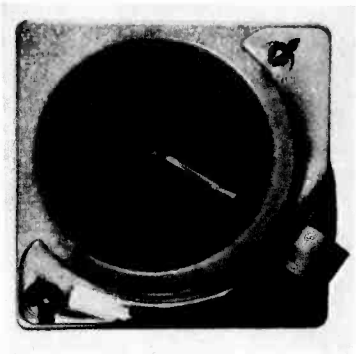


Fig. 1. Top View of Record Changer



vents a damaging flat surface upon the rubber tired drive wheels otherwise developed as the motor drive shaft bears pressure upon them when the record changer remains idle for long periods engaged in either of the speed positions.

LUBRICATION

Use a light machine oil on the following:

1. Motor bearings, saturate top and bottom felts at end bells.
2. Pick-up arm shaft (5), see Figure 3. Apply one drop each to bottom bearing point, bracket hole, and hole through main base plate.
3. Ball bearing assembly (8). See Figure 1.
4. Idler wheel felt (21). See Figure 1.

Apply Lubriplate No. 110 with a small brush to:

1. Idler wheel linkage (15). See Figure 1.
2. Turntable shaft stud (9). See Figure 1.
3. Pick-up arm hinge pins.
4. Pick-up arm raising lever (38). Apply to edge lifting disk hub (31). See Figure 3.
5. Main cam (46) bearing. See Figure 2. It is necessary to remove the sub-plate assembly to lubricate this bearing.

Apply Sta-Put with a small brush to:

1. Teeth of Main Cam Gear (45). See Figure 4.
2. Channeled undersurface of Main Cam Gear (46). See Figure 4.
3. Teeth of Idler Drive Gears (11 and 12). See Figure 1.
4. Pick-up Arm Raising Lever (38). Apply to bearing surfaces. See Figure 4.

PICK-UP CARTRIDGE

The Model P10 record changer is equipped with two pick-up arm cartridge heads, each containing a General Electric Variable Reluctance Cartridge incorporating a replaceable stylus assembly. The "TAN" colored head is plugged into the end of the pick-up arm to play wide groove records known as the Standard type. The "RED" colored head is similarly inserted into the arm when using the Long Playing Microgroove records.

SERVICE—The stylus assemblies may be removed readily from the cartridge for replacement. Instructions for replacement are supplied with each new Replaceable Stylus Assembly catalogued in the replacement parts lists on the last page of this publication.

To insure optimum performance from the cartridge, its stylus, magnetic pole pieces, and gaps should be cleaned periodically of foreign particles accumulated from the record surfaces. A soft bristle brush similar to Cat. No. RQB-001 should be used to clean these parts. The gap clearance between stylus and each of its pole pieces has been adjusted to be not less than .011 inch. Care should be taken not to disturb this adjustment during service adjustment or cleaning.

CYCLE OF AUTOMATIC OPERATION

The following titled paragraphs describe in sequence each action of the record changer mechanism through the automatic cycle of operation.

INITIATING THE CHANGE OF CYCLE—Depressing the ON Button (24) turns on the Motor Power Switch (33) and triggers the Manual Trip Lever (34). The turntable driven by one of the Idler Wheels (14 or 16) drives the Main Cam Gear (45) through the Idler Coupling Gears (11 and 12).

PAWL TRIP ACTION—The Actuating Pawl upon the Main Cam Assembly (46) engages with the sawtooth serrations on the underside of the Main Cam Gear (45). The main cam assembly is thus driven by the main cam gear whenever the actuating pawl is engaged.

The actuating pawl is tripped directly by the Velocity Trip and Roller Assembly (47) which may be triggered either manually or automatically. The pawl becomes engaged in the cam gear sawtooth and the velocity trip lever is shortly returned to normal position in readiness to disengage the actuating pawl at the end of the main cam cycle. In Manual control the velocity trip and roller assembly is triggered by control of the ON Button (24) through Switch Assembly (33) and Manual Trip Lever (34). During automatic operation of the record changer, tripping is accomplished by action of the Automatic Trip Arm (30) which is driven by the Clutch Friction Weight (29) and Pick-up Arm Shaft Assembly.

PICK-UP ARM MOVEMENT—The underside channeled surface of the Main Cam Assembly (46) controls the pick-up arm movement through the Pick-up Arm Raising Lever (38). The lever follows the channeled contour of the main cam, lifting, turning and lowering the Disk Hub (31) and associated pick-up arm and shaft assembly so that the pick-up is started upon the first record grooves.

This completes the movement of the main cam assembly as the actuating pawl is released by the Velocity Trip and Roller Assembly (47) to be tripped and engaged again upon another record changer cycle.

The Automatic Trip Arm (30), coupled to the pick-up arm and shaft assembly by friction, moves toward the velocity trip and roller assembly as the pick-up arm moves across the record being played. As the last or inner record grooves are reached by the pick-up arm, the automatic trip arm triggers the velocity trip and roller assembly. The velocity trip, in turn, trips the actuating pawl to drive the main cam, beginning a new cycle of record play and returning the pick-up arm onto the first grooves of a next record.

RECORD FEED—Movement of the Rocker Arm Lever and Roller assembly (40) upon the underside and outer edge of the Main Cam Assembly (46) controls the record feed. The attached Record Selector Shelf (62) and associated Record Selector Arm Fingers (61) move to push forward a record from the shelf, off the step of the record spindle, and onto the turntable.

MODEL P10

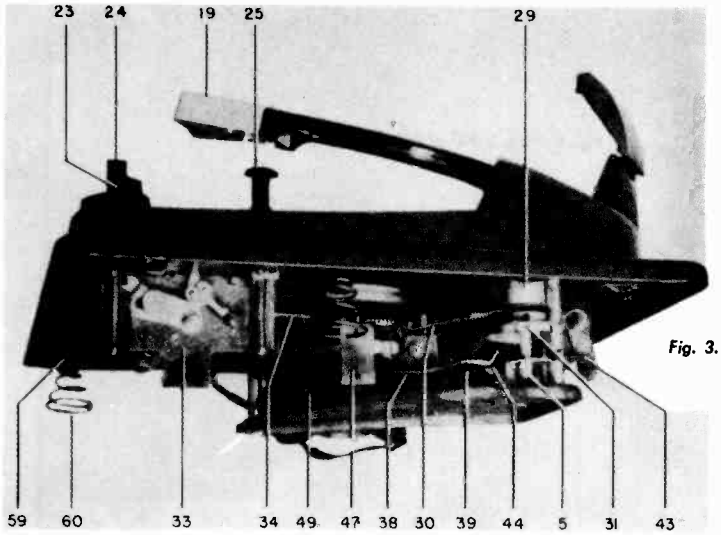


Fig. 3. Right Oblique View of Bottom of Changer

PICK-UP ARM INDEXING—The position of the Record Selector Fingers (61) and attached Index Control Arm (3) just before a record leaves the Record Shelf (62), determines the proper index of the pick-up arm to start upon the first grooves of that particular record.

When a 10-inch diameter record rests upon the record shelf, the record selector fingers are tilted so that the attached index control arm is engaged with the Index Lever Assembly (43). The index lever, by virtue of its compressed spring, forces the Pick-up Arm Raising Lever assembly (38) to follow the outer contour of the channeled undersurface of the Main Cam Assembly (46). Guided by *this contour,* the pick-up arm raising lever lowers the pick-up arm to the proper position upon the first grooves of the *10-inch record.*

A 12-inch record upon the record shelf will depress the record selector fingers, unlatching the attached index control arm from the index lever assembly. This renders the index lever assembly inoperative and results in the pick-up arm raising lever following the inside contour of the channeled undersurface of the main cam assembly as guided by its associated tension springs. In following *this contour,* the pick-up arm raising lever lowers the pick-up arm to the proper position upon the first grooves of the *12-inch record.*

AUTOMATIC SHUT OFF—As the last record leaves the Record Selector Shelf (62) and Record Spindle Step to drop onto the turntable, the bottom of the spindle ceases to bear down upon the end of the Automatic Shut-off Lock Lever (48) directly beneath as a result of all record weight removed from the spindle. This changes the position of the automatic shut-off lock lever so that the hooked segment of its lowered end engages with a segment of the Disk Hub (31), obstructing its normal movement. As a result, the pick-up arm is lowered onto the OFF Button, depressing it to shut off the electrical power to the record changer mechanism.

SERVICE ADJUSTMENTS

A. IDLER WHEEL DRIVE—The turntable is driven by means of one or the other friction idler drive wheels (14 or 16). The driving power is transferred from the motor bushing (27) to the drive wheels and then to the rim of the turntable.

It is important, therefore, that the motor bushing, idler wheels, and rim of turntable be kept clean of grease, oil, dirt, or any foreign matter. Naphtha or an equivalent quick drying solvent is satisfactory for cleaning these parts.

B. AUTOMATIC TRIP—The Automatic Trip Arm (30) follows the movement of the pickup arm through a weight compression clutch (29). When the movement of the pick-up arm (4) toward the record spindle is greater in velocity than $\frac{1}{8}$ inch in $\frac{1}{2}$ revolution of the turntable, the automatic trip arm trips the Velocity Trip and Roller Assembly (47). This releases the actuating pawl on the Main Cam Assembly (46), allowing it to engage the Main Cam Gear (45) to drive the mechanism through the changer cycle.

Normally, the change in velocity of pick-up arm movement occurs at the end of record play, due to the eccentric record lead-in grooves toward the record spindle.

Proper friction between the automatic trip arm and the Disk Hub (31) is essential to correct automatic trip operation. The respective surfaces of clutch weight, automatic trip arm and disk hub surfaces must be kept free of oil or grease.

C. AUTOMATIC LOCK LEVER—The automatic Lock Lever (48) should move up and down freely with no record on the spindle. Normally, its hooked end adjacent to the Pick-up Arm Raising Disk Hub (31) will be raised clear of the disk hub as long as records are upon the spindle. However, after the last record has been played, the hooked end of the automatic lock lever is in a lowered position (due to record weight removed from spindle). In this position, the hook of the lever obstructs further lateral movement of the disk hub and pick-up arm and the pick-up arm is then lowered on to the OFF Button (25) shutting off the changer mechanism. To allow final indexing of the pick-up arm to play the last record as it leaves the spindle and drops onto the turntable, the hooked end to the automatic lock lever must clear the disk hub. This is accomplished for the last record play through the Tab "B" of the lock lever, shown in Figure 5, as it engages with the adjacent tab of the Rocker Arm Lever and Roller Assembly (40). This prevents the lock lever from being lowered which would otherwise obstruct the disk hub movement for the last record play.

For correct adjustment, there should be a clearance of $\frac{1}{32}$ inch between hook end of lock lever and disk hub, with the changer mechanism at rest and no records on the spindle. To make this adjustment, bend the Tab "F" shown in Figure 5. The tab is located on the Base Plate (37) just beneath the automatic lock lever.

D. VELOCITY TRIP—At the completion of the first part of change cycle, the actuating pawl is engaged by the hook end of the Velocity Trip and Roller Assembly (47) which has been returned to its normal position by the reset points on the Main Cam Drive Gear (45). This hook should be adjusted between .005 to .015 inch clearance from the bottom of the main cam drive gear. Greater clearance may permit the pawl to bounce past the hook and re-engage with the main cam gear sawtooth, causing the changer mechanism to operate into another cycle.

E. INDEXING—The eccentric screw (10) accessible through the top of the Pick-up Arm (4) should take care of any normal adjustment. Turn the screw clockwise to index the pick-up stylus in, toward the spindle, or counterclockwise to index the stylus out, away from the spindle.

Should further adjustment be necessary, proceed as follows: Operate the mechanism by revolving the turntable manually until the stylus drops to within $\frac{1}{2}$ inch of a 10-inch record on the turntable. With a No. 8 Bristol wrench in each of the set screws (points D and E, Fig. 5), alternately loosen one and tighten the other until the stylus rests above the records lead-in groove at the desired point.

Make certain both set screws are tightened after adjustment is completed.

The 12-inch position is indexed automatically by the pressure of a 12-inch record on the Record Selector Fingers (61).

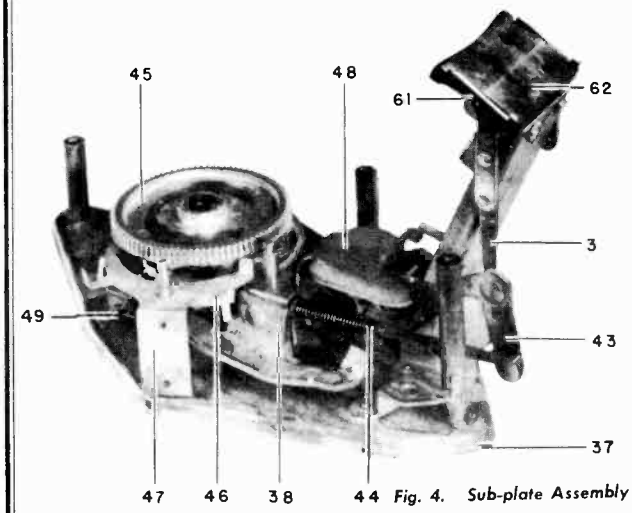


Fig. 4. Sub-plate Assembly

F. PICK-UP ARM LIFT—The stylus should clear the top record of a full stack of records upon the turntable by approximately $\frac{1}{8}$ inch in its approach to, or return travel across the record. Adjust by bending the Pick-up Arm Raising Lever (38) at point "C" shown in Figure 5. *Do not attempt to move Pick-up Arm Raising Disk Hub (31) up or down* as this would upset the adjustment of the Automatic Lock Lever mentioned in a previous paragraph.

G. RECORD DROP ADJUSTMENT—The distance between the Record Selector Fingers (61) and the Record Spindle is critical and should be adjusted as accurately as possible. If this distance is too great, records of minimum diameter will not be pushed off the spindle step during the change cycle. If it is too short, records of maximum diameter will either be over the tips of the record selector fingers (resulting in no record drop and improper pick-up arm index), or be pushed against the spindle with undue force, causing center hole of the record to become damaged.

IMPORTANT: Make certain that a standard size record is used in making the adjustments in the following paragraphs. A standard 10-inch record measures $9\frac{7}{8}$ inches $\pm\frac{1}{32}$ inch in diameter. A standard 12-inch record measures $11\frac{7}{8}$ inches $\pm\frac{1}{32}$ inch in diameter.

With a standard 10-inch record on the spindle, check the distance between the edge of the record and the front of the record selector fingers. This distance should be approximately $\frac{5}{32}$ inch and should be the same for each of the two fingers. With a full stack of records on the spindle, the weight of the records will reduce this distance to about $\frac{1}{8}$ inch. Do not attempt to bend the spindle to adjust this distance. Bending the spindle will destroy the relationship between the heel of the spindle off-set and the horizontal plane of the record. This spacing is set to permit only one record at a time to slide between the heel of the off-set and the step of the spindle. Standard records are 0.70 inch to 0.100 inch in thickness and any change in the angle of the spindle will either close the angle of the off-set which will result in torn center labels on thick records, or open the angle permitting two thin records to drop at one time.

The procedure for adjusting the push-off distance is as follows:

1. Remove the four screws under the Main Plate (6) which hold the Center Trim Section (2).
2. Remove the center trim section by lifting it straight and upward.
3. For forward adjustment of the record selector fingers, wedge a screwdriver between the Rocker Arm and Roller Assembly (40) and the Sub Plate (37) in front of the rocker arm pivot. With the heel of the hand bearing upon the Record Selector Shelf (62), push on shelf to bend rocker arm, bringing record selector fingers nearer to record spindle.
4. For backward adjustment, wedge the screwdriver between the rocker arm and the sub-plate in back of the pivot pin. Push on record selector shelf to bend rocker arm, bringing record selector fingers further away from record spindle.
5. After making adjustment, make certain that both selector arm fingers are equidistant from edge of record. A slight twisting of the rocker arm will bring the fingers to the proper position.

PICK-UP ARM REMOVAL AND REPLACEMENT

The following step-by-step procedure may be used in removing the pick-up arm for service and replacement.

1. The spacing spring between the hinge pins of the pick-up arm bracket must be removed by pressing down on its center until it snaps off the pins. This spring was used to prevent the pick-up arm hinge from coming apart during shipment.
2. With a screwdriver or long-nose pliers, bend in one of the blue steel pick-up arm hinge brackets while lifting up on the arm. This will release the hinge bracket from its hinge pin.
3. Repeat step 2 to free opposite hinge bracket.
4. The pick-up arm may now be removed after freeing pick-up cord from clips.
5. In replacing pick-up arm, the above procedure may be followed in reverse. Make certain cord does not become wedged in bracket. The roller at the rear of pick-up arm hinge should pass beneath the lift bracket attached to the record changer deck. The spacing spring need not be replaced unless the unit is to be shipped.

SUB-PLATE ASSEMBLY (REMOVAL AND ASSEMBLY)

In the event that it becomes necessary to replace any of the major parts of the sub-plate assembly (Figure 4), the entire assembly should first be removed from the main plate. Proceed as follows:

1. Remove the record spindle and turntable.
2. Remove four screws holding Center Trim (2) from Main Plate and remove trim.
3. Remove the Record Selector Shelf (62) held to the Rocker Arm and Roller Assembly (40) by the two screws.
4. Detach Rocker Arm Return Spring (42) from main plate.
5. Remove the four No. 8-32 screws holding the sub-plate studs and the main cam gear stud to the main plate.
6. Main plate may be lifted from sub-plate, letting rocker arm drop through opening of main plate.

Reverse the above procedure to reassemble record changer, making certain pick-up arm shaft, sub-plate dowels and other parts are in their proper position.

RECORD SELECTOR SHELF AND ROCKER ARM ASSEMBLY (REMOVAL AND REASSEMBLY)

The Record Selector Shelf and Rocker Arm Lever Assembly (62 and 40) may be removed from the record changer by detaching its Return Spring (42), removing its Pivot Pin (41) and lifting the assembly out from the top of the record changer.

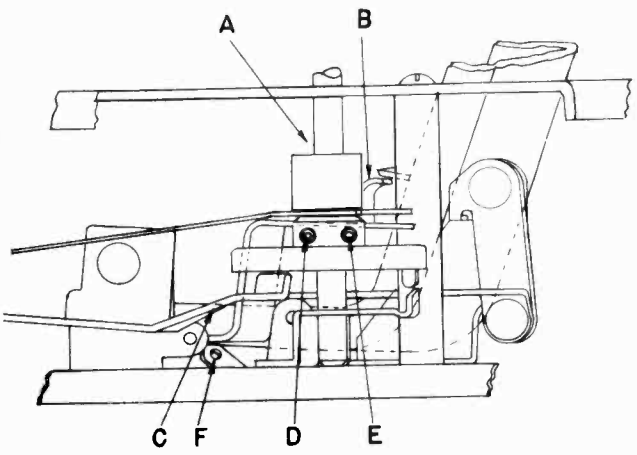


Fig. 5. Adjustment Points

MODEL P10

TROUBLE SHOOTING CHART

SYMPTOMS	REMEDIES OR CAUSES
TRIPPING 1. Automatic Trip Fails.	1. (a) Binding of velocity trip and roller assembly (47). (b) Actuating pawl stuck; part of main cam assembly (46). (c) Automatic trip arm (30) bent and not striking velocity trip and roller (47). (d) Manual trip lever (34) binding. (e) No velocity lead-in eccentric groove at center of record. (f) Foreign matter in record groove or broken record.
2. Manual Trip Fails.	2. (a) Manual trip lever (34); wire spring bent or broken. (b) Velocity trip and roller assembly (47) binding. (c) Actuating pawl stuck.
3. Velocity Trip Fails.	3. (a) Check Service Adjustments paragraphs D. (b) Velocity trip and roller assembly (47) rubbing on main cam gear (45).
4. Last Record Is Not Played.	4. Automatic lock lever failure. Check Service Adjustments, paragraphs C.
PICK-UP INDEXING 1. Pick-up does not start in proper record groove.	1. Check Service Adjustments, paragraphs E.
PICK-UP ARM MOVEMENT 1. Pick-up arm lift too high or too low.	1. Check Service Adjustments, paragraphs F.
RECORD DROP 1. Inconsistent record drop.	1. Check Service Adjustments, paragraphs G.
MOTOR 1. Motor does not shut off automatically.	1. (a) OFF button stuck. (b) Defective switch. (c) Defective switch mechanism.

MODEL P10 REPLACEMENT PARTS LIST

CAT. NO.	REF.	DESCRIPTION
RMS-181	60	SPRING—Record changer mounting spring
RMT-008		TURNTABLE—Record turntable
RMW-053	14	WHEEL—Turntable drive wheel (78 rpm)
RMW-055	27	DRIVE BUSHING—Motor shaft drive bushing and set screw
RMW-056	16	WHEEL—Turntable drive wheel (33 1/3 rpm)
RMX-071	8	BEARING—Ball bearing and retainer assembly
RMX-072	9	STUD—Turntable shaft assembly
RMX-077	46	CAM—Main cam assembly
RMX-078	47	LEVER—Velocity trip and roller assembly
RMX-081	11, 12, 13	GEAR ASSEMBLY—Fiber idler drive gears, coupling, washer, and mounting bolt
RMX-097		RECORD SPINDLE
RMX-102	38	LEVER—Pick-up arm raising lever and bracket assembly
RMX-119	61, 62, 63	RECORD PUSH-OFF SHELF ASSEMBLY—Plastic shelf with record selector fingers and index arm attached
RMX-128	51	PICK-UP ARM HINGE—Hinge assembly for pick-up arm
RMX-129	5	PIVOT POST—Pick-up arm pivot shaft and hinge bracket
RMX-135	35	SHAFT ASSEMBLY—Speed control shaft with retaining washer and toggle arm
RMX-137	52	SPRING AND BRACKET—Pick-up arm counterbalance assembly
RPA-010	4	PICK-UP ARM—Plastic shell with female receptacle and pick-up cord
RPH-003	19	PICK-UP HEAD—Tan colored plastic head with male connector tips and ballast weight (less pick-up cartridge)
RPH-004	19	PICK-UP HEAD—Red colored plastic head with male connector tips (less pick-up cartridge)
RPJ-001		STYLUS ASSEMBLY—3 mil sapphire replaceable stylus (for use with standard groove records)
RPJ-005		STYLUS ASSEMBLY—1 mil sapphire replaceable stylus (for use with microgroove records)
RPX-040		PICK-UP CARTRIDGE—Includes 3 mil sapphire replaceable stylus RPJ-001
RPX-041		PICK-UP CARTRIDGE—Includes 1 mil sapphire replaceable stylus RPJ-005
RSS-004		SWITCH—A-C power switch
RSX-014	33	SWITCH ASSEMBLY—Complete mechanical assembly with a-c switch (less ON and OFF buttons)
RSX-016	36	SPEED CONTROL MOUNTING KIT—Consists of: bushing, dial escutcheon, toggle bracket, lock washer, and hex nut
RWP-003		WEIGHT—Used in tan pick-up head (19) to obtain correct stylus pressure for 3 mil cartridge
RAA-008	30	ARM—Automatic trip arm
RBX-017	26	MOTOR—60-cycle motor
RDB-013	24	BUTTON—"ON" button
RDB-014	25	BUTTON—"OFF" button
RDF-007	21	WASHER—Felt washer over turntable drive wheels
RDK-091	23	KNOB—Manual control knob and spring washer
RDK-167	32	KNOB—Speed control knob
RHC-011	22	CLIP—Retaining clip for turntable idler drive wheels
RHG-024	59	MOUNTING BUSHING—Rubber mounting bushing for record changer mounting springs
RHM-031	53	GROMMET—Rubber shock mount for motor mounting
RHR-001		RIVET—For mounting turntable drive wheel lever (15)
RHS-003		SET SCREW—Allen Head, cone point, 8-32 x 1/4 inch for pick-up arm raising disk hub (31)
RHS-009	13	SCREW—Mounting screw for idler drive gears
RHW-003	7	WASHER—Turntable bearing race washer
RHW-004	20	WASHER—Fiber washer beneath turntable drive wheels
RMF-010	1	RECORD STABILIZER WEIGHT
RMG-005	45	GEAR—Main cam drive gear
RMK-003	12	GEAR COUPLING—Drive coupling between idler drive gears
RML-010	48	LEVER—Automatic shut-off lock lever
RML-017	40	ARM—Rocker arm and roller assembly (less record selector shelf and fingers)
RML-018	43	LEVER—Index selector lever
RML-022	34	LEVER—Manual trip lever and wire assembly
RML-024	15	LINK LEVER—Supports one of each turntable drive wheel
RML-025	50	LEVER PLATE—Speed control lever plate with neutral positioning flat index spring
RML-026	28	LEVER—Turntable drive wheel link lever release
RMM-038		COVER—A-C power switch cover
RMM-079	31	DISK AND HUB—Pick-up arm raising disk with set screws
RMM-088	62	RECORD PUSH-OFF SHELF—Plastic record shelf
RMP-008	41	PIN—Rocker arm pivot pin
RMP-009	49	PIN—Pivot pin for automatic shut-off lever
RMS-071	39	SPRING—Pick-up arm raising lever tension spring
RMS-074	44	SPRING—Index rod compression spring
RMS-075	42	SPRING—Rocker arm return spring
RMS-175	17	SPRING—Tension spring on 78 rpm turntable drive wheel
RMS-176	18	SPRING—Tension spring on 33 1/3 rpm turntable drive wheel
RMS-177	54	SPRING—Tension spring on speed control shaft toggle
RMS-179		SPRING—Used in mounting pick-up cartridges (19)

GENERAL

This record changer is designed to operate from a power source of 105-125 volts at 60 cycles per second. It is a dual speed type of 33⅓ rpm or 78 rpm for playing the standard records automatically or the "Long Play" records manually.

This changer is similar to the Model P6 except for the addition of the pickup arm with the 1 mil stylus for playing the narrow groove records and the dual-speed motor. A switch has been added to switch to either pickup arm. For detailed information, on automatic operation, trouble shooting, and replacement parts common to both the P6 and the P11, refer to ER-S-P6. Only parts special to the P11 changer are given below.

CONTROLS

1. The CONTROL KNOB turns the power to the motor "ON" in *Manual* or *Auto.* position and will cancel a record being played when rotated to *Rej.*
2. If the SPEED CHANGE KNOB is rotated to *Long Play*, the turntable will rotate at 33⅓ rpm. When rotated to *St'd Play*, the turntable will rotate at 78 rpm. When the record changer is not in use, this knob should be rotated to the center position to relieve pressure from the rubber tired idler wheel.
3. PICKUP ARM SWITCH should be switched to *St'd Play* when playing records of the wide or standard groove. This switch should be switched to *Long Play* when playing 33⅓ rpm "Long Play" records which have the narrow or microgroove type of grooves.
4. 10-INCH RECORD SHELF should be raised to a vertical position when playing 12-inch records or lowered to a horizontal position when playing 10-inch records automatically.
5. HOLD-DOWN ARM should be lowered onto the top record of the stack when playing records automatically.

MANUAL OPERATION

1. Raise the hold-down arm and the 10-inch record support to a vertical position and lower the record onto the turntable over the spindle.
2. Select the proper turntable speed with the SPEED CONTROL KNOB.
3. Set the PICKUP ARM SWITCH to select the proper pickup arm.
4. Rotate the CONTROL KNOB to manual.
5. Place the stylus of the proper pickup arm in the lead-in groove of the record.
6. After the record has been played, lift the pickup arm and place it at its rest position. Rotate the CONTROL KNOB to the "OFF" position to stop the turntable.

AUTOMATIC OPERATION

1. Place up to ten 12-inch or twelve 10-inch records over the spindle resting on the spindle shelf and the 12-inch shelf or the 10-inch shelf. Lower the HOLD DOWN ARM onto the records.
2. Set the PICKUP ARM SWITCH to *St'd Play.*

Note: Only records of the wide or standard groove width which require a 3 mil stylus may be played automatically on this changer.

3. Select the proper speed for the records with the SPEED CONTROL KNOB. Note: Do not intermix records requiring different turntable speeds.
4. Rotate the CONTROL KNOB to *Rej.* and release it. The record changer will automatically play the records. After the last has played, lift the pickup arm and place it on its rest position. Rotate the CONTROL KNOB to "*OFF*" to stop the changer.

OPERATING PRECAUTIONS

Do not use warped records for automatic operation. For warped, odd-size, or home-recorded records, play as for manual operation.

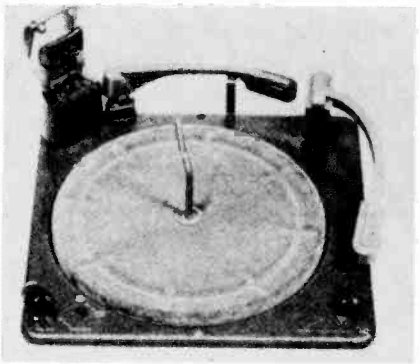
When playing microgroove records, do not allow the St'd Pickup to contact the records as this may damage the record surface.

Do not allow oil or grease to come in contact with the rubber of the idler wheel.

P11 REPLACEMENT PARTS LIST

Cat. No.	Description	Ref. No.
RAC-077	COVER—Terminal cover	113
RBH-011	MOTOR—Two-speed phono-motor (see Fig. 4)	100
RHG-023	GROMMET—For motor speed lever	103
RHX-017	ARM REST—Assembly	110
RMM-092	ARM REST BUMPER	109
RMM-108	LEVER—Motor speed lever	102
RMM-109	"C" WASHER	104
RMM-110	LEVER—Motor speed change lever	105
RMM-111	WASHER—Friction washer	106
RMM-112	SPACER—Thin motor spacer	107
RMM-113	SPACER—Thick motor spacer	108
RMS-178	SPRING—Balance spring inside RPA-008	112
RPA-008	TONE ARM ASSEMBLY—For LP records	111
RPX-040	STANDARD PLAY PICKUP	
RPX-041	LONG PLAY PICKUP	
RSW-067	SWITCH—Tone arm switch	101

MODEL P11



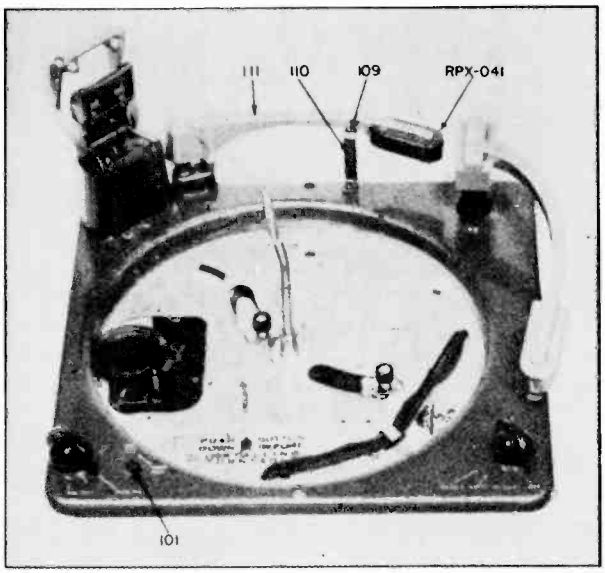


Fig. 1

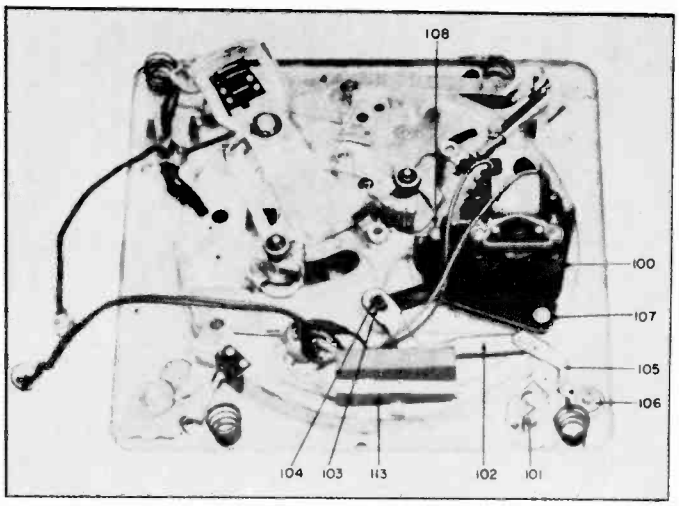


Fig. 2

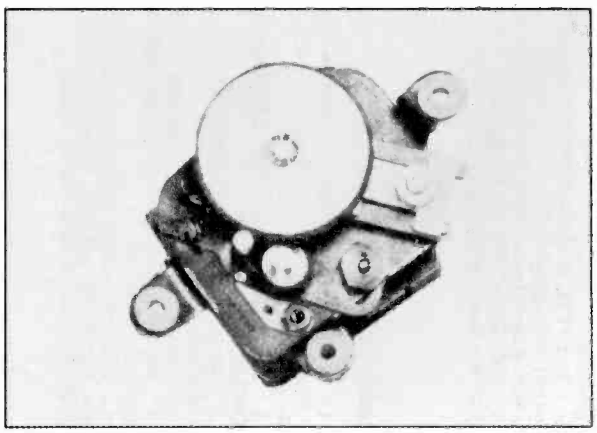


Fig. 3. RBH-010

Two-speed phono motor with belt driven 33⅓ RPM bushing

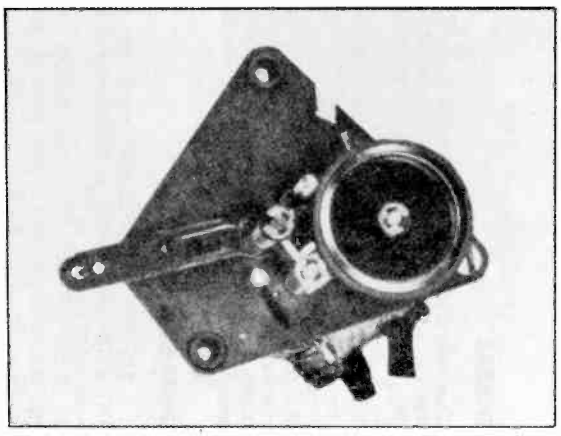


Fig. 4. RBH-011

Two-speed phono motor with idler wheel switching cam

MILWAUKEE Record Changer
No. 11200 Series

TO OPERATE MANUALLY

Raise the record balance arm (42) and the 10" record support (38).
Place a record on the turntable and turn the control button to the manual position.
Place the pickup arm at the start of the record and return it to the pickup arm rest at the end of the record.

TO OPERATE AUTOMATICALLY

Place the pickup arm on the pickup arm rest and raise the record balance arm (42).
(The 10" record support (38) must be lowered for 10" records and raised for 12" records.)
Place 12-10" or 10-12" records on the spindle and record support.
Lower the record balance arm (42) and turn the control button to reject and release it. it will automatically return to the automatic position.
To reject an unfinished record turn the control button to reject and release it.
To remove records from the turntable, turn the control button to the OFF position and raise the record balance arm (42) and the 10" record support (38) and lift the records off.

CYCLE OF OPERATION

The following drawings show a complete cycle of operation. Figures 1, 1A, 1B and 1C show the mechanism in the OFF or nonoperating position. The rest of the Figures show the mechanism in various phases of the change cycle.

To start the change cycle turn the control button (126) to the Reject position as shown in Fig. 2. This causes the notched washer (127) to take the position shown in Fig. 2B. And as soon as the control button (126) Fig. 2 is released, the selector lever spring forces the notched washer (127) Fig. 3B, also (126) Fig. 3, into the automatic position. This action of the notched washer causes point A of the selector lever (132) Fig. 2B to move against the ON-OFF switch (125 Fig. 2B applying voltage to the motor.

Point B of the selector lever (132) Fig. 2B moves away from the lead roller shoulder nut (95) Fig. 2B. Point C of the selector lever (132) pushes against the lead roller dropping lever (78) Fig. 2B causing it to move away from the lead roller shoulder nut (95) Fig. 2B. Thereby, allowing the lead roller (94) Fig. 2A to enter the spiral cam underneath the turntable Fig. 2A.

Fig. 2C shows the lead roller (94) engaged with the spiral cam. This starts the change cycle by the action of the spiral cam forcing the lead roller (94) Fig. 3C and the swing arm (71) Fig. 3B toward the center of the turntable. As the swing arm moves toward the center of the turntable, the cammed end of it (Point D), Fig. 3B forces the adjusting plunger pin (21) Fig. 3C upward raising the pickup arm (14) Fig. 3C from the pickup arm rest (2) Fig. 3C.

As the swing arm (71) Fig. 3B moves farther toward the center of the turntable, the ratchet arm friction springs (82 and 83) Fig. 3B engage the ratchet arm (7) Fig. 3B and swings the pickup arm (14) Fig. 3 away from the turntable (136) Fig. 3 until the ratchet arm (7) Fig. 3B is stopped by coming in contact with the ratchet arm stop bracket (142) Fig. 3B.

MODEL 11200, Series

As the swing arm (71) Fig. 3B starts toward the center of the turntable, Point E, on the swing arm (71) Fig. 3B moves away from the ratchet arm lever (64) Fig. 3B allowing it to pivot up due to the tension of the ratchet arm lever spring (69) Fig. 3B so that it will be in a position for Point F of the ratchet arm lever to contact the ratchet arm (7) Fig. 3 B at the proper point for the pickup arm (14) Fig. 3C to set down on the record. If it were not engaged at the proper point, the tension of the ratchet arm friction springs (82 and 83) Fig. 3B would carry the pickup arm past the start of the record.

Another operation that is taking place as the swing arm (71) Fig. 3B moves toward the center of the turntable is that the roller (73) Fig. 3B of the cammed dropping lever (74) Fig. 3B, makes contact with the lever trip bracket (109)Fig. 3B and gradually forces the cammed dropping lever away from the bearing pin shoulder nut (103) Fig. 3C so that as soon as a record is dropped, the lower or return roller (102) Fig. 3C also (102) Fig. 3A is allowed to enter the spiral cam Fig. 3A so that the swing arm (71) Fig. 3B can return to its original position. This will be covered later, as soon as this phase of the change cycle occurs.

Point G of the swing arm (71) Fig. 3B pushes against the roller (117) Fig. 3B of the ejector idler lever (118) Fig. 3B and the adjusting screw (119) Fig. 3B on the ejector idler lever (118) Fig. 3B pushes against the lower push pin (114) Fig. 3B, which in turn pushes against the ejector lever (31) Fig. 3B (a side view of the ejector lever (31) is shown in Fig. 6). The ejector lever (31) Fig. 6A then pushes against the 12" record slide bolt (33) Fig. 6A which pushes the 10" record slide bolt (40) Fig. 6A; causing the 10" record to drop on the turntable.

To play a 12" record, raise the 10" record support (38) Fig. 8, which causes point J on the 10" record support (38) Fig. 8 to engage the change lever ejector (28) Fig. 8A, which pivots and moves the change lever (67) Fig. 1B, toward the rear of the changer base plate. This allows the ratchet arm lever (64) Fig. 1B to pivot more causing the ratchet arm (7) Fig. 1B to hit against point K on the ratchet arm lever (64) Fig. 1B causing the 12" record to land on the turntable, as was the case with Point F for the 10" record.

As mentioned in a previous paragraph, the roller (73) Fig. 3B of the cammed dropping lever (74) Fig. 3B has made contact with the lever trip bracket (109) Fig. 3B and has forced the cammed dropping lever (74) Fig. 3B away from the bearing pin shoulder nut (103) Fig. 3C allowing the lower or return roller (102) Fig. 3A (also 102) Fig. 3C) to enter the spiral cam Fig. 3A and so to return the swing arm (71) Fig. 3B to its original position.

The lead roller (94) Fig. 3A (also 94 Fig. 3C) is then forced out of the spiral cam by a raised portion of the spiral cam Point H Fig. 3A. Through the action of the tension spring (79) Fig. 3B the lead roller dropping lever (78) Fig. 3B is moved into position over the lead roller shoulder nut (95) Fig. 3B thereby keeping the lead roller (94) Fig. 3C also Fig. 3A out of the spiral cam.

As the swing arm (71) starts back to its original position, the ejector mechanism returns to its' original position. The pickup arm is being moved into position to land on the record through the action of the ratchet arm friction springs (82 and 83) Fig. 4B, on the ratchet arm (7) Fig. 4B.

As explained in a previous paragraph, the ratchet arm lever (64) Fig. 4B has been moved up so as to stop the ratchet arm (7) Fig. 4B at the proper position for the pickup arm to land on the record. As the swing arm (71) Fig. 4B nears the end of its' return swing Point I of the swing arm engages

the friction brake spring spring (61) Fig. 4B. This insures smooth lowering of the pickup arm and also tends to hold the swing arm (71) Fig. 4B in the same position while a record is being played. As soon as the adjusting plunger pin (21) Fig. 4C starts down the cammed end Point D Fig. 4B of the swing arm (71) Fig. 4B the ratchet arm friction springs (82 and 83) Fig. 4B disengage from the ratchet arm (7) Fig. 4B. Point F of the ratchet arm lever (64) Fig. 4B is forced away from the ratchet arm (7) Fig. 4B by Point E on the swing arm (71) Fig. 4B.

The pickup arm (14) Fig. 4 also Fig. 4C is lowered on the record and then Point H of the spiral cam Fig. 4A forces the lower or return roller (102) Fig. 4A also Fig. 4C out of the spiral cam. Through the action of the tension spring (76) Fig. 4B the cammed dropping lever (74) Fig. 4B also Fig. 4C is moved into position over the bearing pin shoulder nut (103) Fig. 4C thereby keeping the lower or return roller (102) Fig. 4C out of the spiral cam. Thus the pickup arm can continue across the record.

Fig. 5 shows the pickup arm (14) at the end of the record, and Fig. 5A shows how the ratchet arm (7) has also moved to the end of the record and the adjusting screw (11) of the ratchet arm (7) is just at the point of pushing the lead roller dropping lever (78) away from the lead roller shoulder nut (95) so that the lead roller (94) Fig. 5B may enter the spiral cam for another cycle of operation.

MODEL 11200, Series

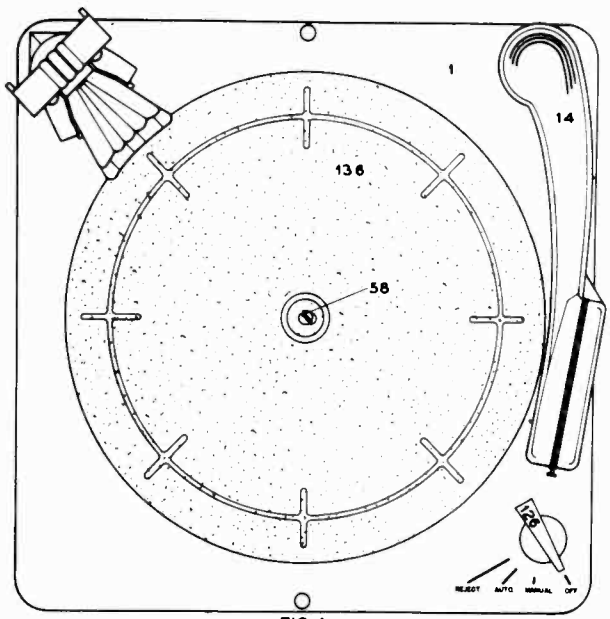


FIG. 1
TOP VIEW
(NORMAL POSITION)

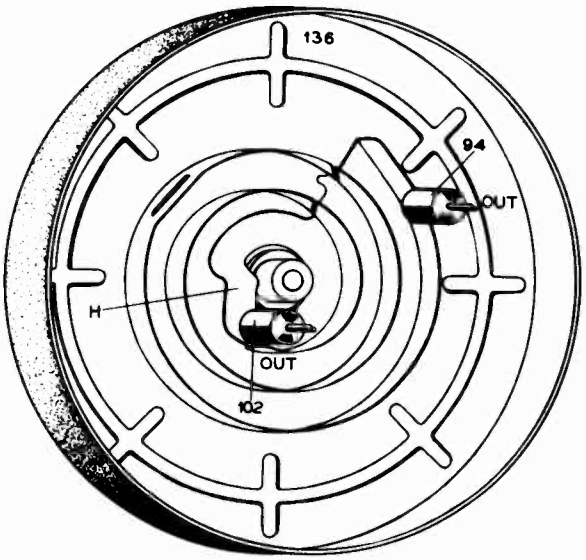


FIG. 1A
BOTTOM VIEW OF TURNTABLE
SHOWING SPIRAL CAM IN
NORMAL POSITION

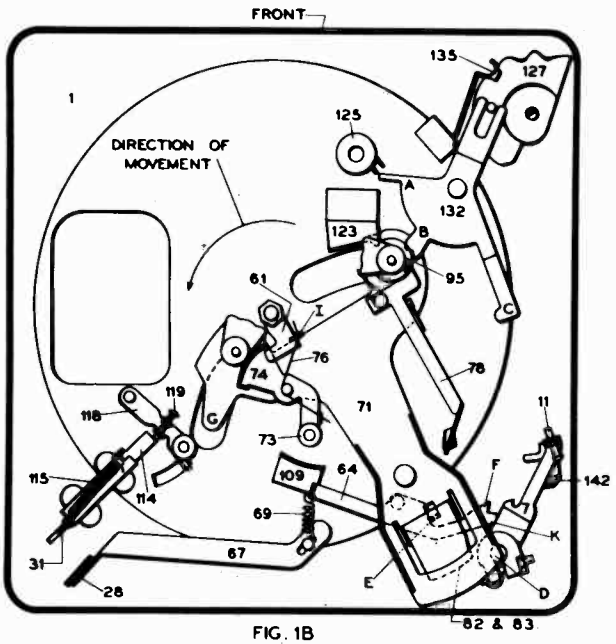


FIG. 1B
BOTTOM VIEW
(NORMAL POSITION)

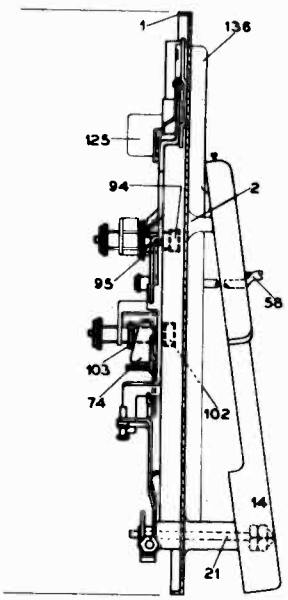


FIG. 1C
RIGHT END VIEW

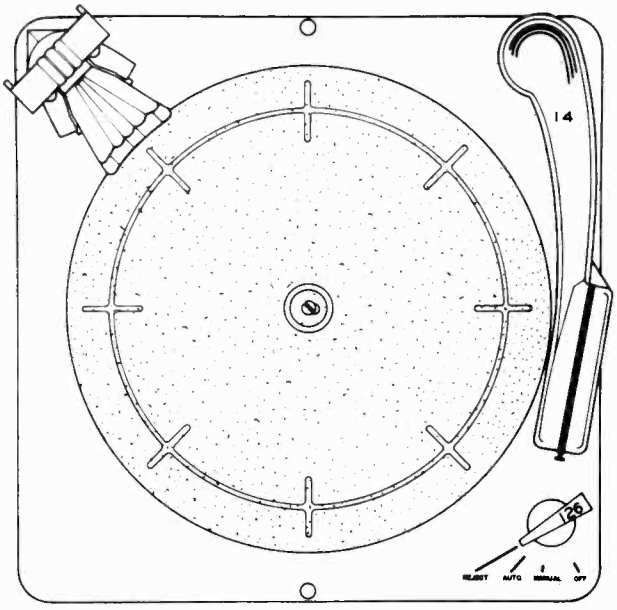


FIG. 2
TOP VIEW
(REJECT POSITION)

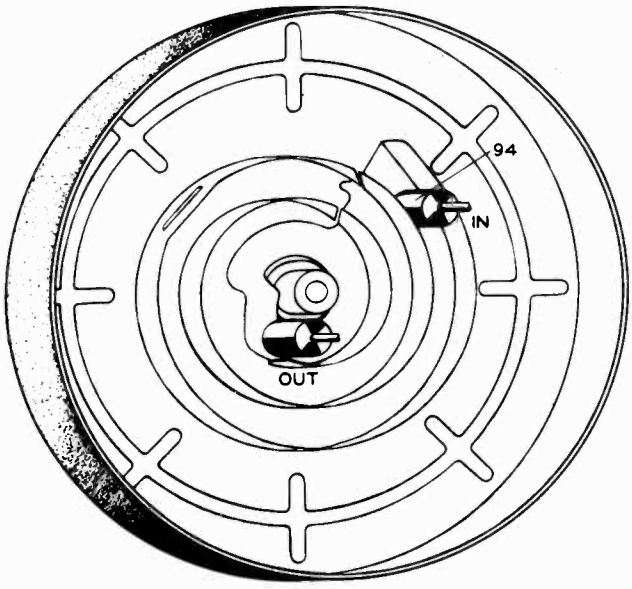


FIG. 2A
BOTTOM VIEW OF TURNTABLE
SHOWING SPIRAL CAM IN
REJECT POSITION

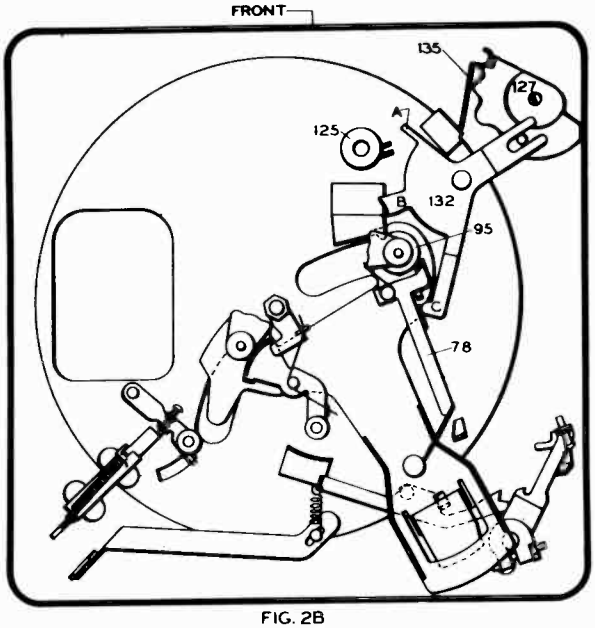


FIG. 2B
BOTTOM VIEW
(REJECT POSITION)

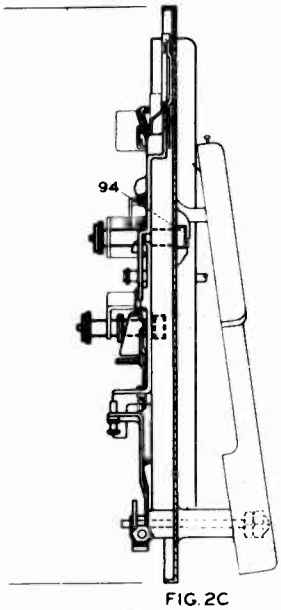


FIG. 2C
RIGHT END VIEW

MODEL 11200, Series

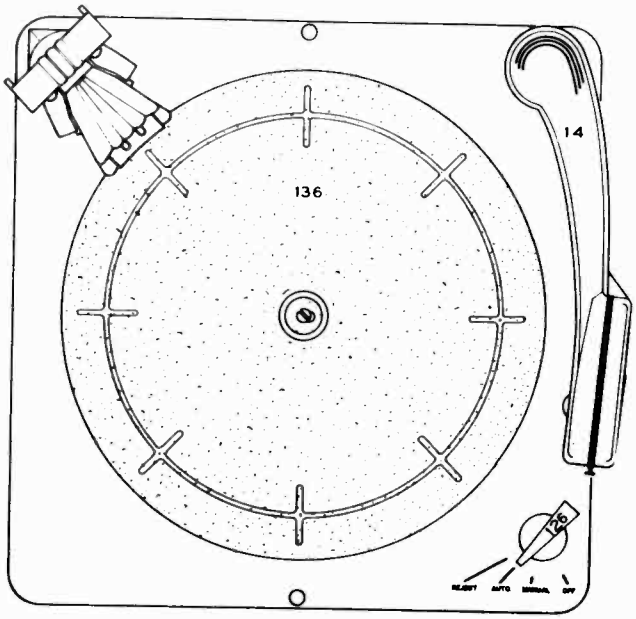


FIG. 3
TOP VIEW
AUTOMATIC POSITION
(RECORD EJECTED)

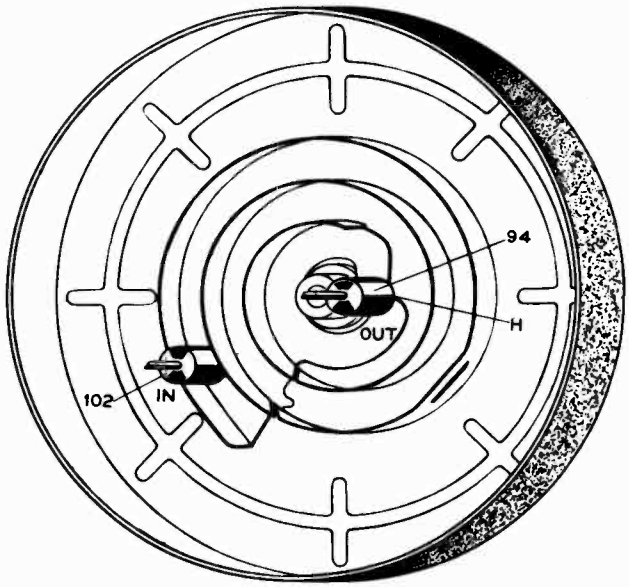


FIG. 3A
BOTTOM VIEW OF TURNTABLE
SHOWING SPIRAL CAM IN
RECORD EJECTING POSITION

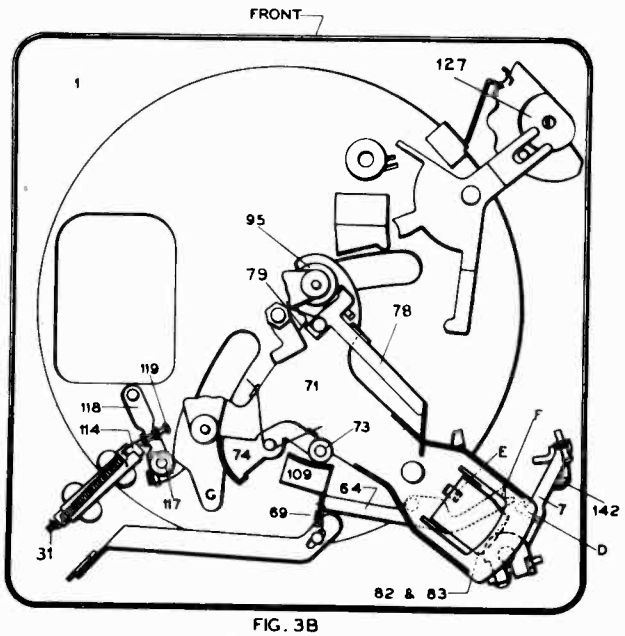


FIG. 3B
BOTTOM VIEW
(AUTOMATIC POSITION)

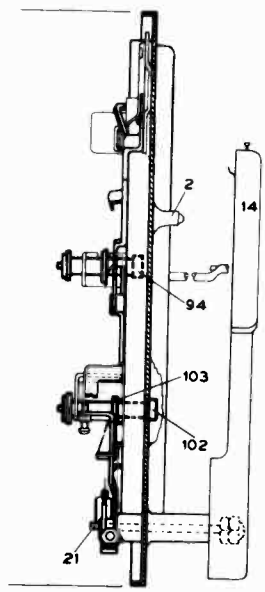


FIG. 3C
RIGHT END VIEW

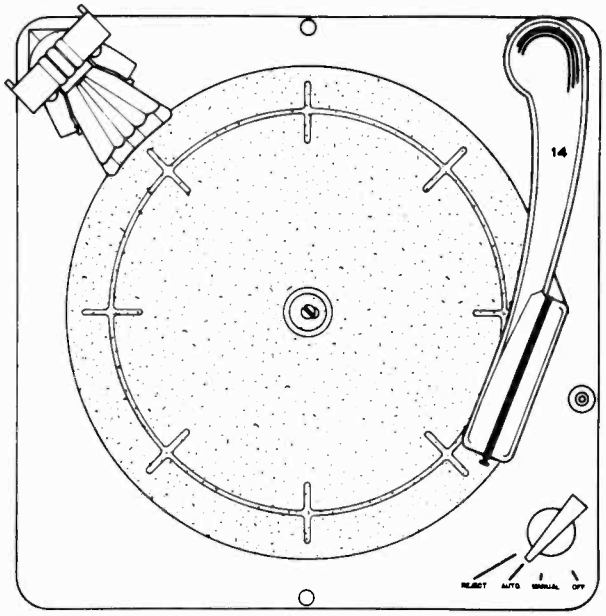


FIG. 4
TOP VIEW
AUTOMATIC POSITION
(START OF RECORD)

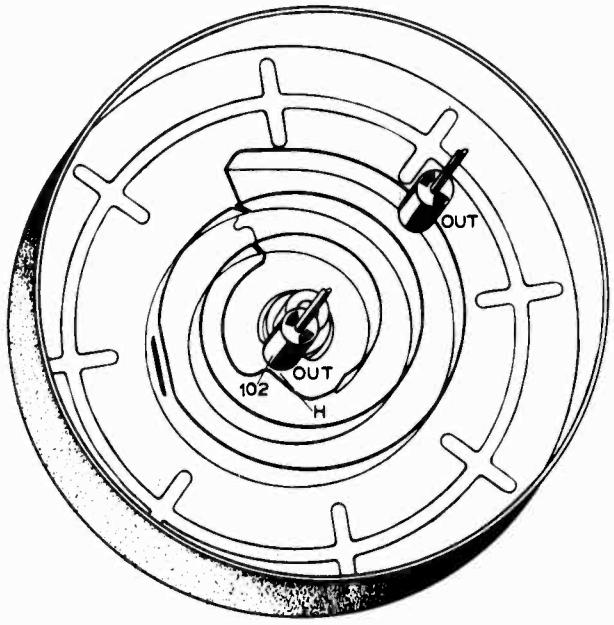


FIG. 4A
BOTTOM VIEW OF TURNTABLE
SHOWING SPIRAL CAM IN
CYCLE OF RECORD PLAYING POSITION

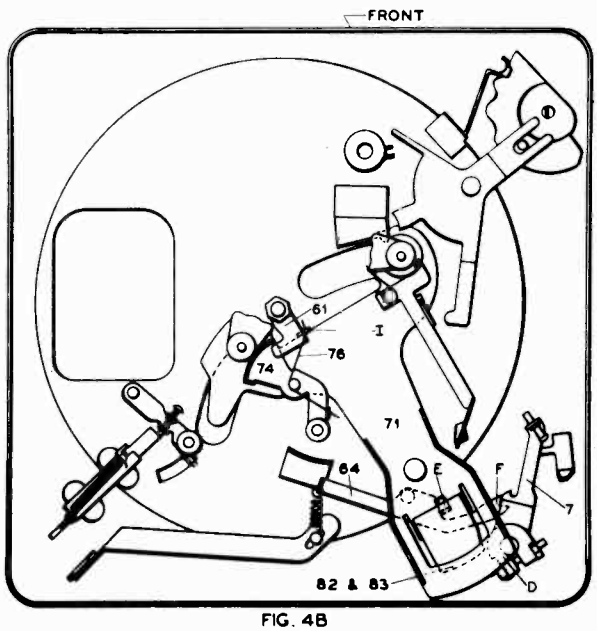


FIG. 4B
BOTTOM VIEW
(START OF RECORD POSITION)

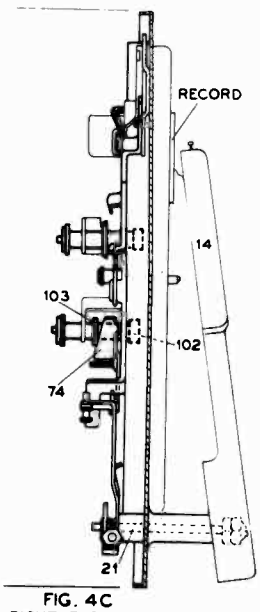


FIG. 4C
RIGHT END VIEW

MODEL 11200, Series

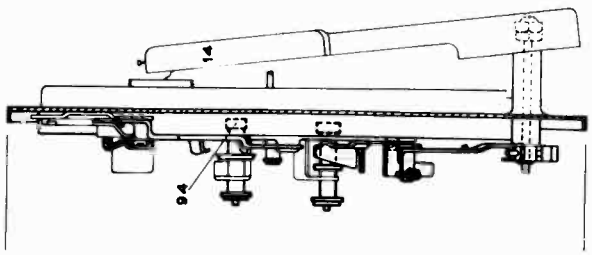


FIG. 5B
RIGHT END VIEW

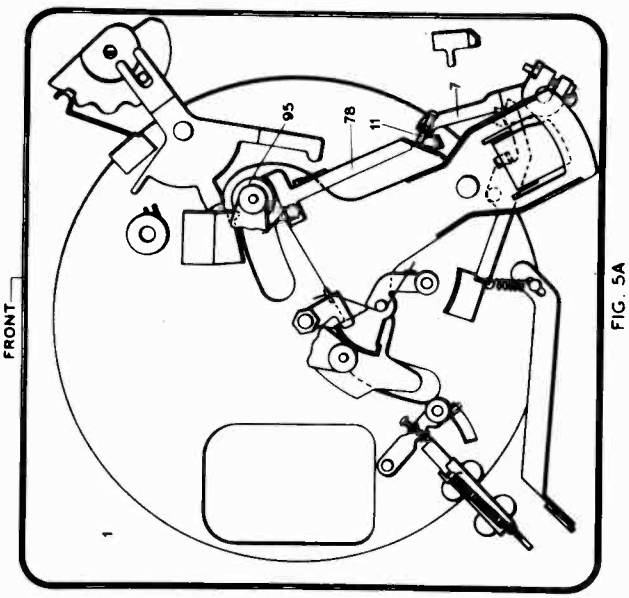


FIG. 5A
BOTTOM VIEW
(END OF RECORD POSITION)

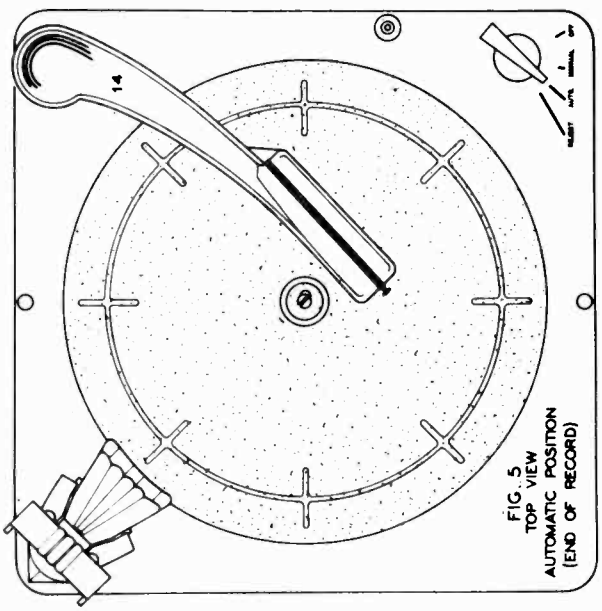


FIG. 5
TOP VIEW
AUTOMATIC POSITION
(END OF RECORD)

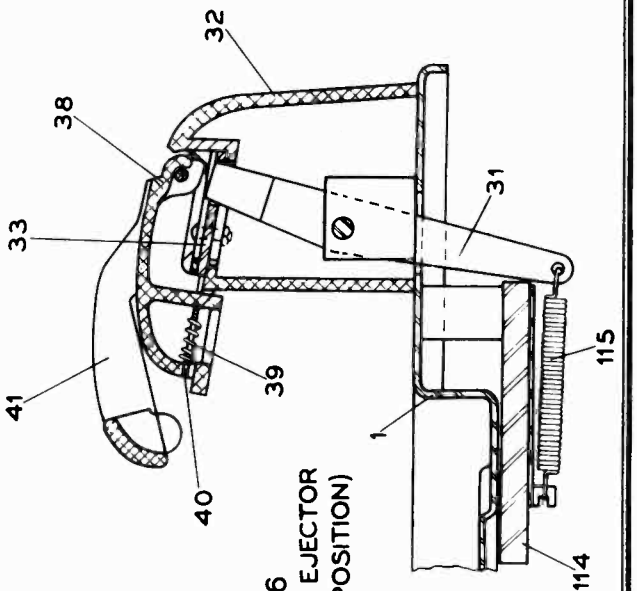


FIG. 6
10" RECORD EJECTOR
(NORMAL POSITION)

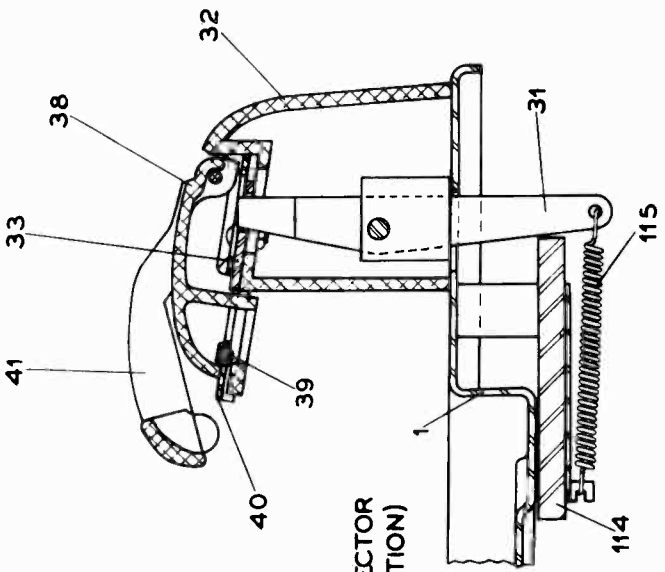


FIG. 6A
10" RECORD EJECTOR
(EJECTING POSITION)

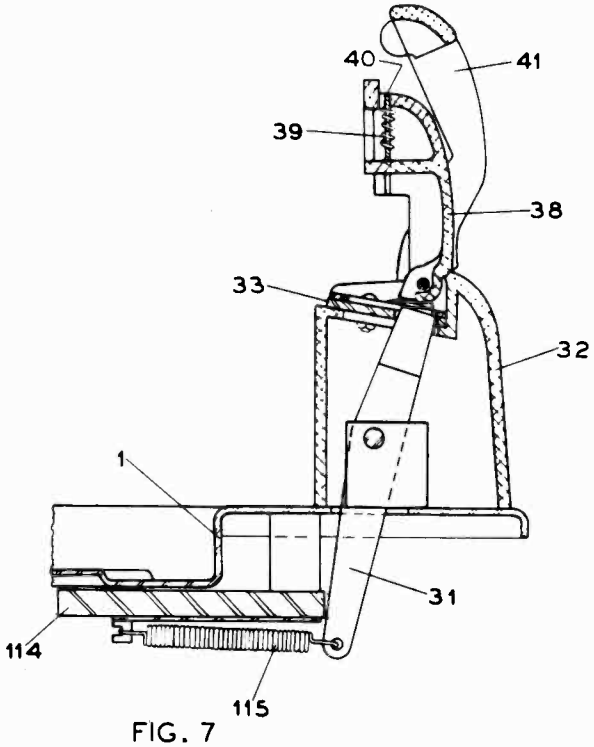


FIG. 7
12" RECORD EJECTOR
(NORMAL POSITION)

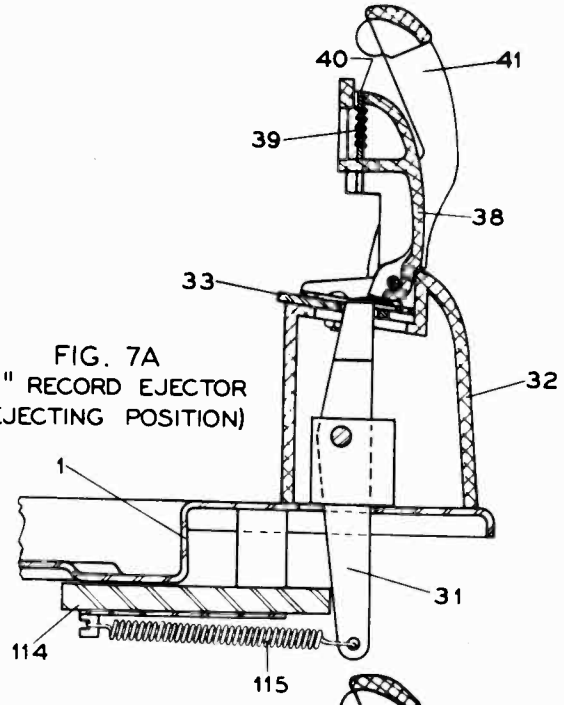


FIG. 7A
12" RECORD EJECTOR
(EJECTING POSITION)

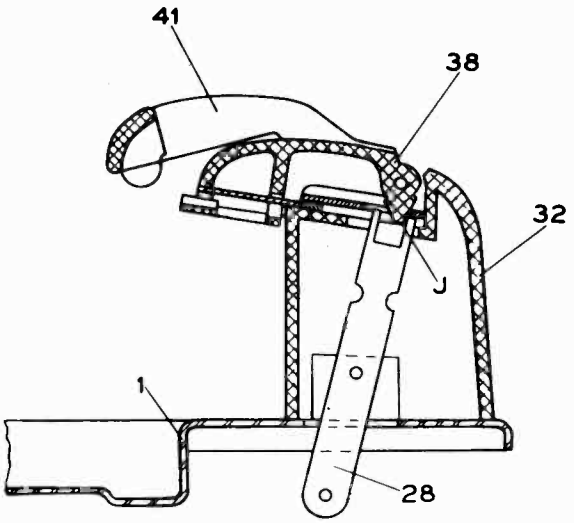


FIG. 8
CHANGE LEVER EJECTOR (28)
IN 10" POSITION

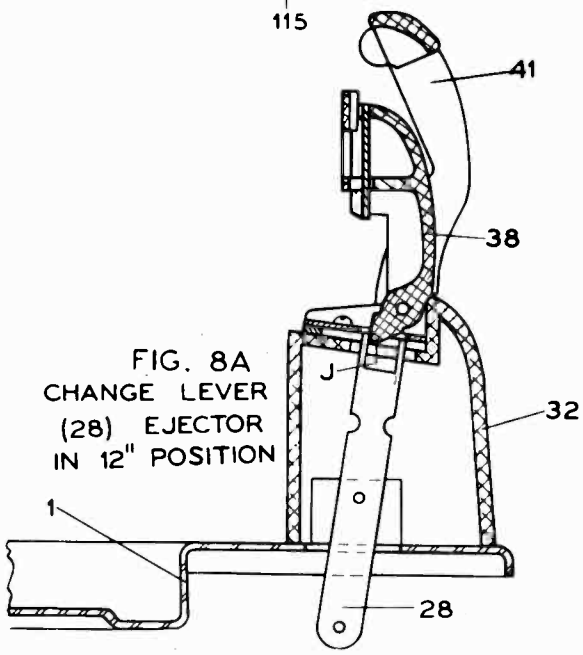


FIG. 8A
CHANGE LEVER
(28) EJECTOR
IN 12" POSITION

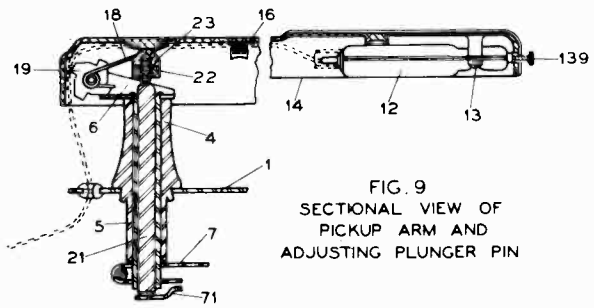


FIG. 9
SECTIONAL VIEW OF
PICKUP ARM AND
ADJUSTING PLUNGER PIN

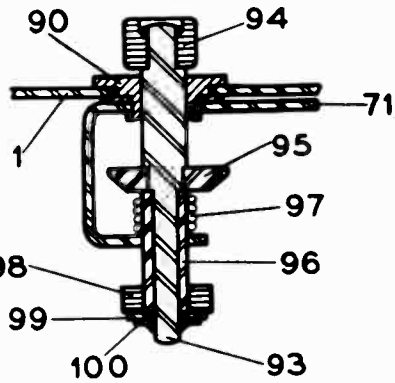
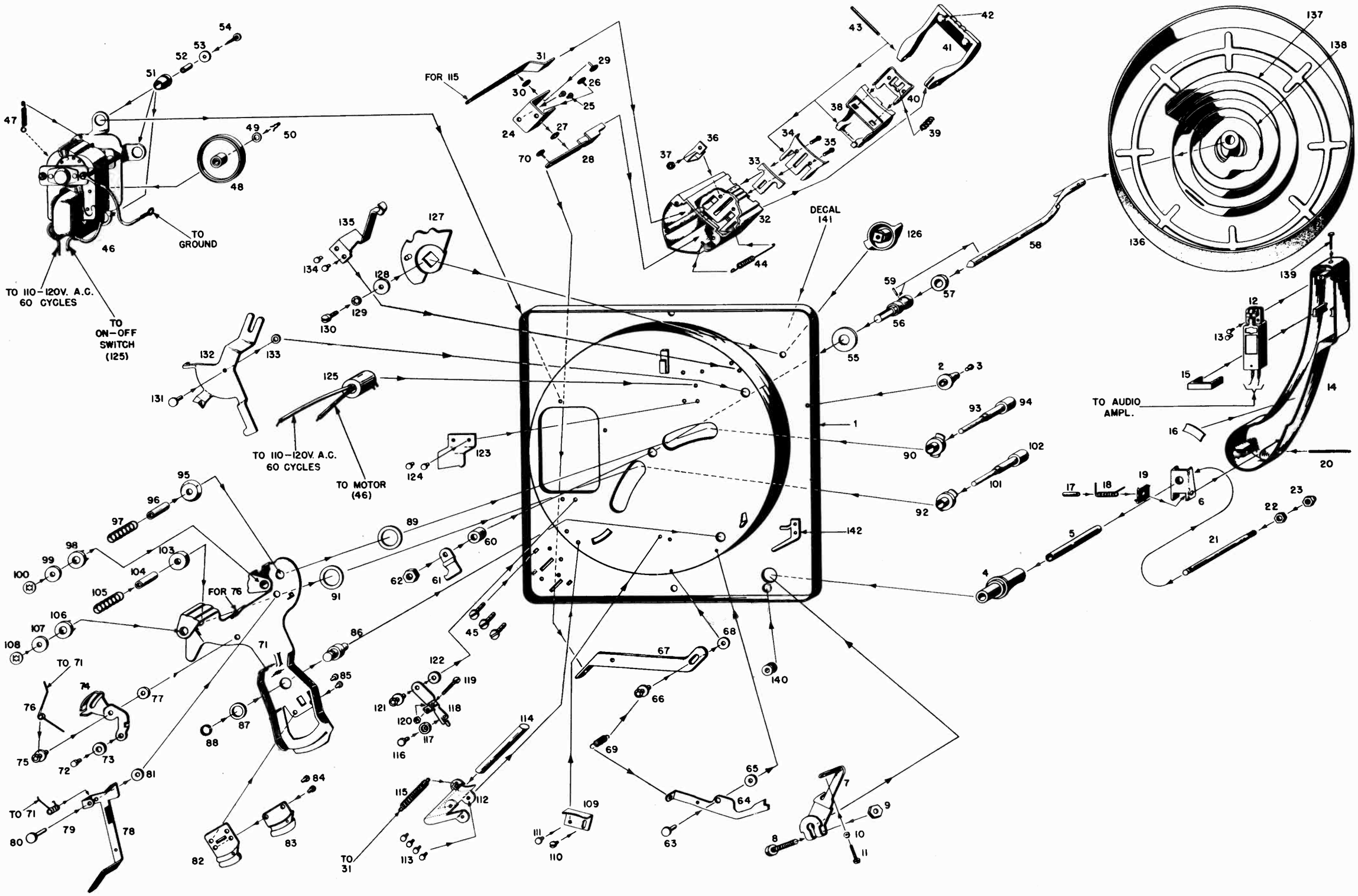


FIG. 10
SECTIONAL
VIEW OF
LEAD ROLLER
ASSEMBLY

TROUBLE SHOOTING CHART

SYMPTOMS	CAUSES	REMEDIES
1-Mechanism continues to cycle	1-Broken or bent selector lever spring (135)	1-Replace if broken 1a-If bent, remove the notched washer (127) and straighten the spring
2-Mechanism jams on return half of cycle	1-A broken or leave dropping lever tension spring (79)	1-Replace if broken 1a-Reset in proper place if loose
3-Mechanism jams on forward	1-A broken or loose cammed dropping lever spring (76)	1-Replace if broken 1a-Reset in proper place if loose
4-Mechanism trips before end	1-Ratchet arm adjusting screen (11) turned too far clockwise	1-Turn adjusting screw (11) counterclockwise until proper point is reached
5-Mechanism does not trip at end of record	1-Ratchet arm adjusting screw (11) turned too far counterclockwise 2-Lead roller compression spring (97) too weak to push lead roller (94) into spiral cam (137 & 138)	1-Turn adjusting screw (11) counterclockwise until proper point is reached 2-Replace compression spring (97)
6-Pickup arm (14) jumps groove	1-The lead roller dropping lever (78) may be bent and is jammed	1-Straighten it out and check to see that it moves freely
7- Pickup arm (14) lands too fast on record	1-Friction broke spring (61) weak or broken	1-Replace spring
8-Pickup arm (14) does not land at start of record	1-Ratchet arm lever spring (69) may be too weak to hold ratchet arm lever (64) in place 2-The ratchet arm clamp screw (8) may be loose	1-Replace spring 2-Disconnect line cord and place control button (126) on automatic. Trip the mechanism and rotate manually noting where pickup arm lands. Loosen clamp screw (8) and holding ratchet arm in place move pickup to start of record and tighten clamp screw (8)



TROUBLE SHOOTING SHART (Cont'd)

SYMPTOMS	CAUSES	REMEDIES
9-Pickup arm (14) does not land on record	1-Acorn nut (23) on plunger pin (21) not properly adjusted	1-Loosen jam nut (22) and screw acorn nut (23) farther down on plunger pin (21)
	2-Shielded lead from crystal pickup may be between arm (14) and acorn nut (23)	2-Dress shielded head over to one side out of the way
10-Records do not drop	1-The idler lever adjusting screw (119) not adjusted properly	1-Turn the adjusting screw (119) until the 12" record slide bolt (33) extends slightly beyond the front edge of the 12" record support (34)
	2-The ejector arm extension spring (115) loose or broken	2-If loose reconnect, if broken replace
	3-The 10" ejector compression spring (39) weak or	3-Replace spring
11-No sound	1-Audio amplifiers defective	1-Check with radio reception
	2-Crystal pickup leads shorted	2-Check for shorted leads
	3-Crystal cartridge defective	3-Try new cartridge
12-Distorted sound	1-Audio amplifier defective	1-Check with radio reception
	2-Defective or worn needle	2-Replace needle
	3-Defective crystal cartridge	3-Try new cartridge
	4-Worn record	4-Try new record
13-Wow or motor rumble	1-Worn spots in idler wheel (46)	1-Replace idler wheel or if worn spots are not too deep try sanding the idler wheel smooth
	2-Oil on idler wheel (46) and turntable rim	2-Clean idler wheel and turntable rim
	3-Warped record	
14-Change cycle is too slow or motor overheats	1-Moving parts binding	1-Locate part and oil lightly
	2-Line voltage incorrect	2-Check for correct line voltage 115 to 117 volts 60 cycles
	3-Defective motor winding	3-Replace motor if defective

MILWAUKEE RECORD CHANGER

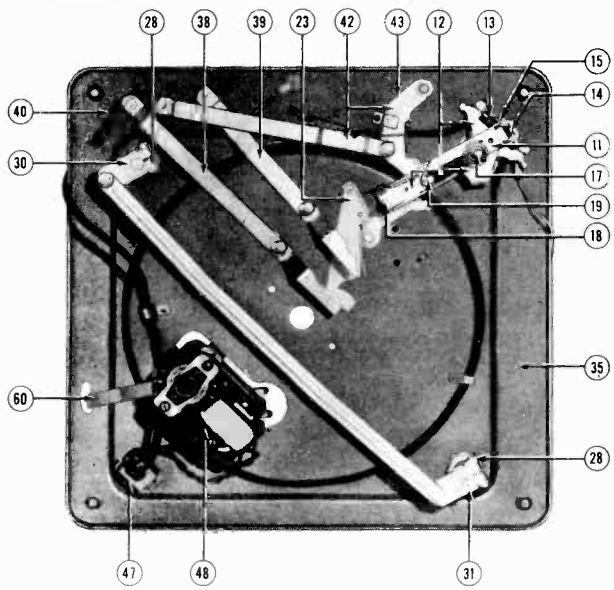
NO. 11200 SERIES

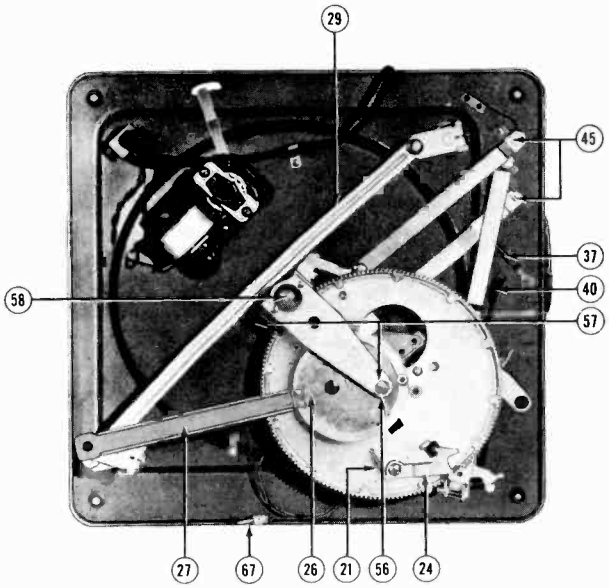
PART NO.	MFR. STOCK NO.	DESCRIPTION
1	11201	MECHANISM PLATE
2	11245	PICKUP ARM REST
3	11224	PICKUP ARM REST BUMPER
4	11230	STATIONARY POST
5	10755-C	PICKUP ARM SWING POST
6		
7	11237	RATCHET ARM
8	10837	10-32x1" CLAMP SCREW
9	10810	10-32 CLAMP SCREW NUT
10	10792	6-32 ADJUSTING NUT
11		6-32x5/8" ADJUSTING SCREW
12	10753	PICKUP CARTRIDGE
13	10834	4-40x$\frac{1}{2}$" SCREWS FOR CRYSTAL CARTRIDGE
14	10752	PICKUP ARM
15	10846	VISCOLOY STRIP
16	10754	PICKUP LEADS SPRING CLIP
17	10763	BALANCE SPRING TUBE
18	10764	PICKUP ARM BALANCE SPRING
19	10766	PICKUP ARM RATCHET
20	10798	PIVOT YOKE PIN
21	10757	ADJUSTING PLUNGER PIN
22	10810	10-32 BEARING PIN JAM NUT
23	10762	ACORN NUT FOR PICKUP ARM
24	11219	EJECTOR PIVOT CHANNEL
25		EJECTOR PIVOT CHANNEL RIVETS
26		CHANGE LEVER EJECTOR PIVOT PIN
27		EJECTOR PIVOT PIN WASHER
28	11222	CHANGE LEVER EJECTOR
29		EJECTOR LEVER PIVOT PIN
30		LEVER PIVOT PIN WASHER
31	11218	EJECTOR LEVER
32	11208	EJECTOR BOX
33	11217	12" RECORD SLIDE BOLT
34	11209	SLIDE BOLT COVER
35	11232	4-40x3/8" R.H. MACHINE SCREWS
36	11220	EJECTOR PRESSURE SPRING
37	11241	4-40 HEX NUT
38	11213	10" RECORD SUPPORT
39	11215	EJECTOR COMPRESSION
40	11214	10" RECORD SLIDE BOLT
41	11212	BALANCE ARM
42	11211	BALANCE ARM BUMPERS
43	11223	HINGE PIN
44	11210	BALANCE ARM SPRING
45	10831	10-32x3/8" THREAD CUTTING MACHINE SCREWS
46	10825	PHONO MOTOR
47		IDLER WHEEL TENSION SPRING
48		IDLER WHEEL
49		IDLER WHEEL FLAT WASHER
50		HAIRPIN SPRING CLIP
51		3 GROMMETS FOR MOUNTING MOTOR
52		3 SPACERS FOR MOUNTING MOTOR
53		3 FLAT WASHERS FOR MOUNTING MOTOR
54	10827	3 6x5/8" SM MOTOR MOUNTING SCREWS
55	10828	REINFORCEMENT WASHER
56	11249	CENTER POST DOG
57	10823-C	FRICTION SPRING WASHER
58	11250	CENTER POST
59		PIN FOR CENTER POST AND CENTER POST DOG
60	10736	SPACER COLLAR FOR CENTER POST
61	10741	FRICTION BRAKE SPRING
62	10830-A	5/16-24 CENTER STUD JAM NUT
63		RATCHET ARM LEVER PIVOT PIN
64	11234	RATCHET ARM LEVER
65		RATCHET ARM LEVER FLAT WASHER
66		CHANGE LEVER PIN
67	11236	CHANGE LEVER
68		CHANGE LEVER FLAT WASHER
69	11235	RATCHET ARM LEVER SPRING
70		CHANGE LEVER COUPLING RIVET
71	11229	SWING ARM
72		ROLLER RIVET
73		CAMMED DROPPING LEVER ROLLER
74	10730	CAMMED DROPPING LEVER
75		CAMMED DROPPING LEVER PIVOT PIN
76	10733	CAMMED DROPPING LEVER TORSION SPRING
77		CAMMED DROPPING LEVER WASHER
78	11231	LEAD ROLLER DROPPING LEVER
79	11233	DROPPING LEVER TORSION SPRING
80	11206	DROPPING LEVER PIVOT PIN
81		LEAD ROLLER DROPPING LEVER WASHER
82	10735	RATCHET ARM FRICTION SPRING
83	10791	RATCHET ARM FRICTION SPRING
84		RATCHET ARM FRICTION SPRING RIVETS
85		RATCHET ARM FRICTION SPRING RIVETS
86		SWING ARM PIVOT PIN
87	11239	33/64 I.D.x7/8 O.D.x.060" FLAT WASHER
88	11240	ESC RETAINING RING
89	10747	2 SWING ARM SLIDE WASHERS
90	10745	2 SWING ARM CLAMPS
91		
92		
93	10743	BEARING PIN
94	11248	ROLLER
95	11242	LEAD ROLLER SHOULDER NUT
96	10751	BEARING PIN SPACER
97	10750	COMPRESSION SPRING
98	11244	ROLLER CUSHION
99	10801	FULCRUM BEARING WASHER
100	10765	ROLLER BEARING SPEED NUT
101	10743	BEARING PIN
102	11248	ROLLER
103	10742	BEARING PIN SHOULDER NUT
104	10751	BEARING PIN SPACER
105	10750	COMPRESSION SPRING
106	11244	ROLLER CUSHION
107	10801	FULCRUM BEARING WASHER
108	10765	ROLLER BEARING SPEED NUT
109	10811	LEVER TRIP BRACKET
110	10831	6-32x3/8" THREAD CUTTING MACHINE SCREW
111		TRIP BRACKET RIVET
112	10724	EJECTOR PIN GUIDE
113		EJECTOR PIN GUIDE RIVETS
114	10804	LOWER PUSH PIN
115	10728	EJECTOR ARM EXTENSION SPRING
116		IDLER LEVER ROLLER PIN
117		EJECTOR IDLER LEVER ROLLER
118	10813	EJECTOR IDLER LEVER
119		6-32x5/8" ADJUSTING SCREW
120		6-32 NUT FOR ADJUSTING SCREW
121		IDLER LEVER PIVOT PIN
122		IDLER LEVER BEARING WASHER
123	11228	LEAD ROLLER RELEASE
124		ROLLER RELEASE RIVETS
125	11243	SWITCH
126	11203	CONTROL BUTTON
127	11225	NOTCHED WASHER
128	10801	FULCRUM BEARING WASHER
129		SEMS SCREW LOCK WASHER
130	10848	10-32x3/8" SEMS SCREW
131		SELECTOR LEVER PIVOT PIN
132	11205	SELECTOR LEVER
133		SELECTOR LEVER BEARING WASHER
134		SPRING RIVETS
135	11226	SELECTOR LEVER SPRING
136	10702	TURNTABLE
137	10704	OUTER SPIRAL
138	10703	INNER SPIRAL
139		NEEDLE SET SCREW
140	10850	PICKUP LEADS GROMMET
141	11247	DECAL
142	10843	RATCHET ARM STOP BRACKET

DESCRIPTION OF CYCLE

In order to observe the action of the changer mechanism as it progresses through a complete cycle of operation, disconnect motor plug from power supply so that Turntable can be rotated by hand. Move the front Control Button to the right so that only the word "AUTO" is visible. Then slide the "START-REJECT" Control Button to the left as far as it will go and release it. The operation of all parts of the changer can now be examined as the Turntable is rotated **clockwise.**

FUNCTION	EXPLANATION
SETTING FOR DESIRED RECORD SIZE	1. The position of the "10-12" Control Button determines the size of records that may be played on the changer 2. When this Control Button is in the 12 inch position, the Index Pin (19) is stopped by the front notch on the Index Stop Lever (43). The horizontal motion of the Pick-up Arm (1) is thus stopped. After the Pick-up Arm Lift Pin (17) and Pick-up Arm (1) are lowered, the Pick-up Arm will land in the correct position to start playing a 12 inch record. 3. When the Control Button is in the 10 inch position, the Index Pin (19) is stopped by the rear notch on the Index Stop Lever (43). Since this notch is deeper than the front notch, the Pick-up Arm (1) will be stopped at a point closer to the Center Post. After the Pick-up Arm Lift Pin (17) and Pick-up Arm (1) are lowered, the Pick-up Arm will land in the correct position to start playing a 10 inch record.
SETTING FOR DESIRED NEEDLE	1. Operating the Needle Selector (62) rotates Crystal Cartridge (2) to engage the proper Needle.



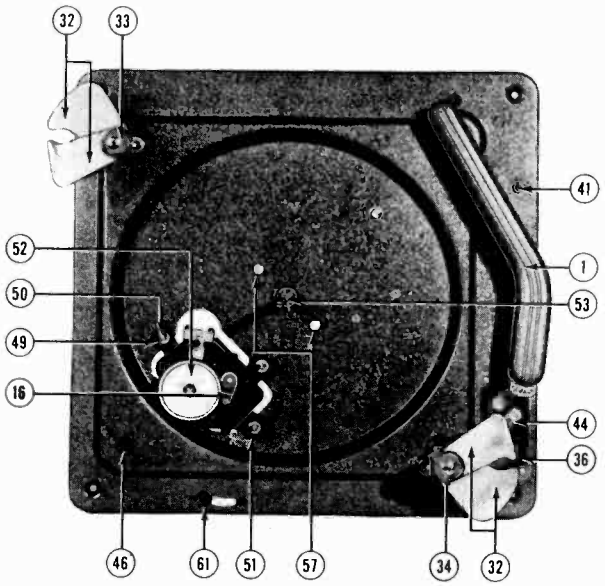


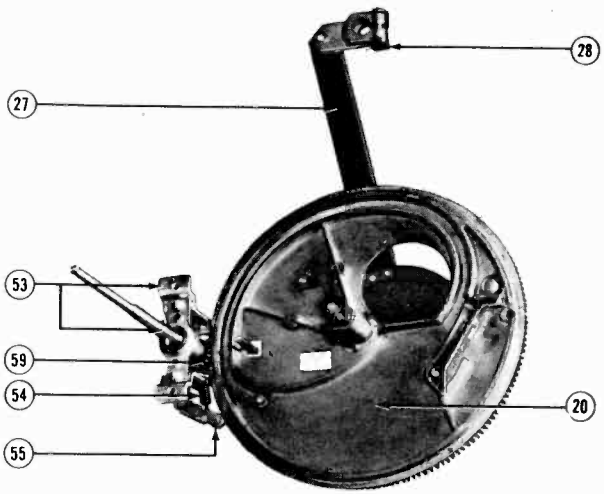
SETTING FOR DESIRED SPEED	1. When the Speed Selector Knob (61) is moved to the left as far as it will go toward the number "78" the motor hub rotates the Idler Wheel (52) which, in turn, engages the inside rim of the Turntable. 2. When the Speed Selector Knob (61) is moved to the right as far as it will go toward the number "33" an auxiliary shaft [connected to the motor hub through Rubber Drive Belt (16)] rotates the Idler Wheel (52). The Idler Wheel engages the inside rim of the Turntable.
STARTING **Operating the "ON-OFF" Switch (46).**	1. Operating this Switch supplies power to Motor (48). 2. Motor (48) operates Idler Wheel (52) to rotate Turntable and Turntable Gear (59). 3. All other parts of mechanism remain at rest until Starting Pawl (24) is released by trip action at end of playing cycle or by operation of the "START-REJECT" Control Button.

MODEL 9000

DESCRIPTION OF CYCLE (Continued)

FUNCTION	EXPLANATION
TRIPPING To trip mechanism and start change cycle, slide "START-REJECT" Control Button down and to the left as far as it will go and then release it.	1. Operating the "START-REJECT" Control Button causes the Reject Link (39) to move the Trip Release Assembly (23). This Assembly releases the Starting Pawl (24) and allows the Pawl to engage the Turntable Gear (59) and start the change cycle.
FUNCTION OF THE MAIN CAM (20)	1. The grooves on the upper surface of the Main Cam direct and co-ordinate the motions of the Pick-up Arm Lift Pin (17), which elevates the Pick-up Arm (1) during the change cycle and the Pick-up Arm Follower (18), which moves the Arm horizontally during the change cycle.
DISPLACEMENT OF A RECORD	1. While the Main Cam (20) is turning, the Eccentric (26) turns the Record Support Arms (32) through the action of the Eccentric Arm (27) and Tie Bar (29). 2. During the first half of the change cycle the Record Support Arm Shafts (30 and 31) and Record Support Arms (32) rotate in a clockwise direction. The two lower changer blades eject the bottom record loaded on the changer and the two upper changer blades slide under the remainder of the stack. 3. During the remainder of the cycle, the Record Support Arm Shafts (30 and 31) and Record Support Arms (32) rotate in a counter-clockwise direction. The upper changer blades now slide out from under the stack of records and drop the stack onto the lower changer blades.

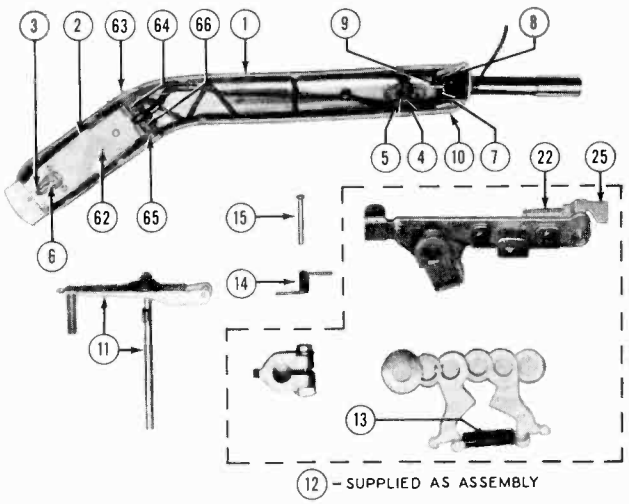




MOVEMENT OF PICK-UP ARM	1. As the Main Cam (20) starts to rotate, the Pick-up Arm Lift Pin (17) raises the Pick-up Arm (1) by riding up the outer ridge of the Main Cam (20). 2. After approximately a quarter turn of the Main Cam (20), the Pick-up Arm Follower (18) enters the groove in the Cam. The groove is cut so as to push the Pick-up Arm Follower (18) and thus the Pick-up Arm (1) to the right. 3. After approximately a three-quarter turn of the Main Cam (20), the groove in the Cam causes the Pick-up Arm Follower (18) and Pick-up Arm (1) to move to the left. 4. Near the end of the cycle, the outer ridge of the Main Cam (20) slopes downward and the Pick-up Arm Lift Pin (17) and Pick-up Arm (1) are lowered.

DESCRIPTION OF CYCLE (Continued)

FUNCTION	EXPLANATION
	5. The position at which the Pick-up Arm sets down on a record may be adjusted by means of the Index Screw (41) located on the upper right hand side of the changer base. The Screw acts as an eccentric in changing the position of the Index Stop Lever (43). A complete description of this method of positioning the Arm and another method which will give greater range of adjustment if required may be found in the "Trouble Shooting Chart" under the section entitled "Pick-up Arm (1) sets down at wrong starting point on record". 6. Elevation of the Pick-up Arm is adjusted by turning the Lift Adjusting Screw (5) located on the under side of the Pick-up Arm (1). For complete adjustment details, see section of "Trouble Shooting Chart" entitled "Pick-up Arm elevation is too high or too low during change cycle".
COMPLETION OF MAIN CAM CYCLE	1. After one complete revolution of the Main Cam (20), the notch in the teeth of this Cam will disengage the Main Cam from the Turntable Gear (59). The Cam Stop Roller (55) enters a groove on the side of the Main Cam (20) which serves to locate its rest position. 2. The Starting Pawl (24) contacts and again becomes held by the Trip Release Assembly (23).
ACTION OF TRIP MECHANISM AT END OF RECORD	1. During the playing portion of the cycle the Trip Latch (25) contacts the serrated edge of the Trip Release Assembly (23). While the Pick-up Arm (1) is advancing toward the Center Post (53) the Trip Latch (25) will not move this assembly. When the Needle (3) enters the spiral groove at the end of the record, the motion of the Pick-up Arm away from the Center Post will cause the Trip Latch (25) to operate the Trip Release Assembly (23). The Starting Pawl (24) will be released and will engage the Turntable Gear (59) to start the change cycle.
"MANUAL" CONTROL OF CHANGER	1. When "AUTO-MANUAL" Control Button is moved down and to the left so that the word "MANUAL" is visible, the Starting Pawl (24) is held in such a position as to be unable to engage the Turntable Gear (59) and it is impossible for the changer to cycle automatically. Forward or reverse recordings may now be played by manually placing the Pick-up Arm on the record at the desired starting point.
STOPPING	1. To stop the changer (NOT DURING CHANGE CYCLE), slide the "ON-OFF" Switch (46) to its off position. Power to the Motor (48) will be turned off.



MODEL 9000

LUBRICATION

The record changer leaves the factory completely lubricated and under normal conditions this lubrication should be sufficient for approximately one year or 1,000 hours of operation. When operated under extreme conditions of dust or heat, lubrication should be performed as frequently as required.

NOTE: AVOID EXCESSIVE LUBRICATION. Do not permit any oil to get on the rubber tire of the Idler Wheel, on the motor hub, on the Trip Release and Starting Pawl mechanism, or on the drive rim of the Turntable. Any oil on these places should be removed with Carbon Tetrachloride.

A drop of good machine oil once a year on the Center Post Assembly bearings, motor bearings, small cotton oil wick on Main Cam, and frictional surfaces will provide the necessary lubrication.

PARTS LIST

DIAGRAM NO.	PART NO.	DESCRIPTION
1	507452	Pick-up Arm, includes Hinge and Shaft (less Crystal Cartridge, Needles, Needle Selector Assembly and springs)
2	507453	Crystal Cartridge (includes Needles)
3	507454	Standard Needle
	507455	"Long Playing" Needle
4	506849	Spring, Lift Adjusting
5	506850	Screw, Lift Adjusting
6	507456	Set Nut for Needle
7	506851	Spring, Needle Pressure
8	506852	Adjusting Washer
9	506853	Tube, Hinge
10	506854	Pin, Hinge
11	506855	Indexing Assembly
12	507457	Crank Assembly
13	506857	Spring, Extension
14	506858	Spring, Index Latch
15	506859	Pin, Index Latch
16	507552	Rubber Drive Belt for Motor
17	*	Pick-up Arm Lift Pin (part of Item 11)
18	*	Pick-up Arm Follower (part of Item 12)
19	*	Index Pin (part of Item 11)
20	507458	Main Cam Assembly (includes attached levers and springs)
21	507555	Spring, Starting Pawl
22	507459	Spring, Trip Latch
23	507460	Trip Release Assembly
24	*	Starting Pawl (part of Item 20)
25	*	Trip Latch (part of Item 12)
26	*	Eccentric (part of Item 20)
27	506864	Eccentric Arm Assembly
28	506865	Drive Crank Nut
29	506866	Tie Bar Assembly
30	506867	Shaft, Front Record Support Arm
31	506868	Shaft, Rear Record Support Arm
32	506869	Record Support Arm Assembly
33	506870	Plastic Cap, Record Support Arm
34	506871	Cap Screw, Record Support Arm
35	507461	Base Assembly (includes Escutcheon and other riveted parts)
36	506873	Escutcheon
37	506874	Spring, Reject
38	506875	Link, Manual
39	506876	Link, Reject
40	506877	Spring, Control
41	506878	Index Bushing Assembly
42	506879	Index Stop and Link Assembly
43	*	Index Stop Lever (part of Item 42)
44	506881	Control Button
45	506882	Control Insert
46	506845	"On-Off" Switch
47	506883	Switch Cover
48	507462	Motor—115 volt, 60 cycle
49	506884	Fibre Washer for Motor Mounting
50	506885	"C" Washer for Motor Mounting
51	506887	Rubber Grommet for Motor Mounting
52	507542	Idler Wheel (includes fibre washer and retaining clip)
53	507543	Center Post Assembly (includes Cam Stop Spring and Roller, Turntable Cam, and Large Ball Bearing)
54	506891	Spring, Cam Stop
55	*	Cam Stop Roller (part of Item 53)
56	506892	Fibre Washer for Center Post Mounting
57	506893	Screw and Lockwasher for Center Post Mounting
58	506894	Large Ball Bearing (at base of Center Post)
59	*	Turntable Gear (part of Item 53)
60	507544	Speed Selector Lever
61	507545	Knob, Speed Selector Lever
62	507546	Needle Selector Assembly
63	507547	Pin for Mounting Needle Selector
64	507548	Sleeve for Mounting Needle Selector
65	507549	End Spring for Mounting Needle Selector
66	507550	Return Spring for Mounting Needle Selector
67	500966	Plug for Phono Input Cable
	501031	Plug for Phono Motor Cable
	507553	Small Ball Bearing (for Pick-up Arm Shaft mounting)
	507551	Pad, Needle Selector
	506895	Turntable
	506842	Rest Post Bumper
	506896	Screw for Mounting Changer
	506897	Spring for Mounting Changer
	506898	Clip for Mounting Changer

Not supplied as replacement part

TROUBLE SHOOTING CHART

SYMPTOM	CAUSE	REMEDY
Turntable fails to start after actuating "ON-OFF" Switch (46).	1. No Power.	Check to determine if there is power at the wall outlet by disconnecting radio power cord and connecting a lamp to same outlet.
	2. Idler Wheel (52) not engaging turntable.	Check to see that pivot lever under Idler Wheel (52) is free. Also be sure that spring which pulls Idler Wheel (52) toward Turntable is hooked to motor frame and has sufficient tension.
	3. Defective "ON-OFF" Switch (46).	Check continuity across switch contacts. Replace switch if necessary.
	4. Defective motor.	Check and replace if necessary.
	5. Broken Rubber Drive Belt (16).	If Speed Selector is in "33" position and Turntable fails to rotate, check condition of Rubber Drive Belt and replace if necessary.
	6. Binding in changer mechanism.	For analysis of fault see symptom entitled "Changer stops while changing a record".
Changer refuses to cycle when "START-REJECT" Control Button is operated.	1. Broken or weak Starting Pawl Spring (21).	If the Starting Pawl Spring (21) is defective, the Starting Pawl (24) will not engage the Turntable Gear (59) when the Trip Release Assembly (23) is operated. Replace this Spring.
	2. Bent Reject Link (39).	Rear end of Reject Link (39) must contact side of Trip Release Assembly (23). Straighten Link.
Changer stops while changing a record.	1. Grease on Idler Wheel (52) or Turntable rim.	Clean with Carbon Tetrachloride.
	2. Idler Wheel (52) not engaging Turntable properly.	Check to see that pivot lever under Idler Wheel (52) moves freely. Also be sure that spring which pulls Idler Wheel (52) toward Turntable is properly engaged and has sufficient tension.
	3. Binding in changer mechanism.	Check for binding at points where Turntable Gear (59) engages Main Cam (20); also at base of Center Post Assembly (53). If Tie Bar (29) is bent and is rubbing against changer base, straighten or replace Tie Bar Assembly (29). Make sure Tie Bar (29) does not rub or jam against frame of Center Post Assembly (53). If this condition occurs, proceed as follows: a. Loosen the bolt and Drive Crank Nut (28) at the end of the Eccentric Arm Assembly (27). b. Rotate the Turntable clockwise by hand until the changer cycle is completed. c. Move Tie Bar Assembly (29) [Record Support Arm Shafts (30 and 31) and Record Support Arms (32) will also move] until Tie Bar (29) is approximately 1/32" from the frame of the Center Post Assembly (53). NOTE: There are two positions of the Tie Bar (29) at which it may be placed approximately 1/32" from the frame of the Center Post Assembly (53). Set the Record Support Arms (32) for automatic operation. Then make sure that at the proper separation of the Tie Bar and the frame of the Center Post Assembly, the lower blades of the Record Support Arm Assemblies (32) are nearer the Center Post (53) than the upper blades. d. Retighten the bolt and Drive Crank Nut (28), making sure that the flange of the Nut faces toward the Record Support Arm Shaft (31). e. Operate "START-REJECT" Control Button and rotate the Turntable clockwise by hand through the changer cycle. If the adjustment has been properly made, the Tie Bar (29) will no longer come in contact with the frame of the Center Post Assembly (53). Lubricate changer mechanism if necessary; see section entitled "Lubrication".
	4. Low line voltage.	Line voltage should not be less than 105 volts.
	5. Weak Motor (48).	If after checking the above items, the changer continues to stall, it may be assumed that the Motor has low torque and should be replaced.

MODEL 9000

TROUBLE SHOOTING CHART (Continued)

SYMPTOM	CAUSE	REMEDY
Changer cycles continuously.	1. Bent arm on Trip Release Assembly (23).	If the Trip Release Assembly (23) becomes bent, the Starting Pawl (24) may not become held by this Assembly at the completion of the Main Cam cycle. Straighten or replace Trip Release Assembly (23).
	2. Bent Starting Pawl (24).	If the portion of the Starting Pawl (24) which contacts the Trip Release Assembly (23) becomes bent, the Starting Pawl may not become held by this Assembly at the completion of the Main Cam cycle. Straighten Starting Pawl (24).
	3. Broken or weak Reject Spring (37).	A defective Reject Spring (37) will not return the "START-REJECT" Control Button to its original position and may keep the Trip Release Assembly (23) from engaging the Starting Pawl (24). Replace this Spring.
Changer fails to cycle after playing a record.	1. Bent or broken Trip Latch (25).	The Trip Latch (25) must contact and exert pressure against the serrated edge of the Trip Release Assembly (23) at the end of a record. Straighten Trip Latch or replace Crank Assembly (12).
	2. Broken or weak Trip Latch Spring (22).	A defective Trip Latch Spring (22) will prevent the Trip Latch (25) from contacting the Trip Release Assembly (23). Replace Spring.
	3. Worn serrated edge of Trip Release Assembly (23).	If the serrated edge of the Trip Release Assembly (23) becomes worn, the Trip Latch (25) will not cause the Trip Release to release the Starting Pawl at the end of a record. Replace Trip Release Assembly (23).
	4. Broken or weak Starting Pawl Spring (21).	If the Starting Pawl Spring (21) is defective, the Starting Pawl (24) will not engage the Turntable Gear (59) when the Trip Release (23) is operated. Replace this Spring.
	5. No eccentric or Spiral groove at center of record.	The Needle (3) must enter the spiral groove at the center of a record before the Trip Latch (25) will operate the Trip Release Assembly (23). Old records which do not have this groove will prevent automatic operation of the changer.
Record drops on one side only during change cycle OR Both sides of record do not drop simultaneously during cycle.	1. Record Support Arms (32) incorrectly adjusted.	Proceed as follows: a. Make sure that the Record Support Arms (32) are set for automatic operation and the changer has completed its change cycle. b. Loosen the three bolts and Drive Crank Nuts (28) that hold the Tie Bar Assembly (29) and Eccentric Arm Assembly (27) to the Record Support Arm Shafts (30 and 31). c. Move the Tie Bar Assembly (29) until it is approximately 1/32" from the frame of the Center Post Assembly (53). NOTE: There are two positions of the Tie Bar (29) at which it may be placed approximately 1/32" from the frame of the Center Post Assembly (53). Make sure that at the proper separation of the Tie Bar and the frame of the Center Post Assembly the Tie Bar (29) extends closer to the front right hand corner of the changer base than in the other position. d. Then, holding the Tie Bar Assembly (29) in place, rotate Record Support Arms (32) and Record Support Arm Shafts (30 and 31) until lower changer blades are pointing in the general direction of the Center Post (53). e. Place a 10" record on the lower changer blades of the Record Support Arms (32) (as done when stacking records for automatic operation) and adjust Record Support Arms (32) so that the **record covers the same amount of space on the two lower blades.** Also, make sure that the nearest portion of the upper changer blades is approximately 5/8" from the edge of the record. f. Retighten the three bolts and Drive Crank Nuts (28). The flange of the Nuts should face toward the Record Support Arm Shafts (30 and 31). g. Operate "START-REJECT" Control Button and rotate the Turntable **clockwise** by hand through the changer cycle. If trouble is not completely corrected, repeat this adjustment but make slight changes in the positioning of the lower changer blades with respect to the 10" record.

TROUBLE SHOOTING CHART (Continued)

SYMPTOM	CAUSE	REMEDY
Record fails to drop off Record Support Arms (32) at correct time during change cycle.	1. Record Support Arms (32) incorrectly adjusted.	For proper adjustment, see previous section of "Trouble Shooting Chart" entitled "Record drops on one side only during change cycle OR Both sides of record do not drop simultaneously during cycle".
	2. Record size not standard.	A standard 10" record has a diameter of 9⅞" ± 1/32 and a standard 12" record has a diameter of 11⅞" ± 1/32.
Erratic motion of Pick-up Arm (1) in horizontal direction during change cycle.	1. Broken Pick-up Arm-Follower (18).	The groove in the Main Cam (20) directs the motion of the Pick-up Arm Follower (18) and the Pick-up Arm (1) in the horizontal direction. A broken Pick-up Arm Follower (18) eliminates or adversely affects this motion. Replace Crank Assembly (12).
	2. Loose bolt and nut on Crank Assembly (12).	The nut and bolt on the Crank Assembly (12) clamp the Crank Assembly to the shaft of the Pick-up Arm Assembly (1). If the nut and bolt are loose, horizontal motion between these two assemblies will be transmitted by friction only. Retighten according to section of "Trouble Shooting Chart" entitled "Pick-up Arm (1) sets down at wrong starting point on record".
	3. Weak or broken Extension Spring (13).	This spring is a safety device enabling the Pick-up Arm (1) to be moved horizontally beyond its normal operating range without causing injury to the changer mechanism. However, if the Extension Spring (13) is defective, horizontal motion between the Crank Assembly (12) and the Pick-up Arm Assembly (1) will be transmitted by friction only. Replace spring.
Erratic motion of Pick-up Arm (1) in vertical direction during change cycle.	1. Weak or broken Spring for Index Latch (14).	This spring lowers the Indexing Assembly (11) when the Pick-up Arm Lift Pin (17) enters the depression on the outer ridge of the Main Cam. Replace this spring if it is found to be defective.
	2. Weak or broken conical spring on Indexing Assembly (11).	This spring is also instrumental in obtaining proper vertical motion of the Pick-up Arm (1). If this spring is found to be defective, replace Indexing Assembly (11).
Pick-up Arm Elevation is too high or too low during change cycle.	1. Lift Adjusting Screw (5) improperly adjusted.	When Pick-up Arm elevation is incorrect, proceed as follows: a. Put twelve 10" records on the Turntable. b. Slide "START-REJECT" Control Button to the left as far as it will go and then release it. c. Rotate Turntable clockwise by hand until Pick-up Arm (1) and Needle (3) approach the stack of records. d. Adjust the Lift Adjusting Screw (5) so that clearance between Needle and top record is approximately ⅛".
Pick-up Arm (1) sets down at wrong starting point on record.	1. Incorrect adjustment of set-down point.	The position at which the Pick-up Arm (1) sets down on a record may be adjusted by means of the Index Bushing Assembly (41). Proceed as follows: a. Set changer for 12" operation and place a 12" record on the Turntable. b. Slide "START-REJECT" Control Button to the left as far as it will go and then release it. c. Rotate Turntable clockwise by hand until Pick-up Arm (1) and Needle (3) start to drop down to record. d. Loosen nut on Index Bushing Assembly (41) and adjust screw of this assembly to drop Pick-up Arm and Needle at desired position on record. This position should place the Needle 5-11/16" from the Center Post (53). e. Retighten nut on Index Bushing Assembly (41). If the Index Bushing Assembly (41) does not provide sufficient range for adjustment, proceed as follows: a. Make sure changer has completed its change cycle. b. Loosen nut and bolt on Crank Assembly (12). c. Move Pick-up Arm Follower (18) toward Center Post Assembly (53) as far as it will go. d. Holding the Pick-up Arm Follower in this position, place Pick-up Arm (1) approximately ¾" from Center Post (53). e. Tighten nut and bolt on Crank Assembly (12). f. Make final adjustment of set-down point using Index Bushing Assembly (41) as explained above.

MODEL 9000

TROUBLE SHOOTING CHART (Continued)

SYMPTOM	CAUSE	REMEDY
	2. Weak or broken spring which operates Index Pin (19).	A defective spring which operates the Index Pin (19) will not engage this Pin with the notches on the Index Stop Lever (43). Replace Indexing Assembly (11).
	3. Defective spring which operates lever on inside surface of Main Cam (20).	The lever located on the inside surface of the Main Cam aids in obtaining the proper set-down point for the Pick-up Arm (1). It guides the Pick-up Arm Follower (18) during the final part of the change cycle. If the spring which operates this lever is defective, the Main Cam Assembly (20) must be replaced.
	4. Broken Pick-up Arm Follower (18), loose bolt and nut on Crank Assembly (12), or weak or broken Extension Spring (13).	See section of "Trouble Shooting Chart" entitled "Erratic motion of Pick-up Arm (1) in horizontal direction during change cycle".
Tripping is possible with Control Button in "Manual" position.	1. Bent Starting Pawl (24).	If the portion of the Starting Pawl (24) which contacts the Manual Link (38) is bent, the Starting Pawl will not be kept from engaging the Turntable Gear (59). Straighten Starting Pawl or replace Main Cam Assembly (20).
	2. Bent Manual Link (38).	Rear end of Manual Link (38) must contact flange on Starting Pawl (24) when changer is set for manual operation. Straighten Link.
Improper "tracking" of Needle with record — Needle slips out of grooves and skips portions of record.	1. Incorrect setting of Needle Selector (62).	Make sure that Needle Selector (62) is in the correct position for playing the type of records on the changer.
	2. Foreign matter in record grooves.	Clean record with record brush or soft camel's hair brush.
	3. Badly worn record.	Examine record for scratches that may have destroyed continuity of grooves.
	4. Badly worn Needle (3).	Examine Needle for worn tip and replace if necessary. To remove and replace a worn or damaged Needle, proceed as follows: a. **If Standard Needle is to be removed,** adjust Needle Selector (62) so that the words "78 ONLY" appear at the top. **If "Long Playing" Needle is to be removed,** adjust Needle Selector (62) so that the words "33 ONLY" appear at the top. b. Loosen Set Nut for Needle (6) located directly below Needle. c. Replacement Needles may be obtained by requesting the following parts: Standard Needle.....Part No. 507454 "Long Playing" Needle.....Part No. 507455 **Do not attempt to use a substitute.** d. Insert Needle so that point extends away from Crystal Cartridge (2) and flat surface of shaft is against Set Nut (6). When tightening Nut make sure that Needle remains parallel to sides of Cartridge and point protrudes approximately 1/8" from lower frame of Needle Selector. To eliminate the possibility of installing the Needles in the wrong sides of the Crystal Cartridge, the shaft of the "Long Playing" Needle is painted red.
	5. Incorrect adjustment of Needle Pressure Spring (7).	The pressure that the Pick-up Arm (1) exerts on a record is controlled by the Needle Pressure Spring (7). Using a Needle Pressure Gauge, the needle pressure should be between 8 and 12 grams. To change needle pressure, proceed as follows: a. To decrease needle pressure, place a screwdriver in a notch of Adjusting Washer (8) and turn Washer by moving screwdriver upward. b. To increase needle pressure, place a screwdriver in a notch of Adjusting Washer (8) and turn Washer by moving screwdriver downward. In making this adjustment it will be necessary to disengage Adjusting Washer (8) from lip on Pick-up Arm Hinge (1).

TROUBLE SHOOTING CHART (Continued)

SYMPTOM	CAUSE	REMEDY
Slow Turntable speed.	1. Speed Selector (61) in wrong position.	Make sure that Speed Selector (61) is in the correct position for playing the type of records on the changer.
	2. Grease on Idler Wheel (52) or Turntable rim causing slipping.	Clean surfaces with Carbon Tetrachloride.
	3. Idler Wheel (52) not properly engaging Turntable.	Check to see that pivot lever under Idler Wheel (52) is free. Also be sure that spring which pulls Idler Wheel (52) toward Turntable is properly engaged and has sufficient tension.
	4. Binding of drive parts.	Carefully check Center Post Assembly (53) for binding.
	5. Line voltage too low.	Line voltage should not be less than 105 volts.
	6. Operating temperature too low.	If the changer has been stored in a cold room, the Turntable speed may be slower than normal.
	7. Faulty Motor (48).	If, after checking the above six items Turntable speed is still too slow, then it may be assumed that the Motor is at fault and should be replaced.
Rumble or "wow"	1. Changer not floating freely on its mounting springs.	Be sure the four Base Mounting Screws used for mounting the changer have been screwed down as far as they will go.
	2. Improper motor mounting.	Be sure that Motor (48) is mounted on Rubber Grommets (51).
	3. Worn tire on Idler Wheel (52).	Examine Idler Wheel (52) for flat spots on tire and replace Wheel if defective.
	4. Worn Pad for Needle Selector.	A worn Pad will cause the Needle Selector (62) to rest against the Pick-up Arm (1). This will cause "needle talk-back". Replace Needle Selector Pad.

PROCEDURE FOR REMOVAL AND REPLACEMENT OF MAJOR PARTS

NAME OF ITEM	METHOD OF REMOVING OR REPLACING
Needle (3).	To remove or replace a Needle (3), proceed as follows: a. If **Standard Needle** is to be removed, adjust Needle Selector (62) so that the words "78 ONLY" appear at the top. If "**Long Playing**" **Needle** is to be removed, adjust Needle Selector (62) so that the words "33 ONLY" appear at the top. b. Loosen Set Nut for Needle (6) located directly below Needle. c. Insert Needle so that point extends away from Crystal Cartridge (2) and flat surface of shaft is against Set Nut (6). When tightening Nut make sure that Needle remains parallel to sides of Cartridge and point protrudes approximately 1/8" from lower frame of Needle Selector.
Crystal Cartridge (2).	Remove the two Needles (3). Remove the two screws (and associated nuts and sleeves) which pass through the Needle Selector Assembly (62) and the Cartridge (2). Crystal Cartridge may now be removed by slipping the "quick disconnect" electrical connectors off the prongs at the rear of the Cartridge (2).
Center Post Assembly (53)	Removal of the Center Post Assembly (53), as well as the remainder of the drive mechanism, may be more easily accomplished if the changer has completed its change cycle. Remove the Turntable by lifting it up from changer base. Then remove the three Screws and Lockwashers (57). To disassemble the Center Post Assembly (53), remove the two screws on this Assembly. When reassembling the Center Post Assembly (53), make sure that the Large Ball Bearing (58) is properly seated in the base of the Assembly. To accomplish this, invert the upper portion of this Assembly and place the Ball Bearing (58) in the hollow at the base of the Center Post. Invert the lower portion of this Assembly and slide it over the Ball Bearing (58) as far as it will go. Insert and tighten the two screws. Then remount the Center Post Assembly (53) onto the changer base using the three Screws and Lockwashers (57). If binding occurs after assembly, a. Disassemble and place one drop of good machine oil in base of Center Post Assembly (53). b. If mechanism still binds, remove Assembly. Remove the two screws on this Assembly, rotate the flange on the upper section of the Assembly 180°, and replace the screws.

MODEL 9000

PROCEDURE FOR REMOVAL AND REPLACEMENT OF MAJOR PARTS (Continued)

NAME OF ITEM	METHOD OF REMOVING OR REPLACING
Eccentric Arm Assembly (27) and Tie Bar Assembly (29).	After the Center Post Assembly (53) has been removed, loosen the Drive Crank Nut (28) at one end of the Eccentric Arm Assembly (27) and remove the small screw and washer at the other end. The Eccentric Arm Assembly may then be easily removed. After the Eccentric Arm Assembly (27) has been removed, loosen the two Drive Crank Nuts (28) and slide the Tie Bar Assembly (29) off the two Record Support Arm Shafts (30 and 31). When reassembling, make sure that the flanges on the Drive Crank Nuts (28) face toward the Record Support Arm Shafts (30 and 31).
Main Cam Assembly (20).	After the Eccentric Arm Assembly (27) has been removed, the Main Cam Assembly will easily slide off its shaft.
Record Support Arm Assemblies (32) and Record Support Arm Shaft Assemblies (30 and 31).	After the Eccentric Arm Assembly (27) and Tie Bar Assembly (29) have been removed, remove the Record Support Arm Caps (33). The Record Support Arms (32) and Record Support Arm Shafts (30 and 31) are now disengaged from the Base Assembly (35) and may be easily slipped off.
Pick-up Arm Assembly (1).	The Pick-up Arm Assembly (1) should not be removed from the changer unless it is to be replaced. There are 18 Small Ball Bearings around the top of the Pick-up Arm Shaft and 17 Small Ball Bearings in a circular slot near the bottom of the Pick-up Arm Shaft. These Bearings will fall out of their respective positions unless the changer is in a horizontal position when the Pick-up Arm Shaft is removed and unless removal is accomplished with extreme care. To remove the Pick-up Arm Assembly: a. Make sure changer is in a horizontal position. b. Pull Phono Pick-up Cable to obtain "slack" in cable between Pick-up Arm (1) and changer base.
	c. Loosen the bolt and nut on the Crank Assembly (12) and remove the Pick-up Arm Assembly by **carefully** lifting at its base. When reassembling, the Pick-up Arm Shaft (1) must pass through each part of the Crank Assembly (12), and the hinge at the end of the Pick-up Arm (1) must be as close to the pick-up arm post of the Base Assembly (35) as possible.
Indexing Assembly (11) and Crank Assembly (12).	These two assemblies may be removed by loosening the bolt and nut on the Crank Assembly (12) and sliding these assemblies off the Pick-up Arm Shaft (1). **CAUTION: Separation of these two assemblies is not recommended unless one of the assemblies is to be replaced.** The Indexing Assembly (11) and Crank Assembly (12) may be separated by removing the small "C" washer on the Index Pin (19) and the Spring and Pin for Index Latch (14 and 15). When reassembling, **make sure parts of Crank Assembly are in correct order and position.** Hold hinge at the end of Pick-up Arm (1) tightly against pick-up arm post of Base Assembly (35) to prevent the 35 Small Ball Bearings around the Pick-up Arm Shaft from falling out.

DESCRIPTION OF OPERATIONAL CYCLES

Power for the motor is obtained through the on-off switch mounted on the bridge assembly. This switch is operated manually by the control button with positions OFF-MAN-AUT-REJ. This button is located to the left of the record-shelf assembly, on the top of the Record Changer.

The Record Changer has three speeds, controlled by the Speed Selector located to the right of the record-shelf assembly. The positions of the Speed Selector are ST'D PLAY– 45 –LONG PLAY. These speed changes are brought about by the shift lever, which changes the positions of the idler wheel and pulley with respect to the motor shaft.

The changer mechanism of the Record Changer is brought into action when a small retractable gear segment, mounted on the cam gear, is released, and engages the hub gear of the turntable shaft, causing the cam gear to be driven. While a record is playing, the retractable gear segment is held in the retracted position by the trip-plate retaining wall, which engages the roller of the gear segment. The segment is released either manually, by pushing the OFF-MAN-AUT-REJ control to REJ, or automatically, when the changer tone arm reverses direction as the needle follows the eccentric finish groove of a record. For 45 r.p.m. automatic operation, an additional trip mechanism is brought into play. This trip mechanism is actuated by a trip stop, mounted on the trip receiver. When the needle of the tone arm enters the finish groove of a 45 r.p.m. record, the trip stop engages the trip lever, which releases the hammer; this hammer strikes the trip plate, and pushes it aside. The gear segment is then released, as explained above, for either the standard or long-play operations.

The tone arm of the Record Changer is operated by two link assemblies attached to actuator levers, which are in contact with the cam surfaces of the cam gear. When the cam gear starts rotating, the lower actuator lever is pushed outward first, and the link assembly with the long cord attached to it raises the tone arm off the record. As the cam gear continues to turn, the upper actuator lever is pushed outward, and its link assembly pulls the tone arm out against the rest post. At this instant, a roller on the cam gear makes contact with the push-off actuator (which is connected to the record-shelf assembly through a series of push-off bars), and operates the record-dropping mechanism.

After the record has dropped to the turntable, the cam releases the upper actuator, permitting the tone arm to move inward. As the tone arm moves toward the center of the turntable, the index finger engages one of the selectors, which stops the tone-arm travel at a point just above the start groove of the record. Following this action, the lower actuator, which is engaged with the lower cam surface of the cam gear, starts riding inward, relaxing the long cord and link assembly, allowing the tone arm to set down onto the record.

ADJUSTMENTS

INDEXING OR SET-DOWN

7" Record

Set a 7" record on the turntable, push the OFF-MAN-AUT-REJ control to REJ, and rotate the turntable by hand approximately 4½ turns. The tone-arm needle should be approximately ½" above the record at this point. Loosen the clamp screw on the trip arm slightly (figure 9); then hold the tone arm steady, ⅛" in from the edge of the record, and set the trip arm so that the magnetic index stop, Part No. 76-5497, is in contact with the selector hinge (inside selector), Part No. 56-7494, as shown in figure 1. The index stop should engage the selector hinge by a minimum of ⅛".

Tighten the clamp screw, leaving 1/32" vertical play, or clearance, between the trip arm and the base plate.

10" Record

Make the index adjustment for 7" records first. Check 10" indexing by the same method as that outlined above. With the needle point ½" above the record, and ⅛" in from the outside edge, the index stop should be in contact with the middle selector, Part No. 56-7478, as shown in figure 2.

Ordinarily, the 10" index is satisfactory after the 7" index adjustment is made; if not, bend the selector *slightly* to the right or left, as required, for the proper set-down of the needle.

12" Record

Adjust as given above for 10" records, except that the index stop should contact the outside selector, Part No. 56-7478. If the indexing is incorrect, bend the selector hinge *slightly* to the right or left, as required, for proper set-down.

TRIP ACTION

10" or 12" Standard or Long-Play Records

With a 10" or 12" record on the turntable, the Speed Selector set to either ST'D PLAY or LONG PLAY, and the OFF-MAN-AUT-REJ control in AUT position, place the tone arm in the finish, or eccentric, groove of the record. The trip finger, Part No. 56-7486, now rides over the ratchet of the trip plate, Part No. 76-5252, as shown in figure 3. The trip finger should ride at an angle of 25° to 30° with respect to the ratchet. To obtain the correct angle, adjust the screw on the trip receiver, Part No. 56-7491, as indicated in figure 3. Make certain that the vertical center line of the trip finger coincides with the center line of the ratchet. To obtain this alignment, loosen screw "A" slightly, and screw "B" completely, on the trip receiver, and swing the trip receiver to the right or left, rotating about point "A" until the trip finger is centered over the ratchet; then tighten the screws.

When this adjustment is made, care should be taken to prevent the trip receiver from being pulled in toward the trip arm too far, as this will prevent the trip-arm stop from engaging the selector hinge by a minimum of ⅛". A compromise between these two adjustments should be reached.

The index adjustment will be affected when making the above adjustments. Remember that these three adjustments are interrelated, and that, when any one of them is made, the other two should be rechecked.

7" — 45 R.P.M. Records

Place a 7", 45 r.p.m. record, with adaptor insert, on the turntable. Set the Speed Selector to 45, and the OFF-MAN-AUT-REJ control to AUT position. Set the tone arm on the portion of the record which contains the leadin grooves. The mechanism should trip when the needle reaches a point approximately ⅛" from the last groove (which is concentric). If it trips before reaching this point, bend the trip finger, Part No. 56-7486, away from the trip-arm stop. If it fails to trip when this point is reached, bend in the opposite direction.

The trip-arm stop should engage the trip by a minimum of 1/32" in both the horizontal and vertical planes, as shown in figure 3. This may be adjusted by loosening the trip locking screw, and sliding or raising the trip to the desired position.

The horizontal force required to trip the changer and initiate the change cycle should not exceed 2 grams at any turntable speed.

MODEL M-20

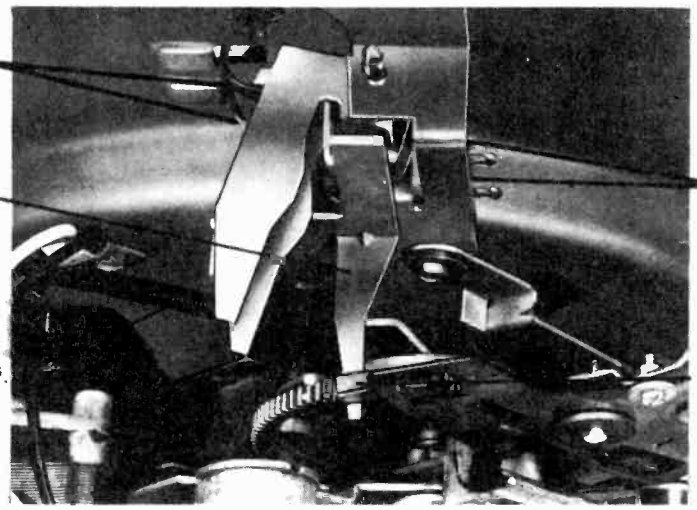


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FIGURE 1. 7" INDEX ADJUSTMENT

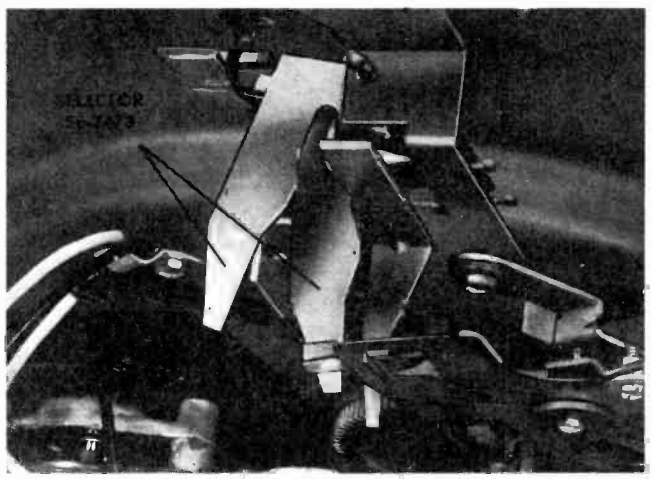

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FIGURE 2. 10" INDEX ADJUSTMENT

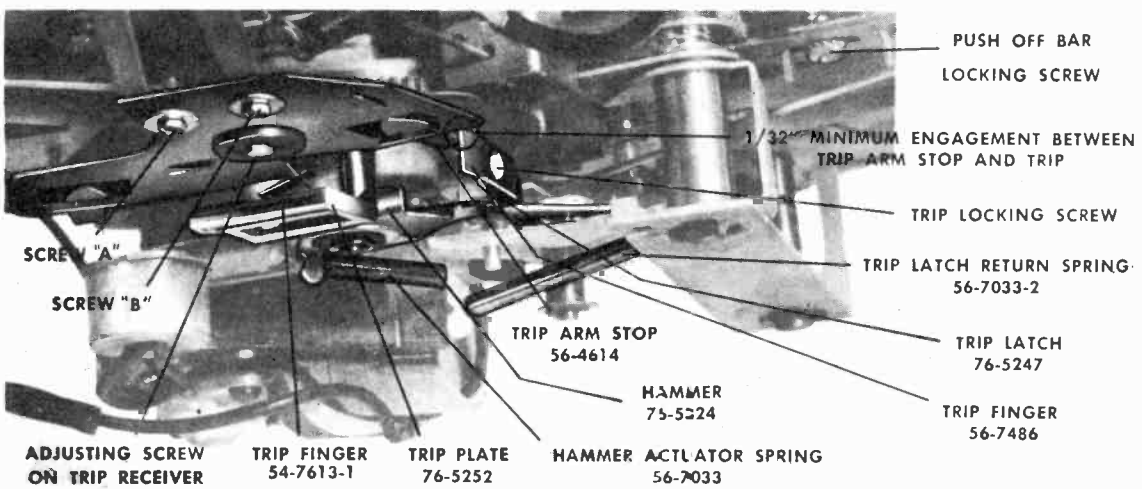

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FIGURE 3. TRIP ADJUSTMENTS

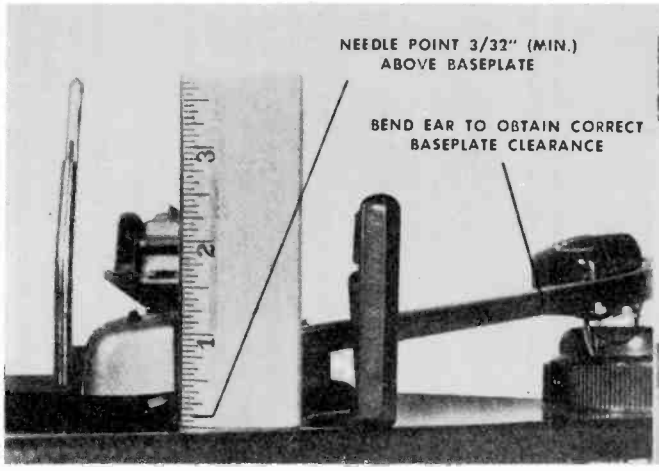

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FIGURE 4. BASE-PLATE-CLEARANCE ADJUSTMENT

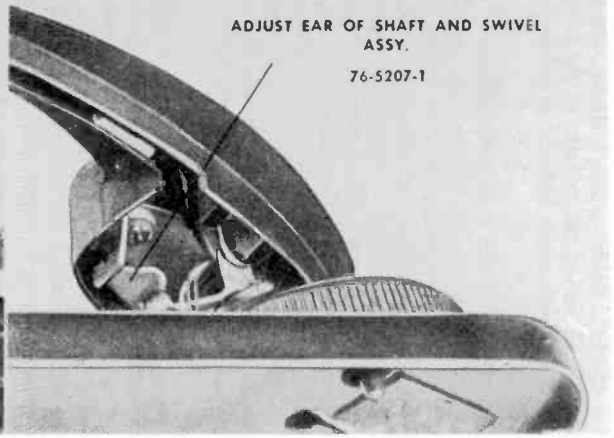

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FIGURE 5. TONE-ARM HEIGHT AND LIFT ADJUSTMENT

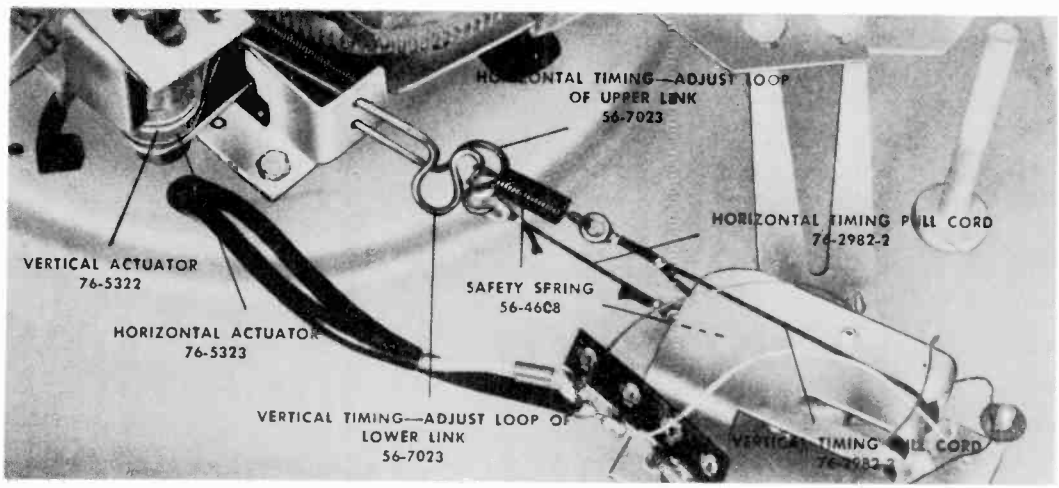

FIGURE 6. HORIZONTAL AND VERTICAL TIMING ADJUSTMENTS

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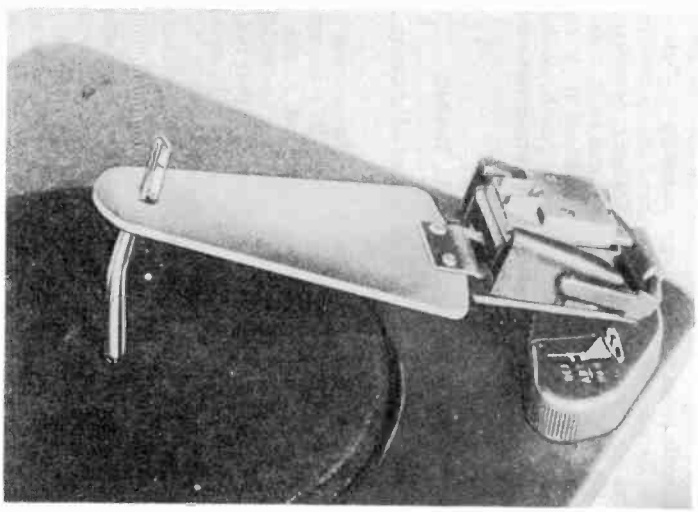

FIGURE 7. SPECIAL RECORD-SHELF GAUGE, SHOWN IN CORRECT POSITION

TP-9994

TONE-ARM HEIGHT AND LIFT

With the changer out of cycle, and the tone arm free, set the arm over the base plate. The needle point should be approximately $\frac{3}{16}$" above the base plate, as shown in figure 4. To adjust the clearance, bend the protruding ear of the swivel post (bending the ear upward increases the clearance, downward decreases the clearance), as shown in figure 5. Now raise the tone arm to its maximum height, and place it against the rest post. There should be a minimum of $\frac{1}{8}$" clearance between the lower edge of the tone arm and the top of the rest-post hook. Adjust the ear on the swivel post until a mean is reached between the correct rest-post clearance and base-plate clearance.

TONE-ARM HORIZONTAL AND VERTICAL TIMING

Before making the vertical and horizontal adjustments, make the tone-arm height and lift adjustments described above.

For the vertical timing, start with the changer out of cycle and the tone arm on the rest post, push the OFF-MAN-AUT-REJ control to REJ, and rotate the turntable approximately $1\frac{1}{2}$ revolutions by hand. At this point, the lower eccentric portion of the cam-and-gear assembly, Part No. 76-3995-2, fully engages the lower (vertical) actuator (the actuator with the cord), Part No. 76-5322. Adjust the wire loop of the lower link, Part No. 56-7023, figure 6, by squeezing or opening the loop so that the safety spring is expanded approximately $\frac{1}{32}$". With this adjustment, the ear of the tone-arm swivel post makes firm contact with the lower end of the cutout on the tone-arm pivot assembly.

For the horizontal timing, start as given in the above paragraph. At the same point, $1\frac{1}{2}$ revolutions from the start of the cycle, the upper eccentric portion of the cam gear fully engages the upper (horizontal) actuator, Part No. 76-5323. Adjust the wire loop of the upper link, Part No. 76-7023, with the short cord, figure 6, by squeezing or opening the loop so that the safety spring is expanded approximately $\frac{1}{32}$". With this adjustment, the tone arm should be snug against the rest post, but not so tight as to cause undue slapping as the arm returns to the rest post during cycling.

RECORD SHELF

Set the record shelf to the 10" position, with the changer out of cycle. Loosen the two hex-head drive screws that hold the record-shelf assembly to the changer base plate just sufficiently to allow movement of the record-shelf stanchion. Place the Philco record-shelf gauge, Part No. 45-1672, over the spindle and onto the record shelf, as shown in figure 7. Move the record-shelf assembly away from the spindle until the large, curved part of the gauge drops even with the record-shelf lips. Now push the record shelf and gauge lightly against the spindle, taking out all play toward the spindle; keep the lips of the record shelf in even contact with the edge of the gauge. Tighten the two hex-head screws.

PUSH-OFF

With the changer out of cycle, push the OFF-MAN-AUT-REJ control to REJ, and rotate the turntable 2 revolutions by hand. At this point, the push-off actuator, Part No. 56-4588, is in its most forward position, in contact with the roller on the cam gear. Loosen the push-off-bar locking screw (indicated in figure 3) slightly (just sufficiently to allow adjustment), and squeeze the push-off ears toward each other until the slide plate on the record shelf extends between $\frac{1}{64}$" and $\frac{1}{32}$" beyond the lips of the shelf. Tighten the hex-head push-off-bar screw.

NEEDLE PRESSURE

Use the Philco gram scale, Part No. 45-9531. Calibrate the scale to zero by holding it upright for vertical measurement, and setting the pointer to the center line of the scale. The center is the "0" point, and each small division on either side of "0" is equal to one gram.

After the scale has been calibrated to zero, hold the scale perpendicularly to the tone-arm head, and support the tone arm by placing the standard-play needle in the hole at the end of the gram-scale arm, as shown in figure 8. By lifting the gram scale carefully, raise the tone arm approximately $\frac{1}{2}$", and note the reading. Then lower the tone-arm, and note the reading. The average of these two readings is the needle pressure, which should be between 7 and 9 grams. The pressure is adjustable by bending the ear at the rear of the tone arm to which the tone-arm spring is anchored, as shown in figure 9. Bending the ear so as to stretch the spring decreases the needle pressure; bending so as to relax the spring increases the needle pressure. If the needle pressure is out of tolerance, make the above adjustments gradually, and recheck after each change, as a small movement gives a rather large variation in needle pressure.

When making this adjustment, be careful not to bend or distort the bracket. If this bracket is deformed, the needle pressure on the last record of a stack will differ from the needle pressure on the first record. When the proper needle pressure is attained, the upper edge of the ear should be parallel to the rear, lower edge of the tone-arm shell. If the bracket was bent while adjusting the ear, gently pry down or push up the bracket (applying even pressure on both sides) until the ear and tone-arm shell are in proper relationship.

VERTICAL FRICTION

To measure the vertical friction, take two gram-scale readings as explained above under **NEEDLE PRESSURE**. One-half of the difference between the two readings is the vertical friction, which should not exceed 1.5 grams.

HORIZONTAL FRICTION

Calibrate the gram scale by laying it flat, face-up. Set the pointer to zero (center mark).

Place a counterweight on top of the rear end of the tone arm, with the changer out of cycle; move the counterweight until the tone arm is balanced horizontally, and the needle point clears the turntable. Hold the gram scale face-up, place its pointer against the side of the pickup, and slowly move the gram scale so as to push the tone-arm horizontally with the pointer, as shown in figure 10. Note the reading of the gram scale while moving the tone arm throughout its entire travel (outside the trip range). At no time should the horizontal friction (the force required to move the tone arm) exceed $1\frac{1}{2}$ grams, nor be less than $\frac{3}{4}$ of a gram.

Note: Whenever any repairs or replacements are performed, all adjustments should be checked, and any necessary adjustments made. When making adjustments, check the lubrication at all points indicated in the LUBRICATION section, and lubricate where necessary, after cleaning off old and excess grease with a soft brush and carbon tetrachloride.

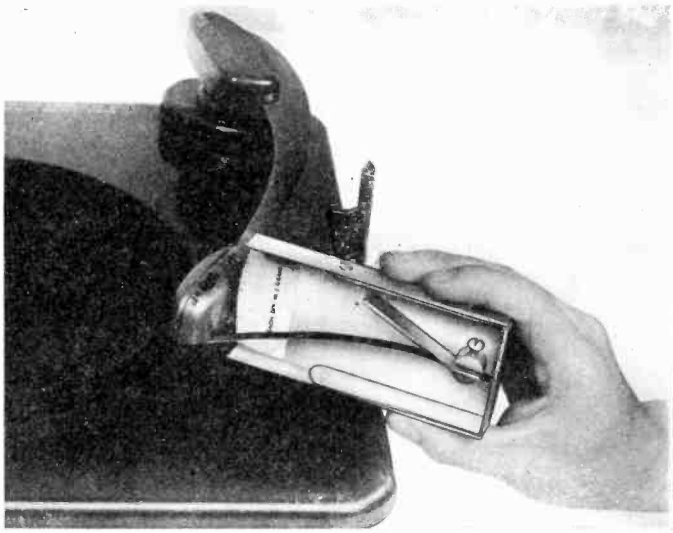

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FIGURE 8. MEASURING VERTICAL FRICTION

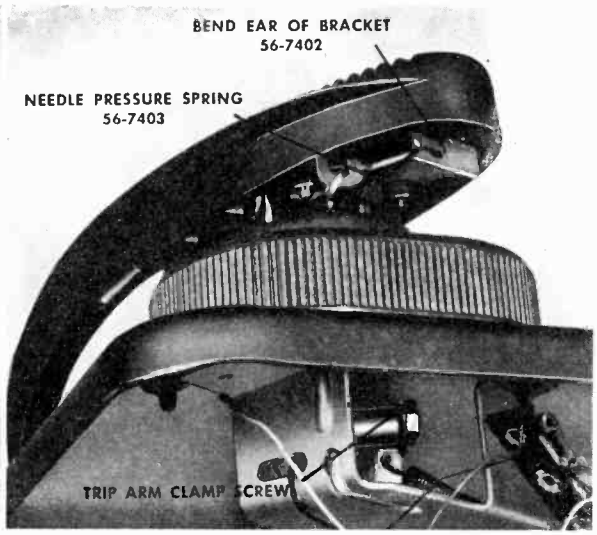

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FIGURE 9. NEEDLE-PRESSURE ADJUSTMENT

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FIGURE 10. MEASURING HORIZONTAL FRICTION

MODEL M-20

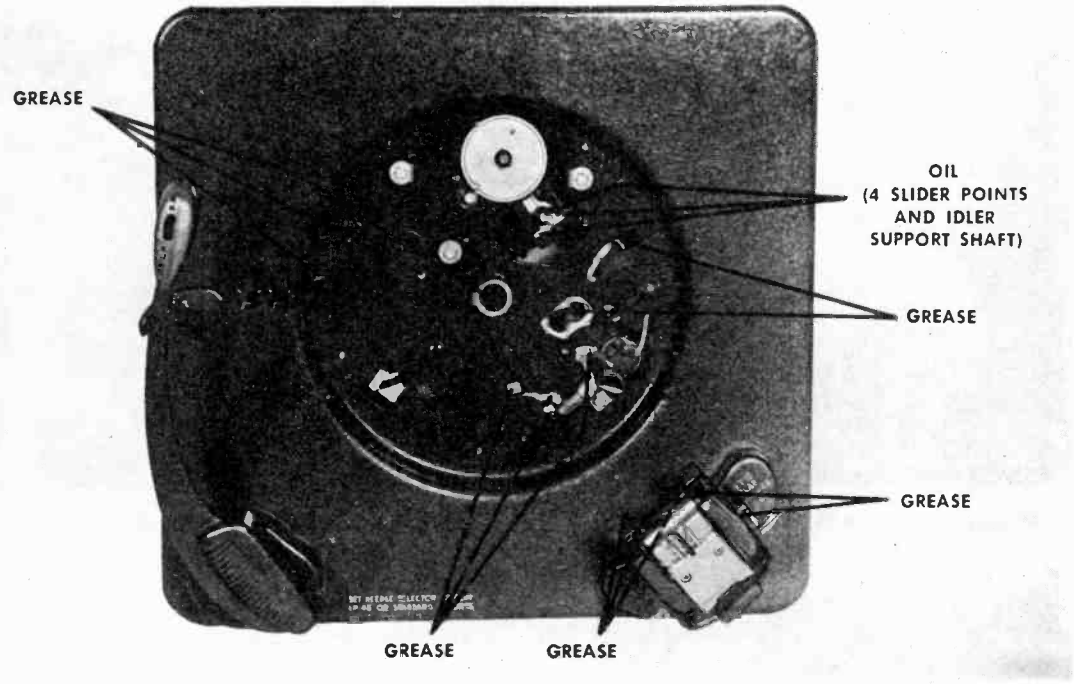

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FIGURE 11. TOP VIEW, SHOWING LUBRICATION POINTS

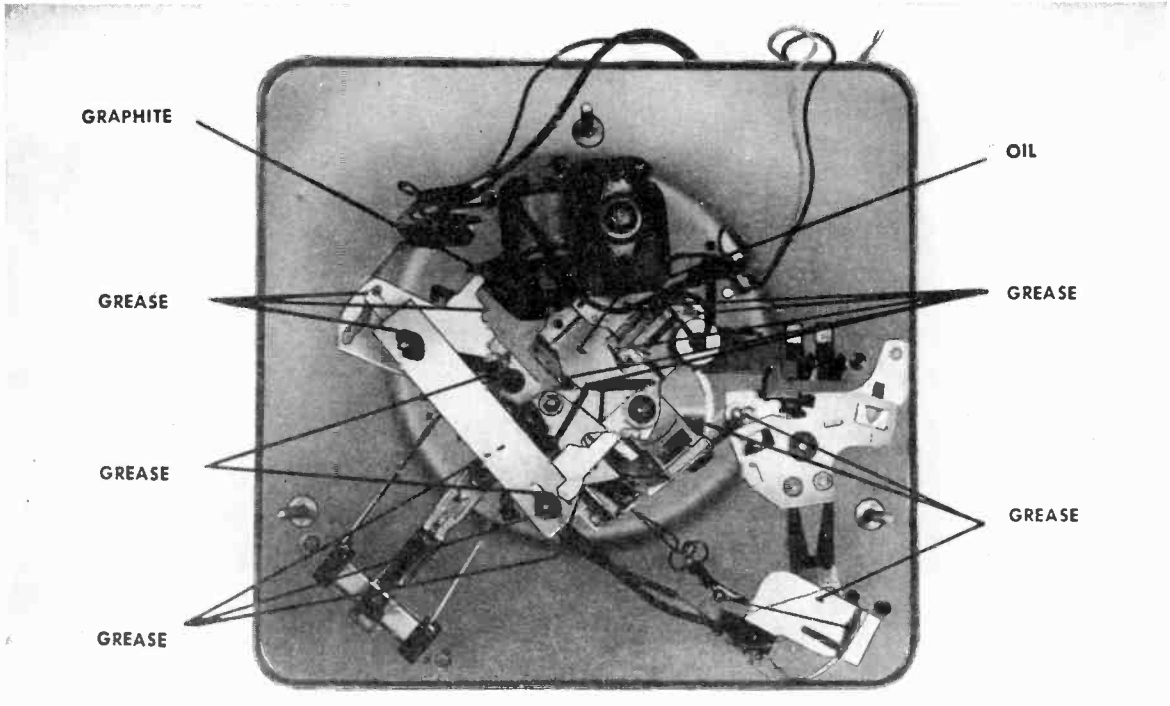

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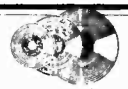
FIGURE 12. BOTTOM VIEW, SHOWING LUBRICATION POINTS



LUBRICATION

When the Record Changer is brought in for service, it should be well cleaned with a fine brush and carbon tetrachloride. Remove the needle guard and clean out accumulated dust with a fine brush. Remove all dirt and old grease and oil. When applying new grease and oil, use it sparingly. Lubrication points are shown in figures 11 and 12. It may be necessary to remove some parts and assemblies in order to properly lubricate them. For example, the cam gear and actuator levers should be removed to lubricate the cam-gear spindle and the actuator stud. The lubrication points that cannot be reached without some degree of disassembly are indicated in the following list with an asterisk, and are also indicated in the breakdown views of their respective assemblies.

LUBRICANTS

Oil—S.A.E. 20
Grease—Texaco Motor Cup Grease (unless otherwise specified)

PARTS NOT TO BE LUBRICATED

The following parts should not be lubricated at any time:
Trip receivers
Trip fingers
Selector assembly (except specific points indicated)
Ratchet portion of trip plate
Trip-latch assembly
Idler tire
Drive belt
Drive-pulley shaft

PARTS TO BE GREASED

Record-Shelf Assembly

Top of push-off saddle
Each of four cast lugs on 10" shelf where pin is inserted and where hold-down pivots*
Loops of hold-down springs where hooked to 10" hold-down and 7" record shelf*
Points of contact of record shelves where push-off blades ride*
Control button fulcrum points*

Bridge Assembly

Three dimples and two upturned ears
End and detent notches of control slider

Cam Gear

Between roller and gear surface
Gear teeth and two lateral cam surfaces
Upper cam surface where selector hinge rides*

Main Assembly

Push-off bar where it connects to its actuator
Push-off actuator where its dimples slide on base plate
Speed Selector ears where they slide on base plate
Speed Selector cam slot, detent surfaces, and pivot point
Selector hinge where ears slide on base plate
Turntable shaft at upper outside bearing *only**
Detent assembly; to roller stud, ear, and sliding guide surfaces
Trip actuator, to three guide surfaces and ear operating reset lever
Actuator spindle*
Horizontal actuator bushing, outside*
Vertical actuator bushing where trip reset arm rides

Tone Arm

Point of shaft and where it rotates in tone-arm stanchion

Motor Assembly

Cam surface of idler-wheel lifter
Detent surfaces
Guide slots of shifter plate
Extension of idler shaft in contact with lower shifter plate

PARTS TO BE OILED

Tone-arm pivot pin*
Trip-plate bushing (inside)*
Spindle; where spindle slides in hole in the bridge, and where it engages the upper bearing of turntable
Cam-gear spindle*
Roller on gear segment

Motor Assembly

Idler support shaft
Idler shaft
Slider bar; four points
Two shift roller pins
Under pivot bushing of shifter plate*
Pulley shaft (remove pulley)*

CAUTION: When lubricating the motor, remove the rubber belt and idler wheel. When lubrication is completed, be sure the motor shaft and pulley are free from oil and grease. Failure to observe this precaution may result in slippage.

GRAPHITE

Powdered graphite should be applied to the ear of the selector plate in the brass shifter bushing.

PETROLEUM JELLY (or DOW CORNING "DC-4")

Apply to the contacts of the cartridge contact plate, and to the dimple of the cartridge retaining spring.

SERVICE NOTE: After long usage, the push-off bar may develop squeaks while cycling. If this is encountered, the following points should be greased sparingly.

Both ends of return spring
Fulcrum of push-off rod
Point of contact between push-off bar and hanger
Where hanger pivots in fulcrum plate
Where push-off rod rides in push-off bar

UNEVEN TURNTABLE SPEED (WOWS)

Uneven turntable speed may be caused by the following conditions.

1. Dirt under and around the idler-wheel assembly.
2. Idler-wheel spring loose or missing.
3. Flat spot on idler-wheel tire or on turntable.
4. Loose or worn pulley belt.
5. Oil or grease on idler-wheel tire, pulley, or drive shaft.

REPLACEMENT OF PARTS AND ASSEMBLIES

The following procedures are recommended for the correct removal of parts and assemblies. The parts should be replaced by reversing the order of removal. Adjustments should be made according to the directions given in the ADJUSTMENTS section of the manual.

1. Crystal

Grasp crystal with fingernails. With the other hand, hold tone arm and apply slight pressure on switch lever. Pull down and to the outside. Replace by holding crystal contacts toward spindle, and pushing upward until firmly seated.

2. Needle

Remove crystal (see paragraph 1). Gently lift out with prying motion, using fingernail or knife point. When replacing needle, align key of needle shaft with keyway in chuck of cartridge, then push needle into cartridge.

3. Spindle

Remove cotter pin from lower end, and pull spindle out. The turntable may now be lifted off.

NOTE: When replacing the turntable, position the speed-control button midway between LONG-PLAY and 45. Hold the idler wheel back toward the center while positioning the speed control until the idler stays retracted. Then replace turntable. This method will *prevent damage* to the *idler-wheel tire.*

4. Tone-Arm Assembly

a. Place changer in MAN position.
b. Unsolder the four tone-arm leads from terminal panel.
c. Remove vertical actuator safety spring from long cord
d. Loosen trip-arm clamp screw
e. Lift out tone arm. Figure 13 shows tone-arm assembly

NOTE: When the tone arm is replaced, be sure to maintain $\frac{1}{32}$" vertical play between the trip arm and the fiber washer.

To insure proper tone-arm damping, be sure that the tone-arm damper is firmly seated in its proper position. Also, the lead washer under the adjusting screw of the trip receiver should never be replaced with a substitute; if it is necessary to replace it, use lead washer, Part No. 8W51958.

5. Trip-Arm Assembly

a. Loosen clamp screw.
b. Raise tone arm sufficiently to clear trip arm.
c. Remove trip arm, and disengage link spring. Figure 14 shows trip-arm and trip-receiver assemblies.

NOTE: When reassembling, maintain $\frac{1}{32}$" vertical play.

6. Motor Assembly

a. Remove spindle and turntable (see paragraph 3).
b. Unsolder motor lead from switch on bridge assembly.
c. Remove ground wire from terminal panel.
d. Remove the three hex-head screws, washers, and spacers from motor frame.
e. Slide jaws of speed-shift lever free of brass spacer and ear of speed-change actuator plate.
f. Lift motor out. Figures 15 and 16 show motor assemblies.

7. Speed-Change Assembly

a. Remove "E" washer and washer from actuator shaft.
b. Remove "E" washer and detent spring from selector-lever shaft
c. Lift off trip actuator.
d. Remove lower "E" washer from selector shaft.
e. Rotate selector lever until ears clear cutouts of base plate, and brass spacer comes free from motor shift lever.
f. Lift selector lever upward and off.
g. Disengage link from control button. Figure 17 shows speed-change assembly.

8. Tone-Arm-Actuator Levers

a. Remove "E" washer from actuator shaft; lift trip actuator off, and push to one side.
b. Remove long spring from reset lever, and lift off.
c. Remove small "E" washer from actuator shaft (above main plate), and remove inner actuator shaft.
d. Disengage link from vertical actuator.
e. Remove spacer, and swing horizontal actuator away from cam gear; slip off from actuator stud, and disengage link. Figure 17 shows actuator assembly.

9. Push-Off Actuator

a. Remove tone-arm actuators (see paragraph 8)
b. Remove return spring from push-off bar.
c. Disengage push-off bar from its actuator.
d. Rotate actuator until its ears clear cutouts in base plate. Lift off. See figure 17.

10. Bridge Assembly

a. Remove mounting plate and hammer-actuator springs.
b. Remove "E" washer, curved washer, and spacer from cam-gear shaft.
c. Lift hammer, hammer bushing, spacer, mounting plate and trip-latch assembly, and mounting-plate bushing from shaft.
d. Remove hex-head screw holding spindle spring and bridge to turntable-bearing bracket.
e. Lift bridge off, and disengage control link from slider control bar. See figure 18.

11. Cam-Gear Assembly

a. Remove bridge (see paragraph 10)
b. Remove "E" washer, and lift off trip plate
c. Remove "E" washer and spacer.
d. Slide cam gear from spindle. Figure 18 shows cam-gear assembly.

12. Selector Assembly

a. Remove cam-gear assembly (see paragraph 11).
b. Remove hex-head screws holding selector bracket.
c. Remove index lever, index-lever spring, and selector-hinge spring.
d. Lift out entire assembly. Figure 19 shows selector assembly.

13. Push-Off and Shelf Assembly

a. Remove push-off return spring, push-off bar, and hanger.
b. Remove selector-link bar from selector lever, then disengage from control button.
c. Remove the two hex-head screws holding stanchion.
d. While lifting assembly free of base plate, rotate, and disengage control link.
e. Remove the three speed nuts holding fulcrum plate.
f. Slide control-button shaft from fulcrum plate, and remove plate and control buttons.
g. Remove spring ring, spring-retaining washer, and heavy spring.

CAUTION: Use due care—the heavy spring may fly out.

h. Remove shelf and push-off assembly from stanchion. Figure 20 shows record shelf and push-off assemblies.

14. Push-Off Blades

a. Remove the two Phillips-head screws from bottom of 10"-12" record shelf, and the one Phillips-head screw from the top. Lift off cover.
b. The 10"-12" push-off blade, the push-off rod, and the 10"-12" hold-down and springs may now be removed.
c. Remove the two small Phillips-head screws from top of 7" cover. Remove cover.
d. The hold-down spring, 7" hold-down, ball bearing and push-off spring, push-off blade, and push-off return spring may now be removed.

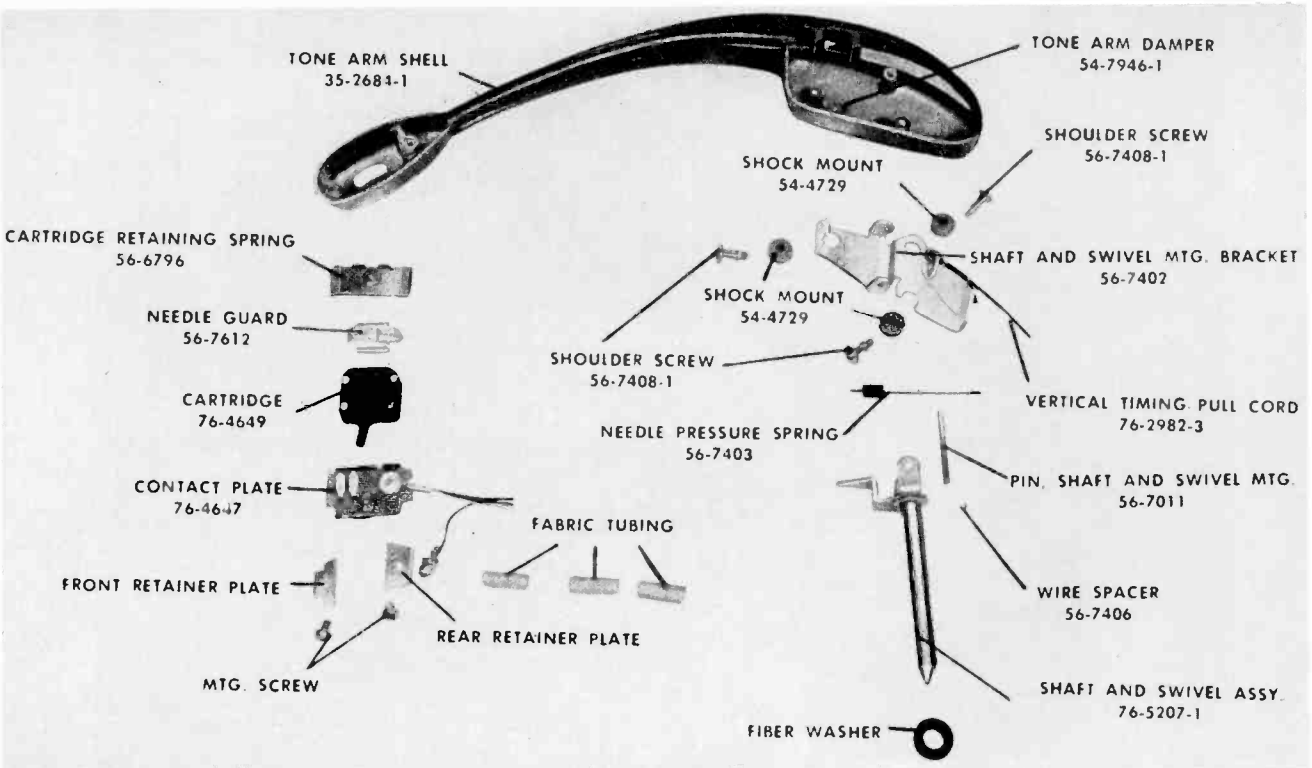


FIGURE 13. TONE-ARM ASSEMBLY

TP-9-219

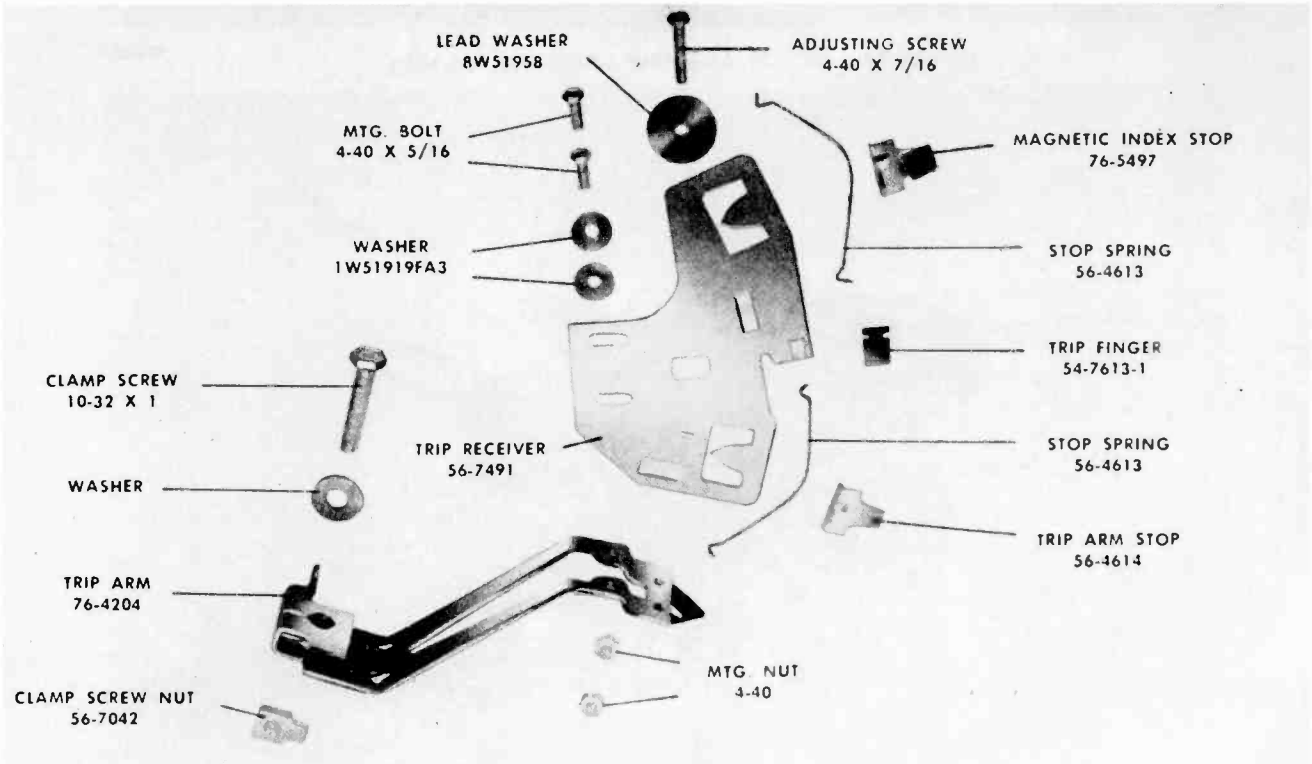


FIGURE 14. TRIP-ARM AND TRIP-RECEIVER ASSEMBLIES

TP-9-202

MODEL M-20

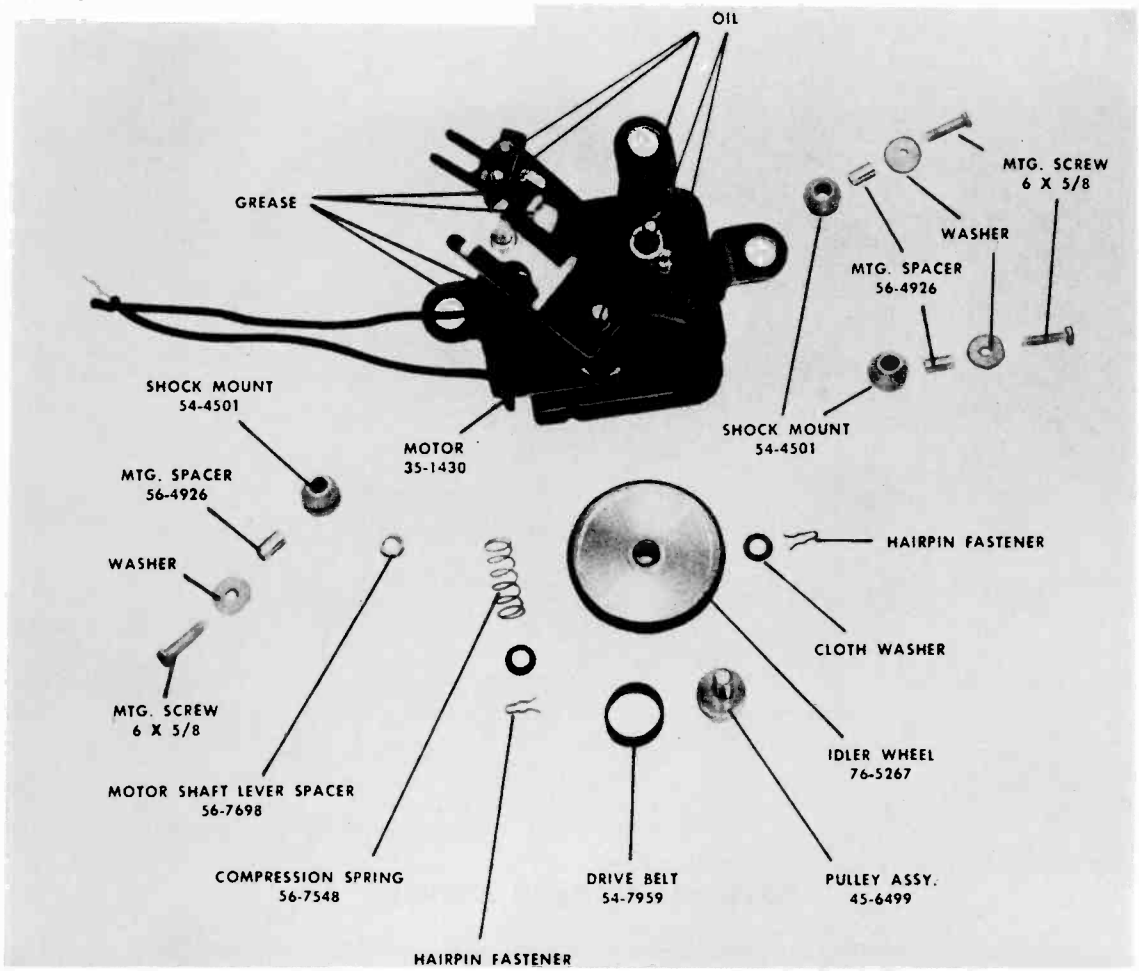


FIGURE 15. MOTOR ASSEMBLY—PART NO. 35-1430

TP-9-204

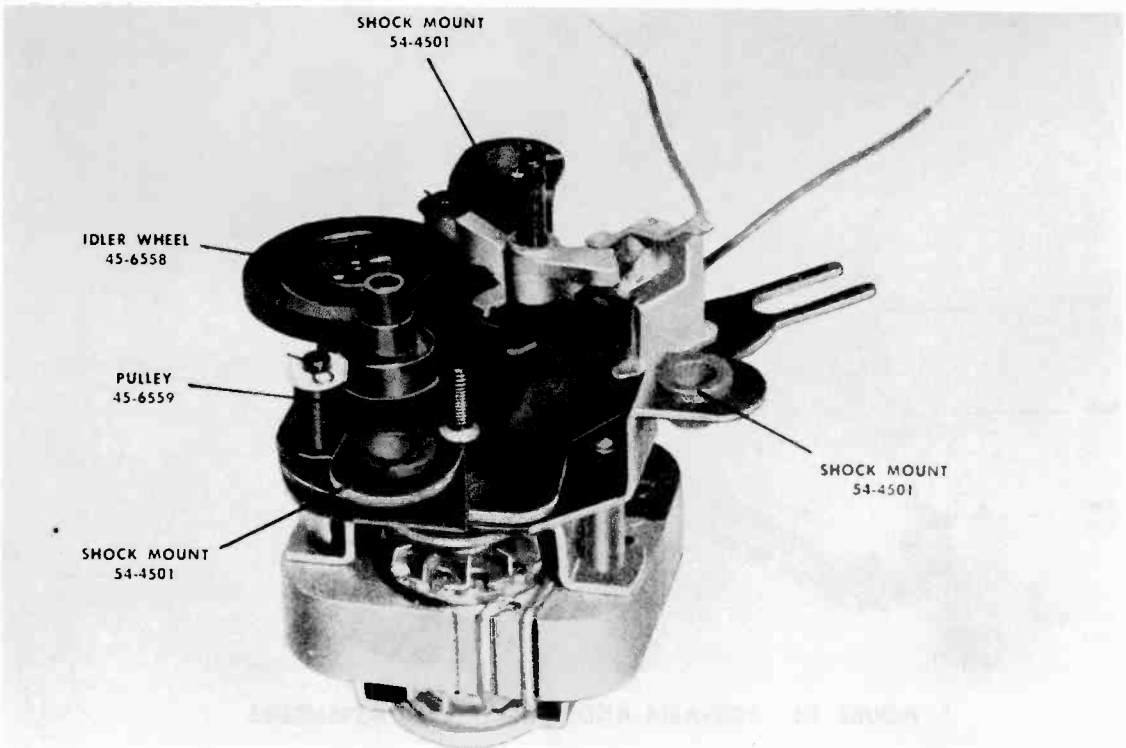
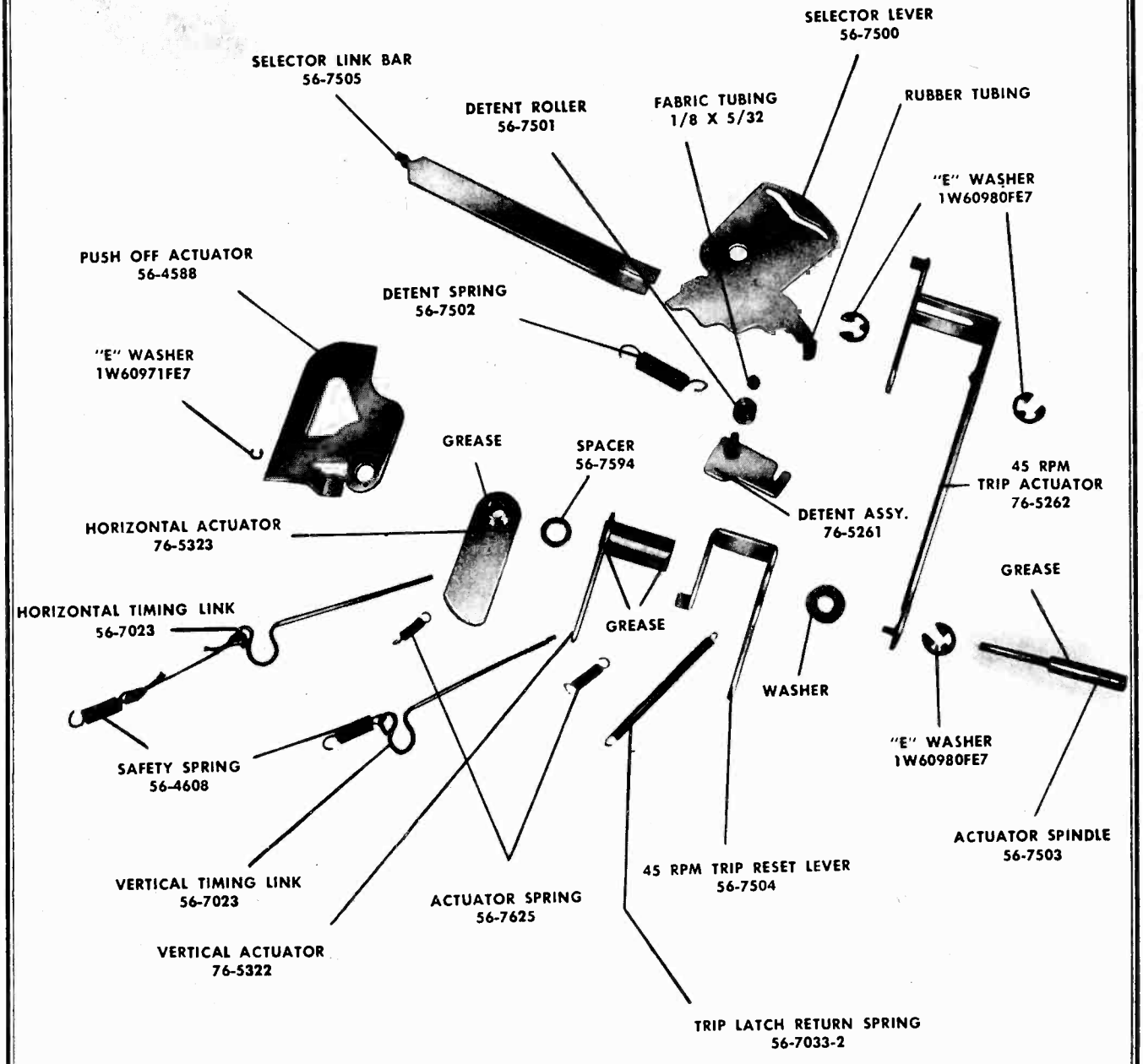


FIGURE 16. MOTOR ASSEMBLY—PART NO. 35-1433

TP-9-456



TP-9-220

FIGURE 17. ACTUATOR AND SPEED-CHANGE ASSEMBLIES

MODEL M-20

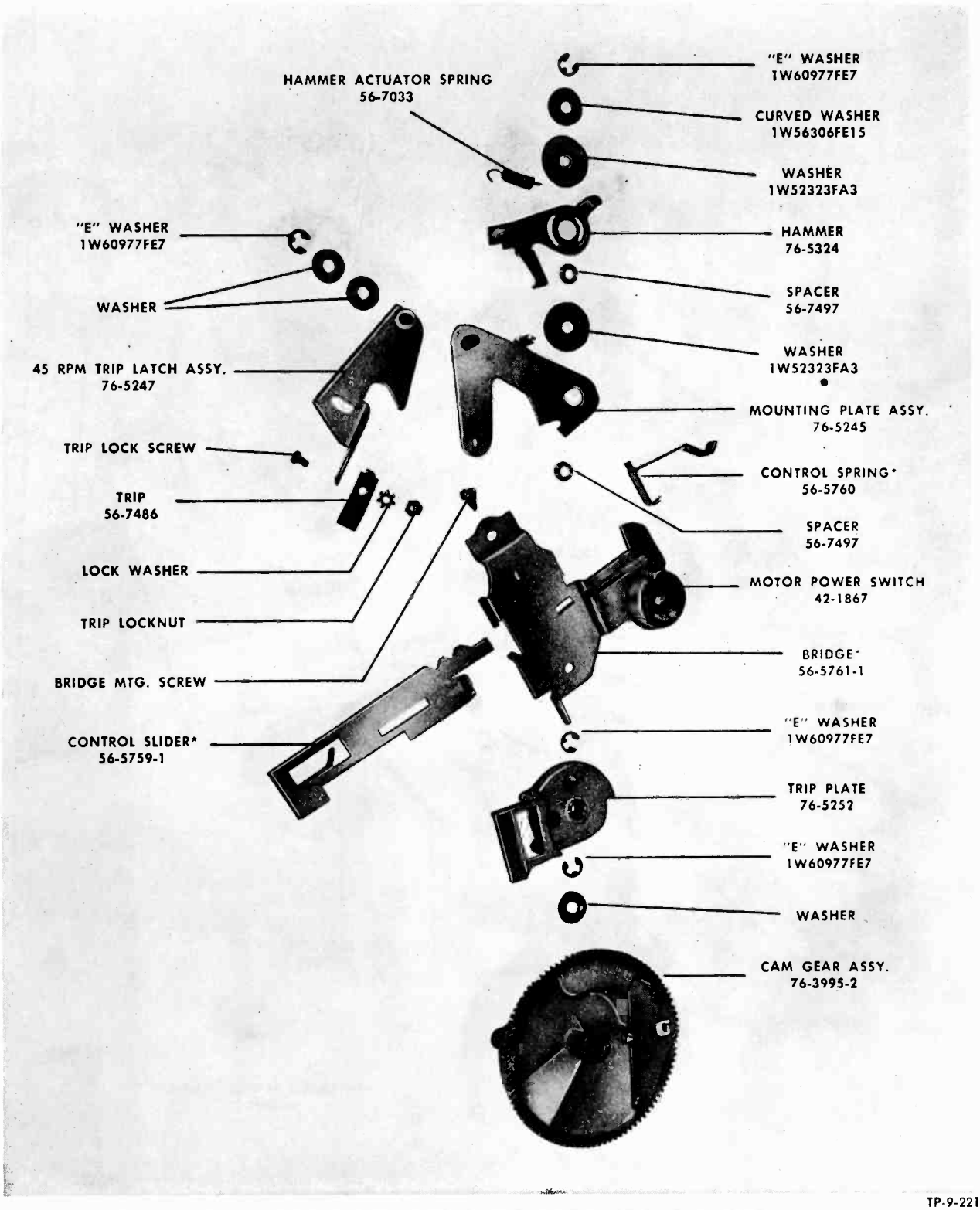


FIGURE 18. CAM-GEAR AND BRIDGE ASSEMBLIES (BRIDGE ASSEMBLY PARTS ARE IDENTIFIED BY *)

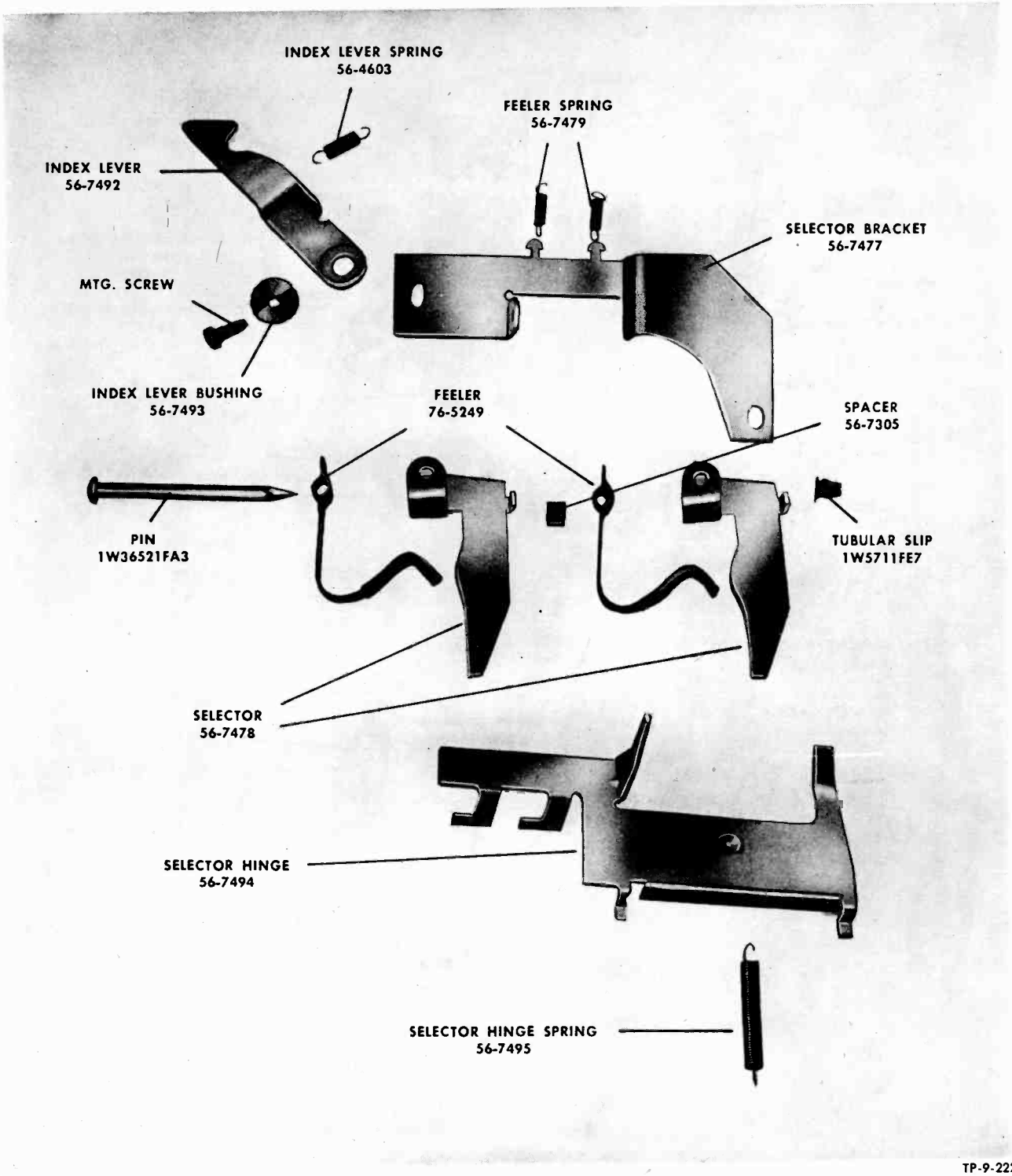
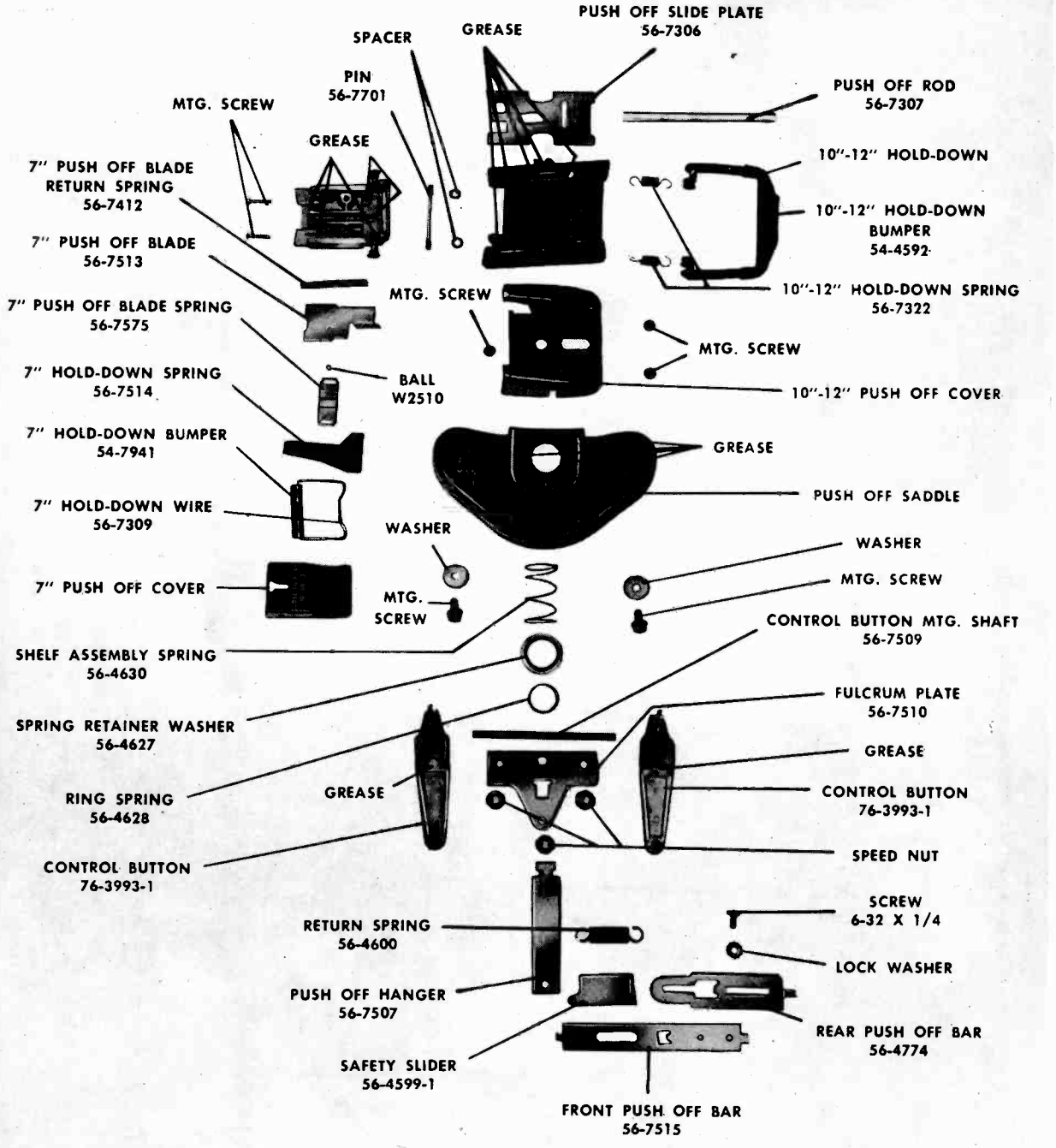


FIGURE 19. SELECTOR ASSEMBLY



TP-9-203

FIGURE 20. RECORD-SHELF AND PUSH-OFF ASSEMBLIES

REPLACEMENT PARTS LIST

DESCRIPTION	SERVICE PART NO.
Actuator Assembly	
Actuator, horizontal	76-5323
Actuator, trip, 45 r.p.m.	76-5262
Actuator, vertical	76-5322
"E" washer	1W60980FE7
"E" washer	1W60971FE7
Link, horizontal and vertical timing (2)	56-7023
Reset lever, 45 r.p.m. trip	56-7504
Spacer	56-7594
Spindle, actuator mounting	56-7503
Spring, actuator (2)	56-7625
Bridge Assembly	76-3998-1
Bearing assembly, turntable	76-2991
Bridge	56-5761-1
Control link	56-7506
Control slider	56-5759-1
Cover, motor switch	76-4010
Spring, control	56-5760
Switch, motor power	42-1867
Cam-Gear Assembly	76-3995-2
Bushing, index lever	56-7493
"E" washer	1W60977FE7
Hammer	76-5324
Index lever, cam locking	56-7492
Latch assembly, 45 r.p.m. trip	76-5247
Mounting plate assembly	76-5245
Spacer (2)	56-7497
Spring, hammer actuator	56-7033
Spring, index lever	56-4603
Spring, 45 r.p.m. trip-latch return	56-7033-2
Trip finger, of trip latch	56-7486
Trip plate	76-5252
Washer (2)	1W52323FA3
Washer, curved	1W56306FE15
Index-Selector Assembly	
Bracket, selector	56-7477
Feeler (2)	76-5249
Pin	1W36521FA3
Selector (2)	56-7478
Selector hinge	56-7494
Spacer	56-7305
Spring, feeler (2)	56-7479
Spring, selector hinge	56-7495
Tubular slip	1W5711FE7
Motor Assembly, 60 cycles (see figure 15)	35-1430
Cable-and-plug assembly, motor power	41-3869
Drive belt	54-7959
Idler wheel	76-5267
Pulley assembly	45-6499
Shock mount (3)	54-4501
Spacer, mounting	56-4926
Spacer, motor shift lever	56-7698
Spring, compression	56-7548

DESCRIPTION	SERVICE PART NO.
Motor Assembly, 60 cycles (see figure 16)	35-1433△
Idler wheel	45-6558
Pulley	45-6559
Shock mount (3)	54-4501
Spacer, mounting	56-4926
Motor Assembly, 25 cycles	35-1446
Motor Assembly, 50/60 cycles	35-1442
Conversion kit for 50-cycle operation	40-7848
Push-Off-Bar Assembly	
Actuator, push-off	56-4588
Bar, push-off, front	56-7515
Bar, push-off, rear	56-4774
Hanger, push-off	56-7507
Safety slider	56-4599-1
Spring, return	56-4600
Push-Off and Shelf Assembly	76-5259
Ball	W2510
Bumper, 10"-12" hold-down	54-4592
Bumper, 7" hold-down	54-7941
Control button (2)	76-3993-1
Fulcrum plate	56-7510
Hold-down wire, 7"	56-7309
Pin	56-7701
Push-off blade (7")	56-7513
Push-off rod	56-7307
Shaft, control-button mtg.	56-7509
Slide plate, 10" and 12" push-off	56-7306
Spring, 7" hold-down	56-7514
Spring, 10" and 12" hold-down (2)	56-7322
Spring, 7" push-off blade	56-7575
Spring, 7" push-off blade return	56-7412
Spring, ring	56-4628
Spring, shelf assy.	56-4630
Washer, spring retainer	56-4627
Speed Change	
Detent assembly	76-5261
Lock, detent plate	56-7499
Roller, detent	56-7501
Selector lever	56-7500
Selector link bar	56-7505
Spring, detent	56-7502
Tone Arm (complete)	35-2692-3
Bracket, mounting for shaft and swivel	56-7402
Cartridge	76-4649
Contact plate	76-4647
Damper, pyralin	54-7946-1
Guard, needle	56-7612
Needle	35-2693
Pin, shaft and swivel	56-7011
Pull-cord assembly, vertical timing	76-2982-3
Retainer plate, front	56-6795

MODEL M-20

REPLACEMENT PARTS LIST (Continued)

DESCRIPTION	SERVICE PART NO.
Retainer plate, rear	56-6794
Screw, shoulder, swivel mounting (3)	56-7408-1
Shaft-and-swivel assembly	76-5207-1
Shock-mount, swivel mounting (3)	54-4729
Spacer, wire, shaft and swivel pin	56-7406
Spring, cartridge retaining	56-6796
Spring, needle pressure	56-7403
Spring, safety, pull-cord	56-4608
Stanchion, tone arm	56-5746-1
Tone-arm shell	35-2684-1
Trip Arm	76-4204
Index stop, magnetic	76-5497
Nut, clamp screw	56-7042
Pull-cord assembly, horizontal timing	76-2982-2
Spring, safety, pull-cord	56-4608
Spring, stop (2)	56-4613
Trip-arm stop	56-4614
Trip finger	54-7613-1
Trip receiver	56-7491
Washer (2)	IW51919FA3
Washer, lead	8W51958

DESCRIPTION	SERVICE PART NO.
Miscellaneous	
Base-plate and tone-arm-stanchion assembly	76-5256
Bumper, rubber, tone-arm rest	54-4647
Cable clamp	56-2832
Driver, 45 r.p.m. record	56-7747
Insert (adaptor), 45 r.p.m. record	54-4744
Spindle	76-3926-1
Cotter pin, spindle retaining	ZW35740
Spring, spindle	56-7508
Switch, tone-arm-output selector	42-1873
Tone-arm rest	56-6376
Turntable	
Felt ring, turntable bearing	54-7385

△This motor is not stocked. Order Part No. 35-1430.

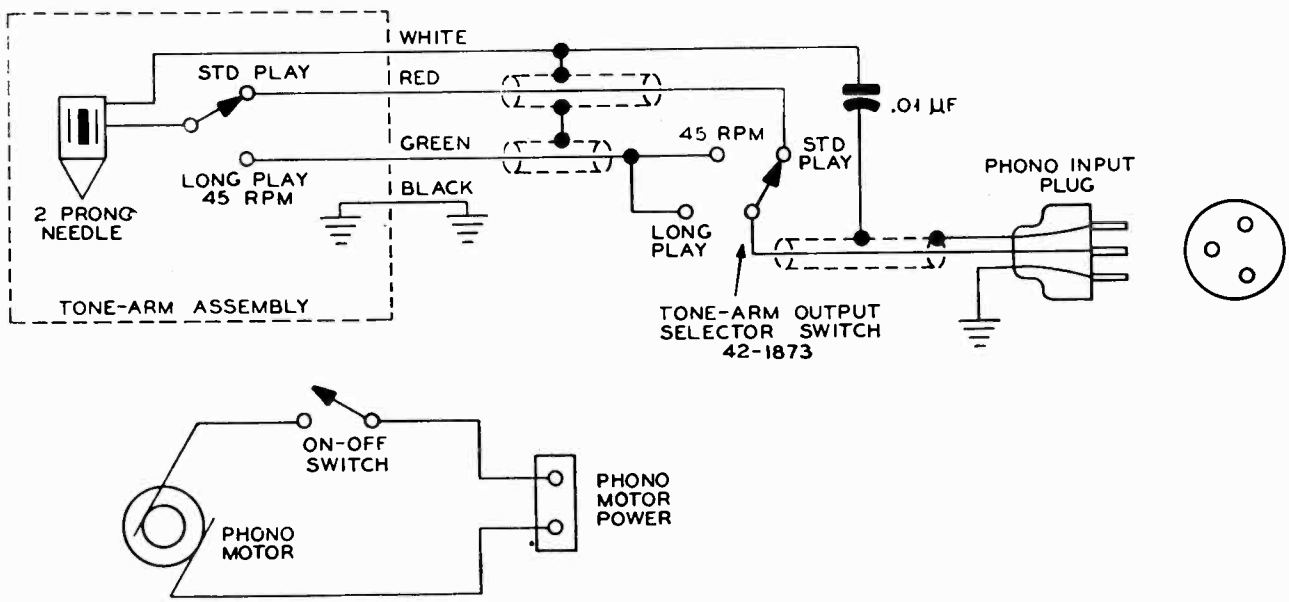


FIGURE 21. WIRING DIAGRAM OF MODEL M-20

Trav-ler Record Changer Model A

OPERATION OF RECORD CHANGER

For 10" records the long side of the record shelf (11) must be turned counterclockwise (Fig. 6) so that it points toward the spindle (47).

For 12" records, the short side of the record shelf (11) must be turned counterclockwise so that it points toward the spindle (47).

In either case, always turn the record shelf counterclockwise until a click is heard. This will be the 10"-12" index lever (9) engaging one of two slots on the 10"-12" index cam. (12). This insures correct positioning of the mechanism during cycling or playing.

Lift the record holddown plate (20) Fig. 6 to the rear of the record shelf (11)(if it is not already there) and place two or three records on the spindle (47) and record shelf (11). Return the record holddown plate (20) so that it rests on the records holding them in place.

Turn the control knob (29) to the Reject position and hold momentarily. Release the control knob (29) and it will return to the ON position for automatic operation.

If the mechanism is working properly more records may be added.

This changer was designed to play automatically 12 - 10" or 10 - 12" standard records not mixed, and to operate on 115-117 volts 60 cycles.

CYCLE OF OPERATION

Drawings A through 5 show Trav-ler Model A Record Changer progressing through a complete cycle of operation.

Fig. A shows the bottom view of the Record Changer with the drive wheel and belt in place. Fig. B shows the bottom view of the Record Changer with the drive wheel and belt removed and the main cam (40) in place. All parts visible from the bottom of the Record Changer are labeled in these 2 drawings.

If Figs. 1 through 5, the drive wheel (41) and main cam (40) have been omitted for sake of clarity and to show operation of otherwise hidden parts. The main cam, however, has been shown in these drawings as a dotted line to illustrate its position.

Only those parts are labeled in Figs. 1 - 5B which are operative or referred to in that particular phase of cycle. Figs. 1, 1A, and 1B illustrate the parts of the Record Changer in the OFF or normal position.

To start the change cycle, turn the control knob (29) to the Reject position as shown in Fig. 2A. Release the control knob and it will automatically return to the ON position as shown in Fig. 3A.

This causes the reject arm actuating lever (26 Fig. 2) to move to the left, causing the reject arm (35 fig. 2) to pivot and push the ON -

MODEL A

OFF switch (22 Fig. 2) to the ON position. And at the same time point A of the reject arm (25 Fig. 2) pushes against the release arm (35 Fig. 2) releases its hold on the cam pawl (39 Fig 2C) allowing it to drop down and engage the raised portions of the drive wheel (41 Fig. 2C). The drive wheel is driven by the drive belt (42) and drive pulley (46 Fig. A).

This section starts turning the main cam (40 Fig. B). The pickup arm lift (56 Fig. 3B) which normally rests in the depression (point C) in the top of the main cam (40 Fig. 3C) is forced out of the depression and rides around the flat surface of the cam for the duration of the change cycle. At the same time, the pickup arm lift (56) forces the pickup arm (62 Fig. 3B) upward. And the cam follower (14, point D, Fig. 3) in following the inside contour (E Fig. 3C) of the main cam moves the pickup (62 Fig. 3A) away from the turntable (54 Fig. 3A) so that a record will be free to drop. (Assuming start of new cycle.)

As soon as point F of the main cam (40 Fig. 3C) moves against the ejector roller (15 Fig. 3) the roller is forced away from the main cam and the roller shaft (15) see exploded view) in turn forces the ejector plate (16) Fig. 3A and 6 forward and pushes a record off the record shelf (11 Fig. 4A).

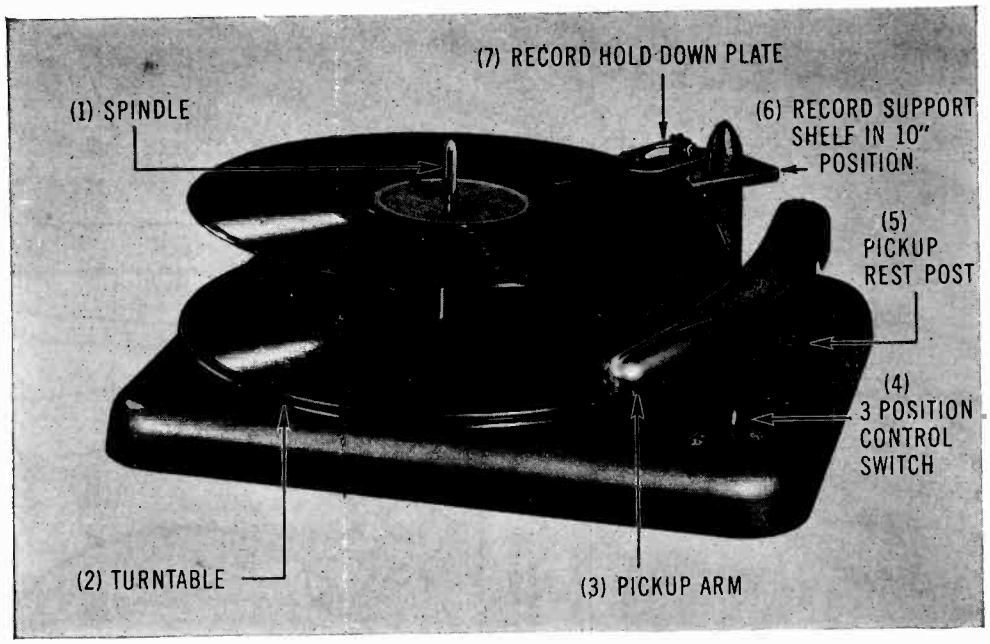
As the main cam (40 Fig. 3) continues to turn, the tension of the ejector spring (31 Fig. 3) forces the ejector roller (15) to follow the outside contour of the main cam (40 Fig. 4). This allows the ejector plate (16 Fig. 4A) to return to its normal position.

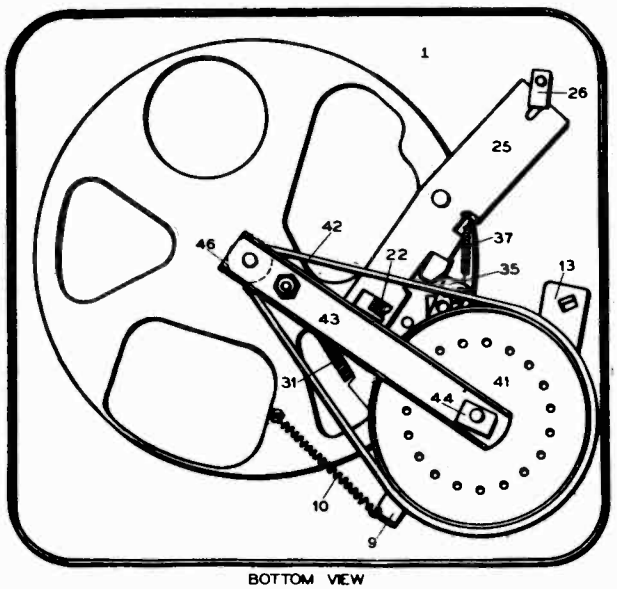
Near the end of the change cycle as the cam follower (14, point D, Fig. 4) reaches point G of the inside contour of the main cam (40 Fig. 4C), the pickup arm starts moving toward the turntable (54 Fig. 4A), and when it is directly over the starting point of the record, the main cam (40 Fig. 4C) moves until the depression, C, in the main cam, is directly under the pickup arm lift (56 Fig. 4B), which causes the pickup arm (62 Fig. 4B) to lower onto the record.

As the main cam (40 Fig. 4) ends its' revolution, the cam pawl (39 Fig. 4D) comes in contact with point B on the release arm (35 Fig. 4) and is lifted up from contact with the drive wheel (41 Fig. A also Fig. 4D) and thereby stopping the main cam in its original position.

The pickup arm is now free to move across the record.

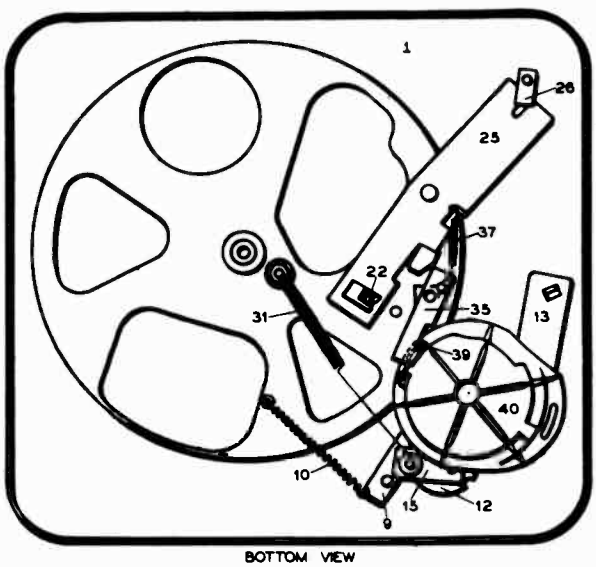
Fig. 5 shows how the pickup trip arm (13) has followed the pickup arm (62 Fig. 5A) as it moved across the record. The pickup arm is at the end of the record and the serrated end of the pickup trip arm has moved against the release arm tension bracket (33 Fig. 5). (Also see 33 on exploded view). The backward and forward movement caused by the grooves at the end of the record forces the release arm tension bracket (33 Fig. 5) to pivot, and the pivot point applies pressure to the release arm (35 Fig. 5) forcing it away from the cam pawl (39 Fig. 2C) allowing the cam pawl to drop and engage the main drive wheel (41 Fig. 2C), thereby starting another change cycle.





BOTTOM VIEW

FIG. A
DRIVE WHEEL AND BELT IN PLACE



BOTTOM VIEW

FIG. B
CAM IN PLACE

MODEL A

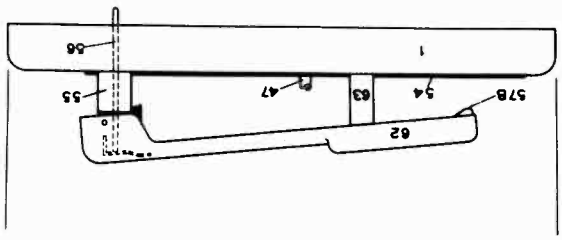


FIG. 1B
OFF POSITION

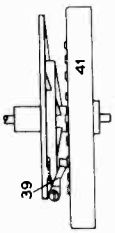


FIG. 2C
REJECT POSITION

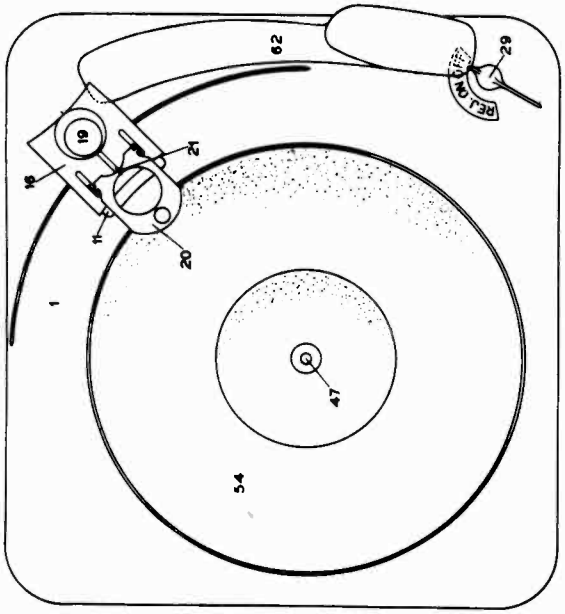


FIG. 1A
OFF POSITION

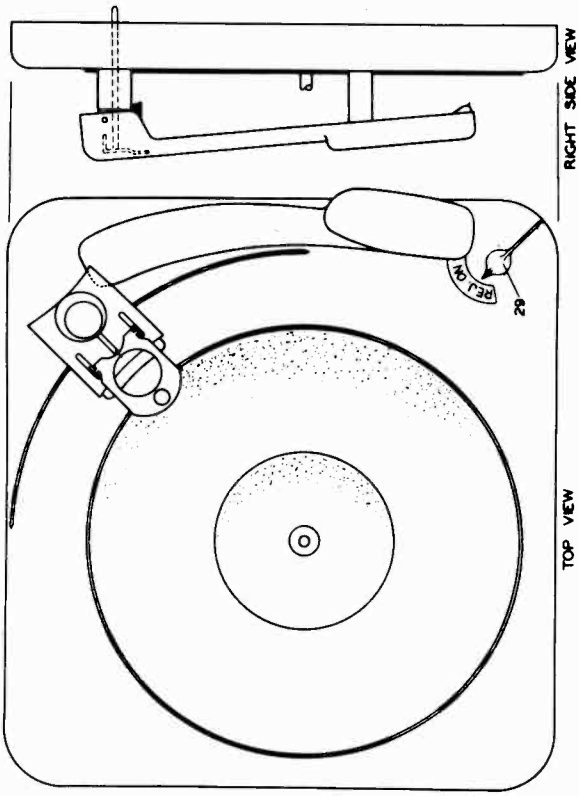


FIG. 2B
REJECT POSITION

FIG. 2A
REJECT POSITION

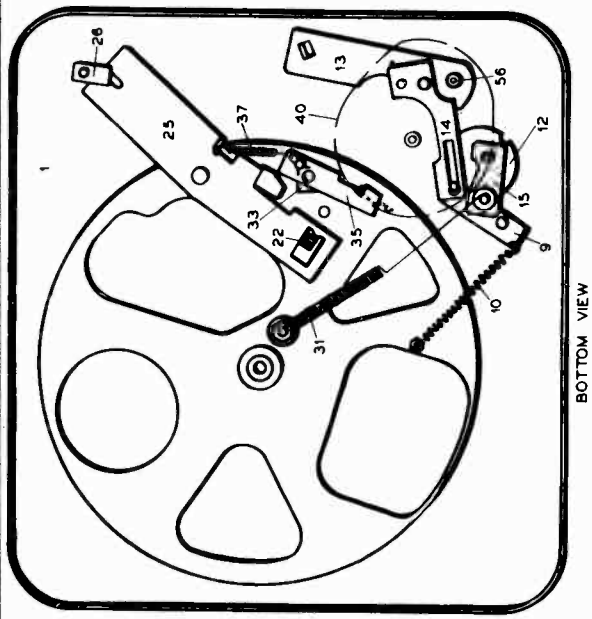


FIG. 1
OFF POSITION

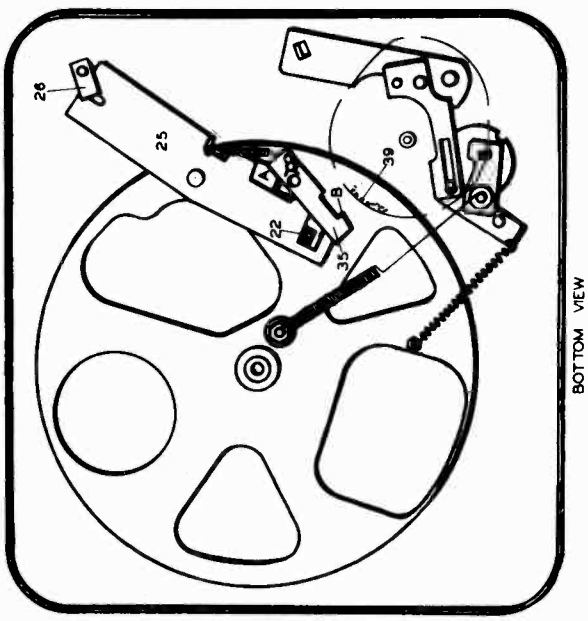
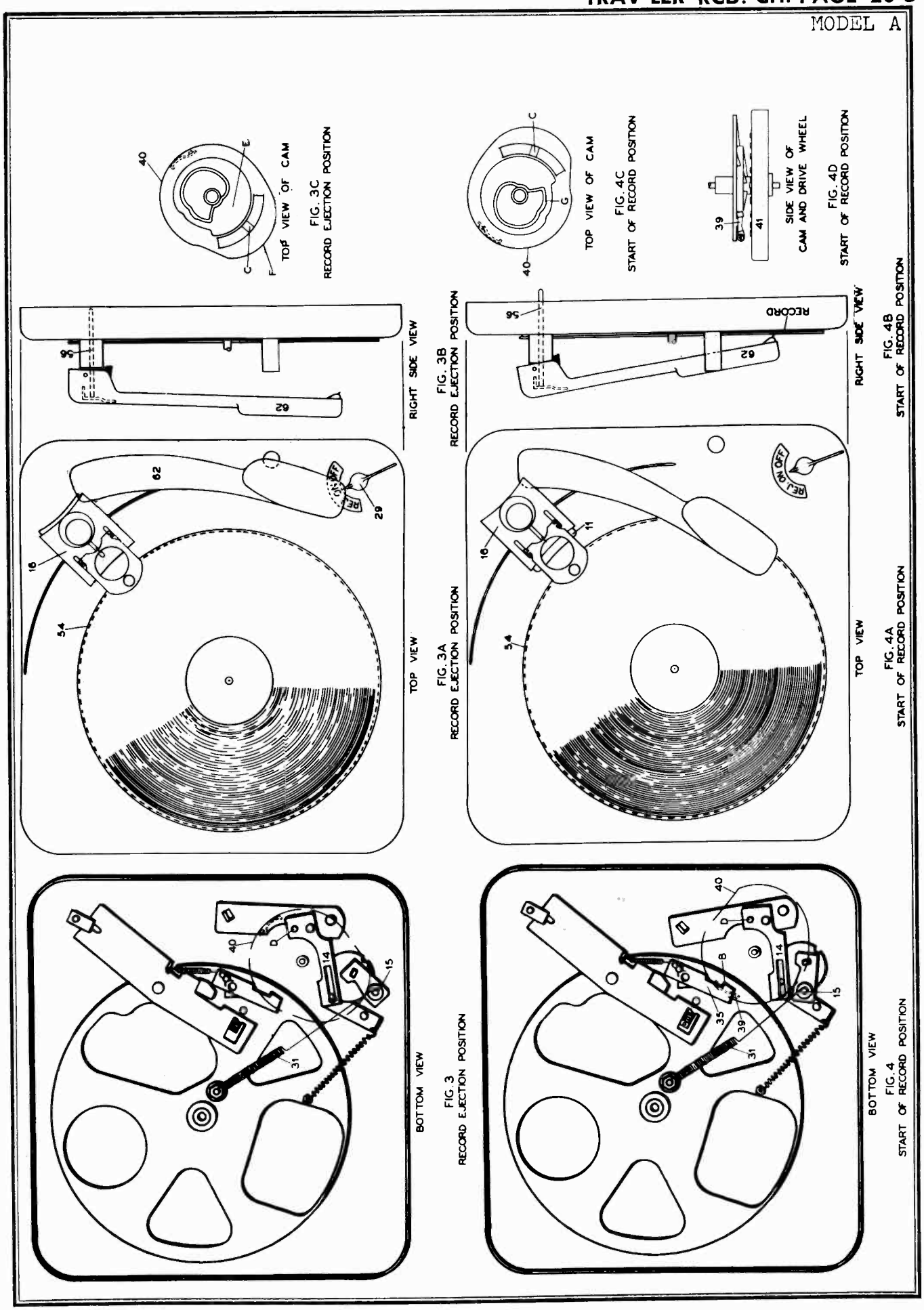
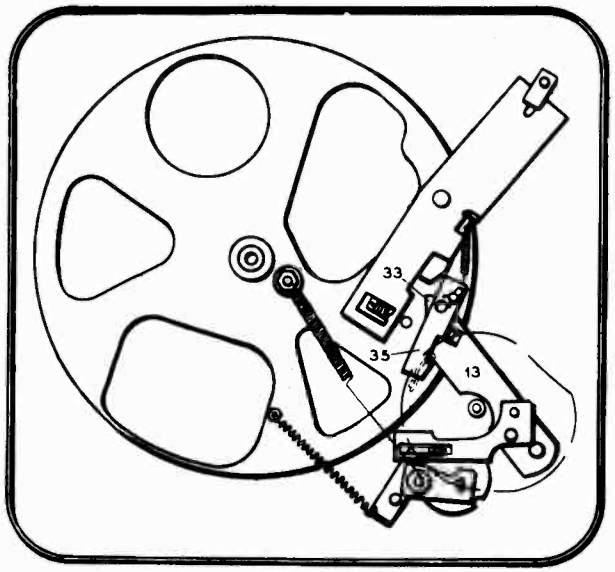


FIG. 2
REJECT POSITION

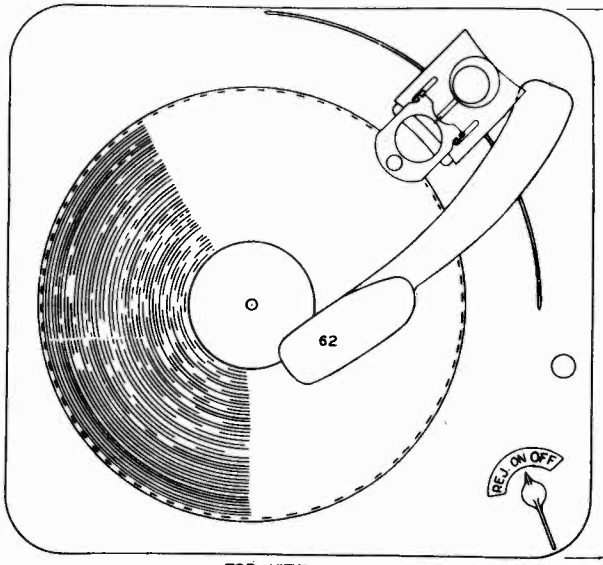
MODEL A





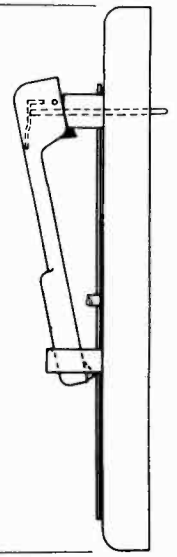
BOTTOM VIEW

FIG. 5
END OF RECORD POSITION



TOP VIEW

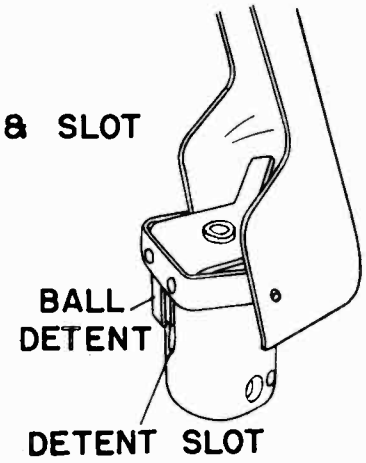
FIG. 5A
END OF RECORD POSITION



RIGHT SIDE VIEW

FIG. 5B
END OF RECORD POSITION

FIG. 7
BALL DETENT & SLOT



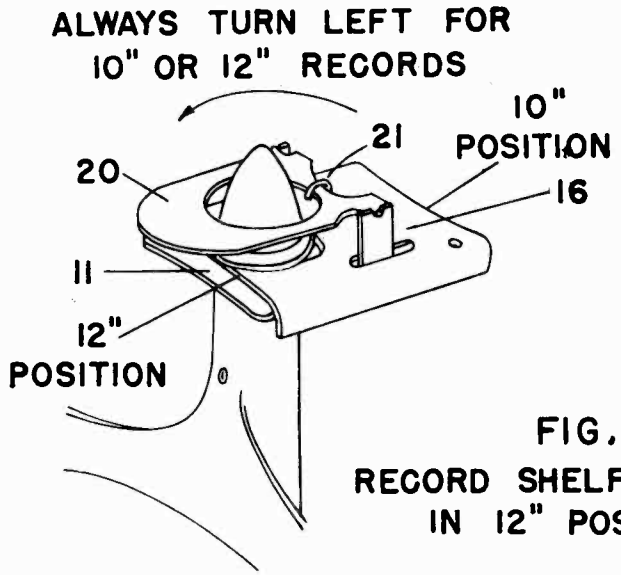
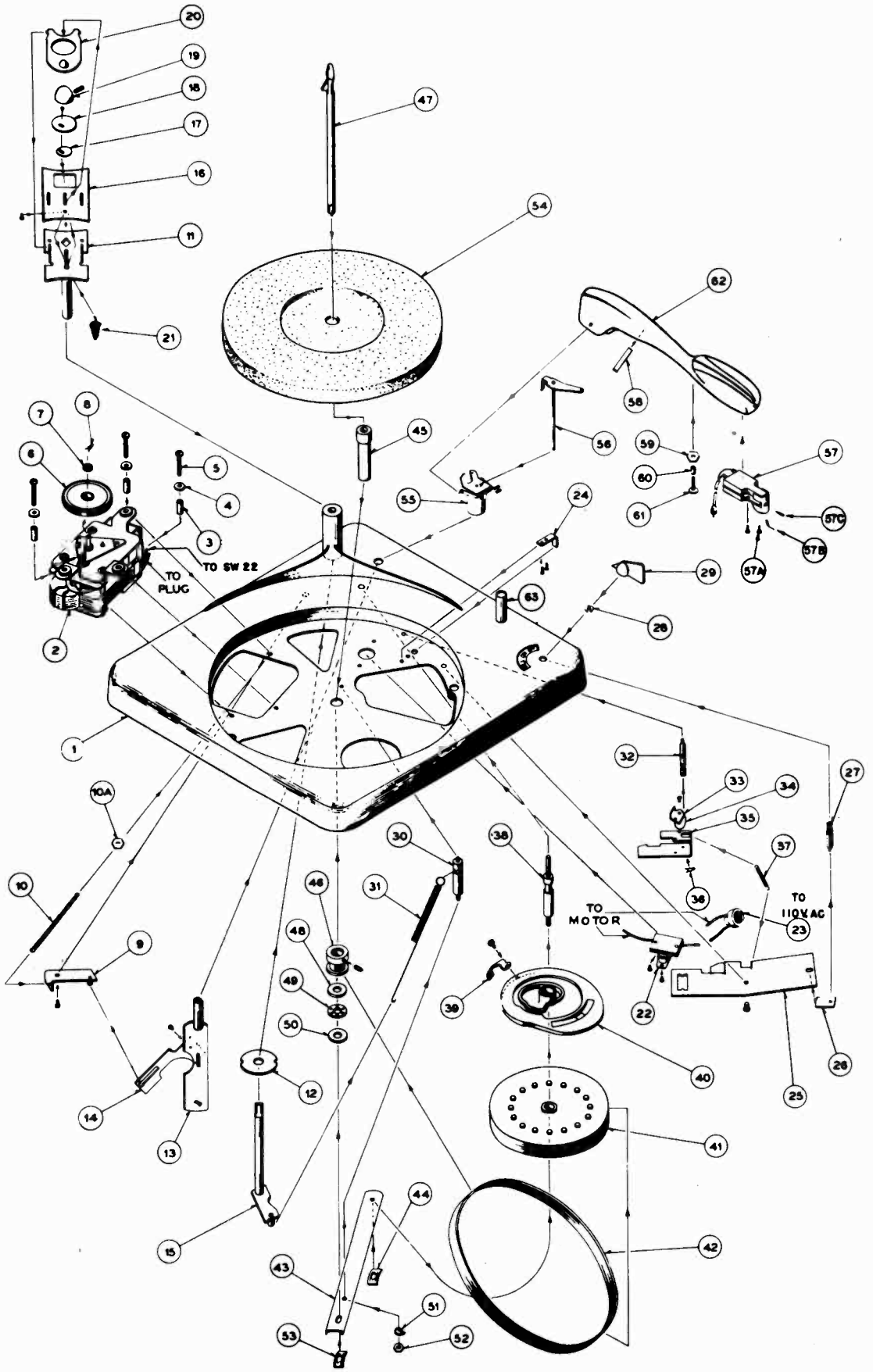


FIG. 6
RECORD SHELF SHOWN
IN 12" POSITION



SYMPTOMS	CAUSES	REMEDIES
1. Changer continues to cycle	1. Release arm spring (37) weak or lost 2. Reject Arm (25) binding 3. Release arm (35) bent 4. Actuating lever shaft (27) binding	1. Replace Spring 2. Oil lightly at pivot pin 3. Straighten until parallel with changer base plate 4. Remove control knob and oil shaft lightly
2. Mechanism does not trip at end of record	1. Pickup trip arm (13) is bend downwards	1. Straighten trip arm until parallel with changer base plate
3. Pickup arm moves a short way in on record then jumps a groove	1. Pickup trip arm (13) is bent upwards	1. Straighten trip arm until parallel with base plate
4. Wow or motor rumble	1. Worn spots in idler wheel (6) 2. Oil on idler sheel (6) and turntable rim 3. Warped record	1. Replace idler wheel or if spots are too deep try sanding the wheel smooth 2. Clean idler wheel and turntable rim
5. Change cycle is too slow or motor overheats	1. Moving parts binding 2. Line voltage incorrect 3. Defective motor winding 4. Drive belt slipping	1. Locate part and oil lightly 2. 115-117 Volts 60 cycles 3. Replace motor 4. Clean belt, pulley and drive wheel if oily. Replace belt if not oily
6. Pickup arm lands too far in on record or	1. Ball detent is not in detent slot Fig. 7	1. Hold the pickup arm part (55) stationary and move the pickup arm until the ball detent Fig 7 engages the bell detent slot
7. Pickup arm does not lower enough to reach the record	1. The pickup arm lift (56) is bent upwards	1. Bend the pickup arm lift (56) down slightly and try the changer each time until the proper angle is obtained
8. Turntable will not start	1. A break in the line cord 2. Defective power plug 3. Defective switch 4. No voltage at power outlet 5. Burned out motor	1. Replace 2. Replace 3. Replace 4. Check fuse box 5. Replace
9. Distorted sound	1. Audio Amplifier defective 2. Word needle 3. Defective crystal cartridge 4. Worn record	1. Check with radio reception or check audio amplifier 2. Replace needle 3. Try new cartridge 4. Check with new record
10. No Sound	1. Defective crystal cartridge 2. Loose connection between crystal and audio amplifier 3. Defective Audio Amplifier	1. Replace 2. Make continuity and short check 3. Make conventional voltage, resistance and tube check

TRAV-LER RECORD CHANGER MODEL A

PART NO.	DESCRIPTION
1	Base Plate
2	Motor
3	Motor Mount Spacer
4	#6 Flat Washer
5	6 - 32x7/8" Motor Mount Screw
6	Idler Wheel
7	Fibre Washer
8	Hairpin Clip
9	10" - 12" Index Lever
10	Index Lever Tension Spring
10A	Tension Spring Anchor Nut #6-32
11	Record Shelf
12	10" - 12" Index Cam
13	Pickup Arm Trip Arm and Shaft
14	Cam Follower and Arm
15	Ejector Roller and Shaft
16	Ejector Plate
17	Ejector Cam
18	Ejector Washer
19	Ejector Assembly Top
20	Record Hold Down Plate
21	Hold Down Plate Spring
22	A.C. On-Off Switch
23	A.C. Connector Plug
24	Release Arm Stop
25	Reject Arm
26	Reject Arm Actuating Lever
27	Actuating Lever Shaft
28	"C" Washer
29	Control Knob
30	Bearing Support Bar Standoff
31	Ejector Roller Spring
32	Release Arm Support

PART NO.	DESCRIPTION
33	Release Arm Tension Bracket
34	Tension Bracket Spring
35	Release Arm
36	Hairpin Clip
37	Release Arm Spring
38	Main Cam and Drive Wheel Shaft
39	Cam Pawl
40	Main Cam
41	Drive Wheel
42	Drive Belt
43	Bearing Support Bar
44	Speed Nut
45	Turntable Bearing
46	Drive Pulley and Set Screw
47	Spindle
48	Bearing Washer
49	Turntable Thrust Bearing
50	Bearing Washer
51	#10 Lock Washer
52	#10-28 Nut
53	Speed Nut
54	Turntable
55	Pickup Arm Post and Set Screws
56	Pickup Arm Lift
57	Crystal Pickup Cartridge
57A	Pickup Mounting Screws
57B	Needle
57C	Needle Set Screw
58	Pickup Leads Spring Clip
59	#4-32 Nut
60	Spaghetti Sleeve
61	#4-32x1/2" Machine Screw
62	Pickup Arm
63	Pickup Arm Rest

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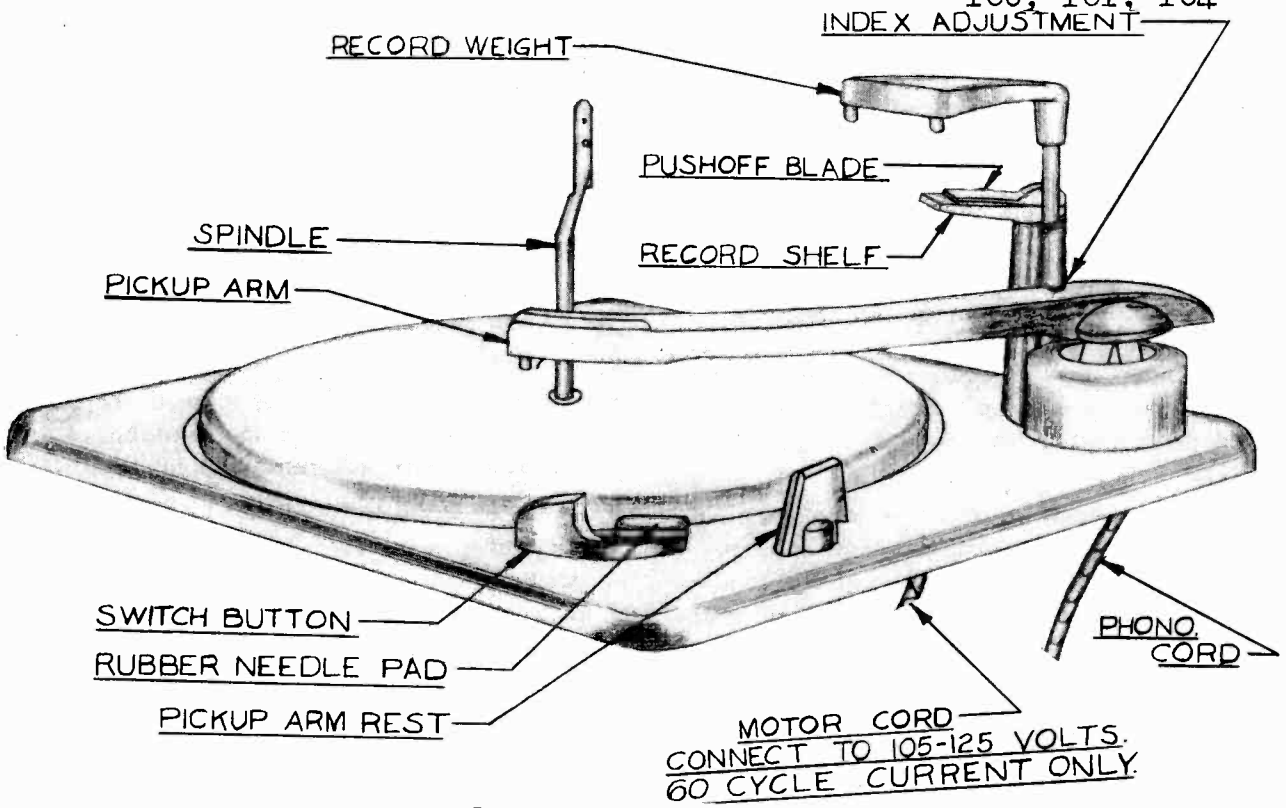

DESCRIPTION

The Webster-Chicago Model 146 is a single post, spring-cushioned spindle, automatic record changer. Simple in design and operation, it provides manual or automatic playing of a 1" stack of 10" or 12" records with a minimum of waiting time between records during automatic operation. When set for automatic operation, Model 146 returns the pickup arm to the rest position after the last record, although the motor continues to revolve until attended.

Model 146 features the exclusive Webster-Chicago Velocity Trip mechanism. The pickup arm is not actuated by "lead-in" springs and there is a minimum of lateral pressure. The arm travels freely in either direction. This lack of lateral pressure or inertia add immeasurably to the life of records and is considered to be as important as extra light vertical pressure, which in some instances would result in poor tracking at extremely low or high frequencies. This free floating arm permits "home recordings" or "inside out" records up to 12" size to be played manually.

Model 146 will change warped or rough-edged records, at the same time assuring maximum protection to the finest discs.

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160, 161, 164

OPERATION

MOTOR

Connect the motor cord to a source of 105-115 volt 60 cycle current only. If it is desired to operate the changer on 50 cycle current, a special motor pulley (Part No. 17X412-11) must be used in place of the one supplied with the changer in order to drive the turntable at the required speed of 78 R.P.M.

Do not under any circumstances connect the motor to a source of direct current or alternating current of any other frequencies.

PICKUP

The high impedance crystal cartridge supplied may be of the fixed permanent point or removable needle type. If it is the latter, use a needle which is not more than $1\frac{1}{16}$ inches long for most satisfactory results.

Some desirable qualities of a good needle are faithful reproduction, low surface scratch or hiss, long wearing qualities, minimum record wear and rugged construction.

The Webster-Chicago Nylon Needles are particularly adaptable for use with your Webster-Chicago "146" Do not use single play or cactus needles for automatic operation. Such needles require frequent replacement or sharpening and are not designed to play a full stack of records.

OPERATION — AUTOMATIC

1. Turn the Record Shelf forward or back for ten or twelve inch records.
2. With the record ballast weight lifted and turned forward out of position, place up to a 1" stack of 10" or 12" records on the spindle so that the bottom record rests on the step of the spindle and on the Record Shelf.
3. Turn the record ballast weight and lower it until it rests on the top record.
4. Move the control knob from the STOP position (nearest the pickup arm rest) to the START-REJECT position (farthest from the pickup arm rest) and release. The control will then drop back into the automatic playing position and the mechanism will continue to operate automatically until the last record is completed. The pickup arm will then return to the "rest" position and the motor will continue to revolve until the control knob is returned to the STOP position.
5. To reject any record while playing in the automatic position, move the control knob momentarily to the START-REJECT position and release.

NOTE: The mechanism may be turned off at any time or during any portion of the change cycle by moving the control knob to the STOP position.

The pickup arm may be moved horizontally at any time without damage to the mechanism. However, the pickup arm cannot be returned to the pickup arm rest until the change cycle has been completed.

After the last record has been played, the entire stack may be removed from the turntable at one time. The simplest procedure is as follows:

a. Place the pickup arm on the pickup arm rest.
b. Lift and turn the record ballast weight out of position.
c. Place the fingers of both hands under opposite edges of the bottom record.
d. Do not apply pressure to the top record. (Keep your thumbs free.)
e. Lift the stack of records straight up following the contours of the spindle. This permits the stack of records to follow the curve of the spindle without binding and greatly facilitates the removal of the stack.

OPERATION — MANUAL

1. Turn the Record Shelf to the TWELVE inch position (this is not essential but permits more clearance in loading and unloading records.)
2. Place a record on the turntable.
3. Move the control knob from the STOP position to the AUTOMATIC position, then toward the spindle to the MANUAL position, as indicated by the arrow on the control knob.

   No harm will result if the knob is accidentally moved to the START-REJECT position. If a twelve inch record is on the turntable, the arm will automatically index to the edge of the record. If a ten inch record is on the turntable, the needle will be set down gently on the rubber pad and the arm may be moved to the edge of the record.
4. Place the needle gently on the edge of the record. Particular care should be exercised if your pickup has a sapphire point needle. Although the sapphire is very hard and long wearing, it is extremely brittle and may be fractured or chipped if dropped on the record
5. To stop the mechanism at any time, move the control knob to the STOP position.

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SERVICE INFORMATION

All units are accurately adjusted, lubricated and tested at the factory. However, service repairs and adjustments sometimes become necessary. This bulletin should be studied carefully before making any adjustments or replacing parts.

The functions and most probable misadjustments of the main assemblies are as follows (reference numbers refer to the exploded views

THE AUTOMATIC TRIP FAILS TO FUNCTION

The Main Cam Assembly (32) and Actuating Gear (31) are the heart of the record changer. The Main Cam Assembly drives the mechanism associated with the action of the Pickup Arm (7) and the Record Selector assemblies. It, in turn, is driven by the gear train (28, 29, 30) and the Turntable which is rim driven by the phonograph motor.

The Main Cam Assembly and Actuating Gear is put in motion or "tripped" by means of the "automatic" trip or by the manually operated "reject" trip. When the movement of the Pickup Arm toward the spindle is greater than 1/8" in 1/2 revolution of the turntable, the Automatic Trip Arm (35) trips the Velocity Trip and Roller Assembly (33). This releases the Actuating Pawl on the Main Cam Assembly (32), allowing it to engage the Main Cam Actuating Gear (31) and driving it through the change cycle. The pressure from the Automatic Trip Arm required to actuate the trip mechanism is negligible.

The Automatic Trip Arm follows the movement of the Pickup Arm through a weighted friction clutch (34). This clutch must be kept free of oil and grease. If the clutch does not cause the Automatic Trip Arm to trip the mechanism, clean the clutch parts with carbon tetrachloride. This clutch should operate the trip mechanism without placing undue drag on the movement of the pickup arm.

Also check for:

1. Velocity Trip and Roller Assembly (32) binding.
2. Slight burr on end of the Actuating Pawl or on the underside of the hook end of the Velocity Trip and Roller Assembly.
3. Actuating Pawl stuck (part of Main Cam Assembly (32) engaged by the hook end of the Velocity Trip and Roller Assembly (33).
4. Automatic Trip Arm (35) bent and not hitting the Velocity Trip and Roller Assembly (33).
5. Automatic Trip Arm (35) fails to touch the Velocity Trip and Roller Assembly.
6. Velocity Trip and Roller Assembly (33) rubbing on the underside of the Main Cam Actuating Gear (31).
7. No velocity lead-in groove or eccentric groove in the center of record.

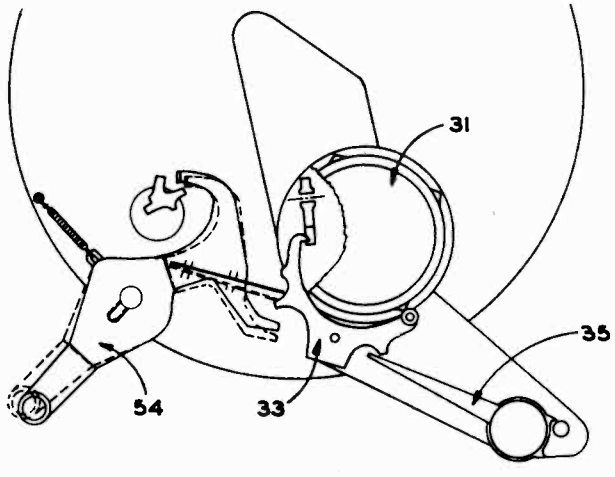
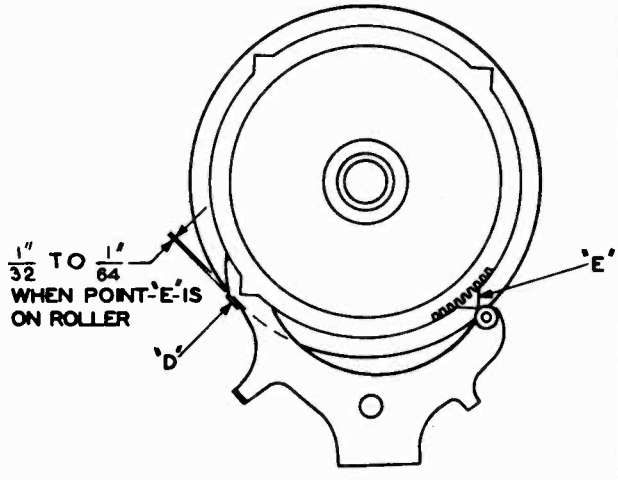


Fig. 1



ADJUST IF NECESSARY BY BENDING AT POINT "D"

Fig. 2

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8. Foreign matter in record groove.
9. Badly worn record.
10. Badly bent or worn needle.

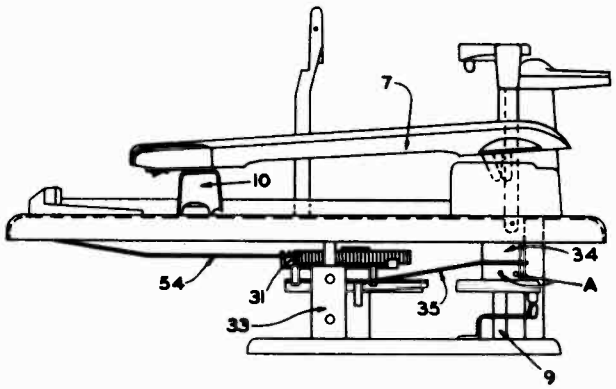

Fig. 3

IF THE "REJECT" TRIP FAILS TO FUNCTION

When the control knob is moved to the extreme START-REJECT position, the hair spring of the Reject Trip Lever Arm (54) actuates the Velocity Trip and Arm Assembly, putting the change mechanism in cycle. See Fig. 1.

Check for:

1. "Reject" trip hair spring of Lever 54 bent or broken.
2. Velocity Trip and Roller Assembly (33) binding.
3. Actuating Pawl stuck (part of Main Cam Assembly 32).

IF THE MECHANISM CONTINUES TO CYCLE

At the completion of the change cycle, the Actuating Pawl is disengaged from the Main Cam Assembly Actuating Gear by the hook end of the Velocity Trip and Roller Assembly, which has been returned to its normal position by the reset points on the Main Cam Drive Gear, Fig. 2.

If the clearance between the lip on the Velocity Trip Lever and the edge of the Main Cam is too small, it will prevent the hooked end of the Velocity Trip Lever from engaging the trigger. Adjust the clearance between the lip ("D" of Fig. 2) on the Velocity Trip Lever and the Main Cam to be within $\frac{1}{32}$" and $\frac{1}{64}$" when the roller is contacting the point of one of the reset points on the Actuating Gear

Also check for:

1. Velocity Trip and Roller Assembly (33) rubbing on Main Cam Actuating Gear (31).
2. Manual Trip Lever (54) binding.
3. "Disengage Roller" broken on Velocity Trip and Roller Assembly (33).

PICKUP ARM LIFT TOO HIGH OR TOO LOW

The vertical movement of the pickup arm is controlled by the angle of the pickup arm raising lever (37 and Fig. 4). The needle should approach the top record of a full stack of 10" records on the turntable with approximately $\frac{1}{16}$" clearance.

To adjust:

1. Put a full stack of 10" records ON THE TURNTABLE.
2. Trip the "Start-Reject" control and rotate the turntable clockwise until the needle clears the top record of the stack by about $\frac{1}{16}$"
3. Be sure the notch in the pickup arm raising disc engages the pickup arm raising lever.
4. If the needle does not clear the top record or if it raises too high, adjust by bending the pickup arm raising lever (37) at points X and Y as indicated in Fig. 4.

CAUTION: All adjusting bends should be made slowly, using slight but firm, easy pressure.

Be sure the set screws in the Pickup Arm Raising Disc (36) are not loose and are properly positioned in the alignment holes as explained in the paragraph on Needle Setdown Indexing.

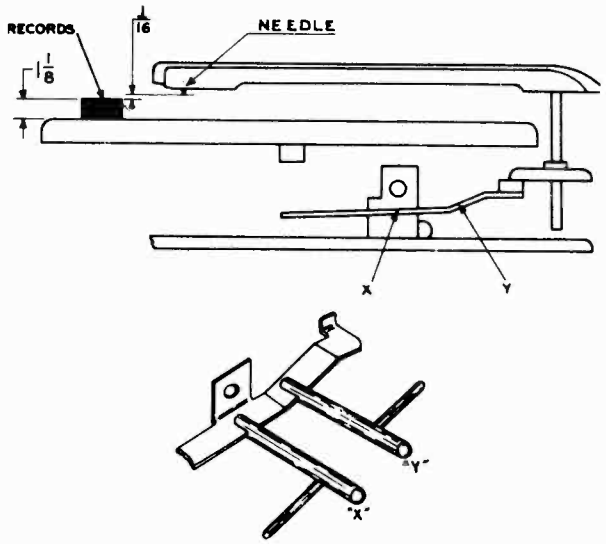

Fig. 4

NEEDLE SET DOWN INDEXING INCORRECT

The horizontal movement of the pickup arm (7) is controlled by the eccentric excursion of the Pickup Arm Raising Lever (37) moving the Pickup Arm Raising Disc (36) when actuated by the Main Cam Assembly (32). The eccentric screw (part of 8). accessible through the top of the pickup arm (7), should take care of any normal position adjustment. Turn this screw clockwise to index the needle in toward the spindle and counter-clockwise to index the needle out away from the spindle.

Should further adjustment be necessary, proceed as follows:

1. Set the eccentric screw, just mentioned, to a middle position.
2. Set the Record Shelf (4) to the 10" position.
3. Operate the mechanism by revolving the turntable manually until the needle drops to within 1/8" of a ten inch record on the turntable.
4. Be sure the notch in the Pickup Arm Raising Disc (36) engages the Pickup Arm Raising Lever (37).
5. The No. 8 Bristol set screws "A" of the Pickup Arm Raising Disc (36, Fig. 3) have pointed ends which fit into off center holes in the Pickup Arm Pivot (9). Alternately loosen one screw and tighten the other until the needle rests above the record lead-in groove at the desired point. Be sure that both set screws are tight when this adjustment is completed.
6. Complete the change cycle of the mechanism and place the pickup arm on the Pickup Arm Rest (10). The tongue of the Pickup Arm Raising Disc (36) should now rest against the post which supports the sub plate assembly. If the pickup arm does not rest in the proper position on the pickup arm rest, bend the tongue closer to or away from this post until the pickup arm is correctly positioned.
   REMEMBER: Always slight but firm, easy bends!
7. Turn the Record Shelf to 12" and check the needle drop on a twelve inch record. Make any additional adjustments with the eccentric screw mentioned previously.

PICKUP ARM DROPS OFF REST

The upturned end of the Pickup Arm Pivot Shaft Bracket (Fig. 3) prevents the Pickup Arm from falling off the Pickup Arm Rest. There should be 1/64" clearance between the tongue of the Pickup Arm Raising Disc (36) and the bottom of the groove formed by the Bracket and the Base Plate Post. Bend the Bracket end up or down to secure proper positioning of the Disc tongue and the Pivot bracket. Be careful to bend the end only or the Bracket will bind on the Pickup Arm Pivot Shaft. The Bracket should not be too high or the Disc tongue will rub on it when the needle approaches the edge of a 12" record, causing "glide in" on the first few grooves of the record.

ERRATIC INDEXING

Indexing in either the 10" or the 12" position is controlled through the presence or absence of pressure from the Compression Spring (45), on the Pickup Arm Raising Lever bracket, forcing the stud to travel the inside edge or the outside edge of the groove in the bottom of the Main Cam. The compression on this spring is changed as the Record Shelf is changed from the 10" to the 12" position. Improper adjustment of the spring tension will result in erratic indexing.

In the 12" position, the spring should be just free. In the 10" position the compression of the spring holds the stud of the Pickup Arm Raising Lever against the outside edge of the groove. If the compression tension needs adjustment:

1. Turn the Record Shelf (4) to the 12" position.
2. Trip the Reject control and rotate the Turntable clockwise until the push off Blade reaches its farthest forward position. At this point the cam follower will be at the highest point on the Main Cam ("A" of Fig. 5).
3. Loosen the lock bolts of (41) and (42).
4. Be sure that the Record Shelf is held in the extreme 12" position while adjusting the Record Shelf and Push-off Blade fingers.
5. At the same time, push the Push-off Blade forward as far as possible and push the Push-off Blade and Record Shelf Assembly downward tight against the Housing (6).
6. Position the Record Shelf finger and the Toggle Assembly (41) so the 12" finger of the Push-off

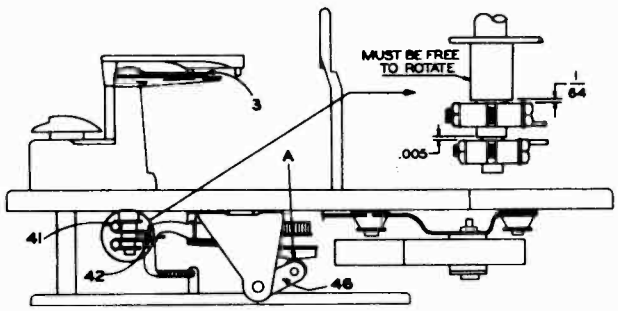

Fig. 5

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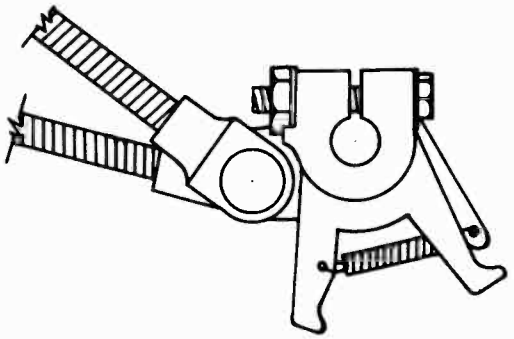

Fig. 6

Blade finger (42) looks like Fig. 6. A visual spacing of approximately 1/64 between the rounded edge of the toggle assembly and the Push-off Blade finger when viewed directly from the bottom of the record changer is required. See Fig. 6. Since these two parts lie on different planes, this adjustment must be made by observation only.

7. While holding the Push-off Blade and Record Shelf Assembly tight against the Housing (6), push the Index Toggle Assembly (41) against the spacer (40) and tighten the lock bolt.
8. Tighten the Push-off Blade bracket lock bolt, leaving approximately 1/64" clearance between the shoulder of the Record Shelf shaft and the Push-off Blade finger bracket (42).

RECORD FAILS TO DROP

The record must leave the spindle step just prior to or at least by the time it leaves the record shelf. If the spindle is too far from the record shelf, the record will hang up on the spindle step and fail to drop.

To adjust:

Press down on the edge of the turntable nearest the Record Shelf to secure proper spacing. DO NOT bend the spindle itself. Also be sure a standard record is used when aking this adjustment. A standard 10" record has a diameter of 9 7/8" ± 1/32". A standard 12" record measures 11 7/8" ± 1/32" in diameter.

If the changer still fails to drop records, put the mechanism in cycle and watch the movement of the Push-off Blade. If it fails to protrude beyond the edge of the Record Shelf when at its greatest forward position, adjust the Push-off Blade finger position:

1. Turn the record Shelf (4) to the 12" position.
2. Trip the Reject control and rotate the Turntable until the Push-off Cam Follower reaches the highest point on the Main Cam ("A" of Fig. 5).
3. Loosen the Push-off Blade finger (42) clamp bolt.
4. Push the Push-off Blade forward as far as possible and hold the Push-off Blade and Record Shelf assembly downward tight against the housing (6).
5. Tighten the Push-off Blade finger clamp bolt (42), leaving 1/64" vertical clearance between the shoulder of the Record Shelf shaft and the Push-off Blade finger (42).

CHANGE CYCLE STARTS BEFORE END OF RECORD

If the Trip Assembly chatters while the changer is running or if the changer cycles before the entire record is played, there is probably insufficient clearance between the hook end of the Velocity Trip and Roller Assembly and the actuating gear. This clearance should be adjusted to be within 1/32" to 1/64" by bending the lever at point "C" as shown in Fig. 7.

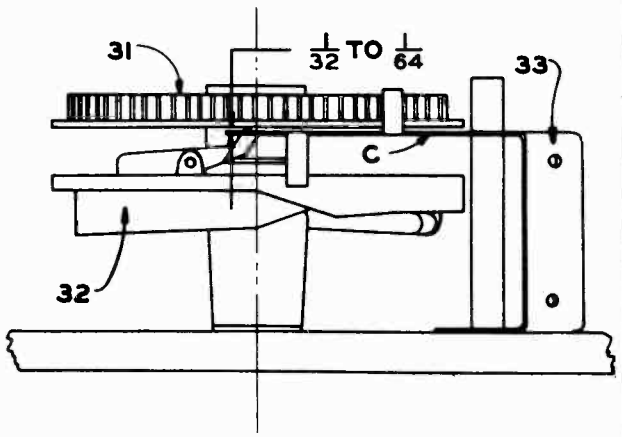

Fig. 7

LAST RECORD REPEATS

The weight of the records on the Spindle keeps the Automatic Shut Off Lock Lever (59) from dropping and engaging the Pickup Arm Raising Disc. The dropping of the last record releases the Automatic Shut Off Lock Lever, permitting it to drop and prevent the Pickup Arm Raising Disc from moving the Arm onto the record when the change cycle starts.

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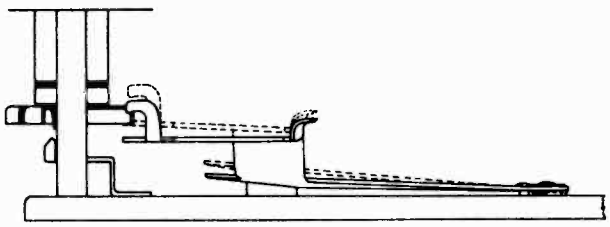

Fig. 8

If the last record continues to play:

1. Check the Spindle to be sure that it moves up and down freely.
2. With no records on the Spindle, and with the mechanism at rest, the hook of the Automatic Shut Off Lock Lever (59) should clear the top of the Pickup Arm Raising Disc by 1/32". Adjust, if necessary, by bending the Automatic Shut Off Lock Lever slightly.

REPLACEMENT OF PARTS

TO REPLACE PICKUP CARTRIDGE

A Pickup cartridge can be most easily replaced by first removing the Pickup Arm.

1. Hold the Pickup Arm firmly with left hand.
2. Remove the spring from between the pins of the hinge bracket.
3. Using a tool such as a screwdriver, press in on one of the blue steel Pickup Arm hinge brackets while lifting up on the arm. This will release the Pickup Arm Hinge pin.
4. Repeat on the other pickup arm bracket.
5. The Pickup Arm, when released from the hinge brackets, may then be turned over and laid on the turntable for easy access to the cartridge.

TO REPLACE THE PICKUP ARM

The Pickup Arm may be replaced in its bracket as follows:

1. Hook the roller on the rear of the hinge assembly under the Pickup Arm lift stop, inside the Housing (6).
2. Using a pair of long nose pliers, place the pickup arm hinge brackets, one at a time, over the pins in the Pickup Arm Pivot Shaft (9) bracket.

The retaining spring need not be replaced unless the unit is to be re-shipped.

In performing this operation, be sure that the pickup cord lies outside of the hinge and does not become wedged in the bracket.

LUBRICATION

Model 146 Record Changers leave the factory completely oiled and lubricated. Under normal conditions this should be sufficient for approximately one year or 1,000 hours of operation. When operated under extreme conditions of dust or heat, this operation should be performed more frequently as required.

Do not permit any oil or grease to get on the rubber Idler Drive Wheel or the Motor Sleeve, on Turntable Drive Rim or on the Automatic Trip Arm clutch. Any oil or grease on these points should be removed using Carbon Tetrachloride.

The recommended lubricants and points of lubrication are as follows:

A — No. 10 OIL (Apply With Small Oil Can or Medicine Dropper)

1. Motor Bearings. Saturate top and bottom felts.
2. Pickup Arm Shaft. Drop one drop each to bottom bearing point, bracket hole through Main Base Plate.
3. Ball Bearing Assembly.
4. Idler Wheel Felt.

B — A NON FLUID LUBRICANT (Apply With Small Brush)

1. Idler Wheel Link.
2. Turntable Shaft Stud.
3. Pickup Arm Hinge Pins.
4. Knife edge of Pickup Arm Raising Lever.
5. Main Cam Bearing. (It is necessary to remove the sub-plate assembly to lubricate this bearing.)
6. Teeth of Main Cam Actuating Gear.
7. Track of Main Cam Gear.
8. Teeth of Large and Small idler gears.
9. Raising lever Bracket bearing surfaces.

AVOID EXCESSIVE LUBRICATION

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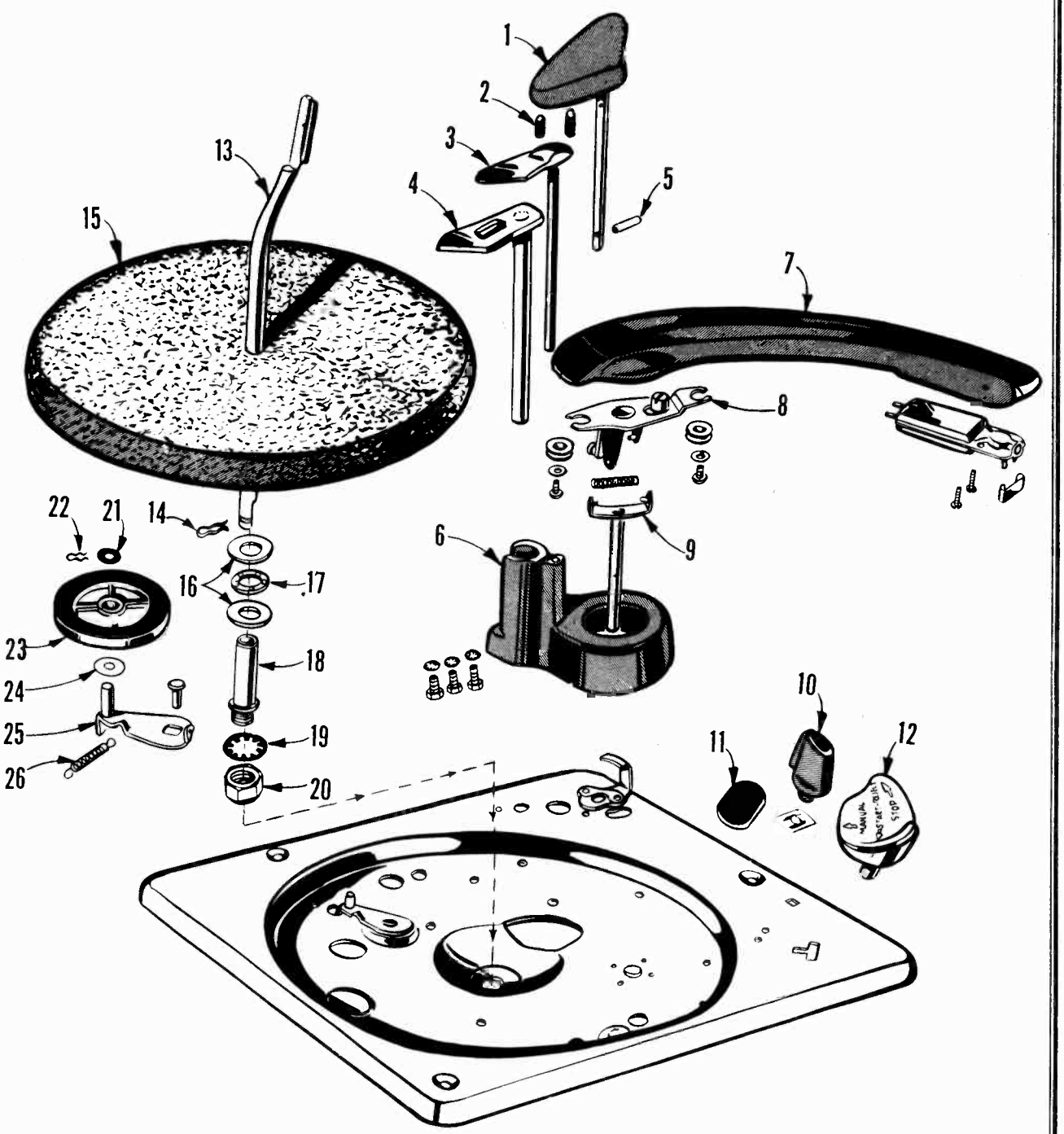
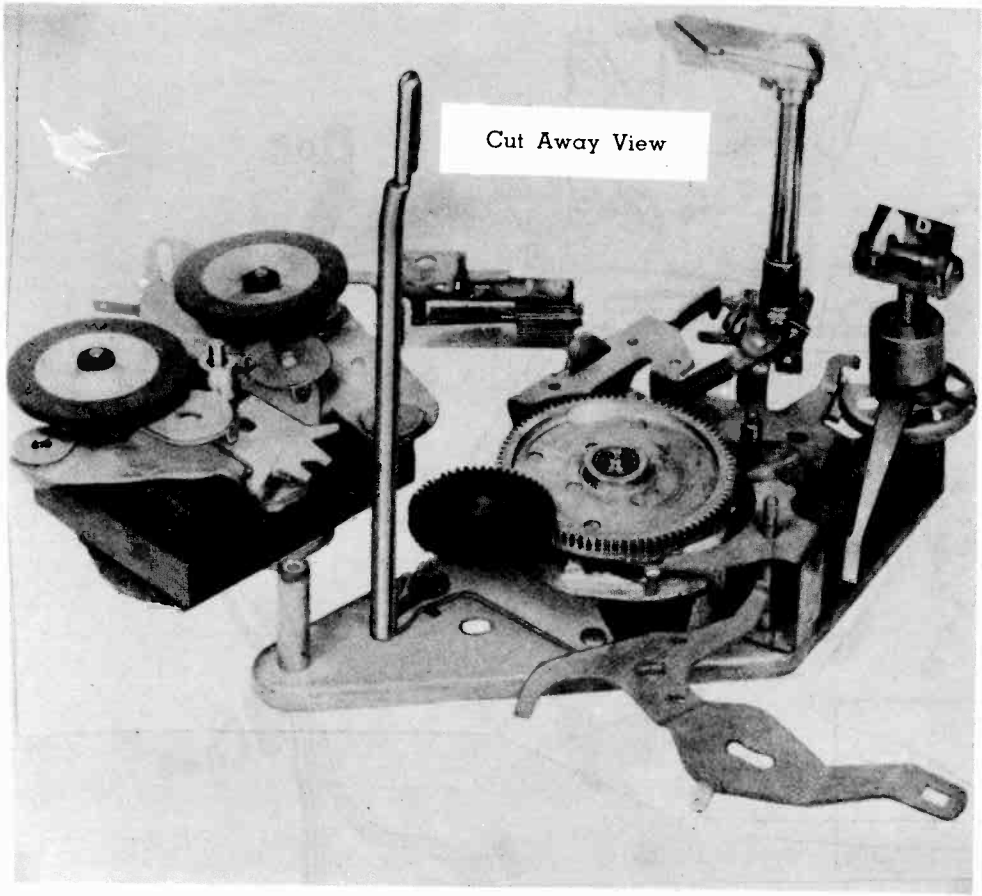


Exploded View — Above Main Plate



REPLACEMENT PARTS LIST

Illustration No.	*Part No.*	*Description*
1	42X186	Record Weight Assembly
2	24P013	Record Weight Cushion
3	42X183	Push-off Blade
4	42X184	Record Shelf
5	27P157	Groove Pin
6	42P182	Housing
7	49P021	Pickup Arm — Less Cartridge
8	21X258	Tone Arm Hinge Assembly
9	11X136	Shaft Assembly for Tone Arm
10	49P090	Rest-Tone Arm
11	24P004	Needle Pad
12	42P001	Switch Button
13	11X358	Spindle
14	50P204	Clip — Spindle Retaining
15	11X292	Turntable
16	25P269	Bearing Race Washer
17	11X058	Bearing Race Washer
18	41P414	Turntable Bearing
19		
20	26P687	Nut — Turntable Stud
21	25P030	Felt Washer — Idler
22	50P125	Clip — Idler Retaining
23	11X003	Idler Drive Wheel
24	25P046	Fibre Washer — Idler
25	11X068	Idler Link Assembly
26	45P347	Pickup Arm Pivot Bracket

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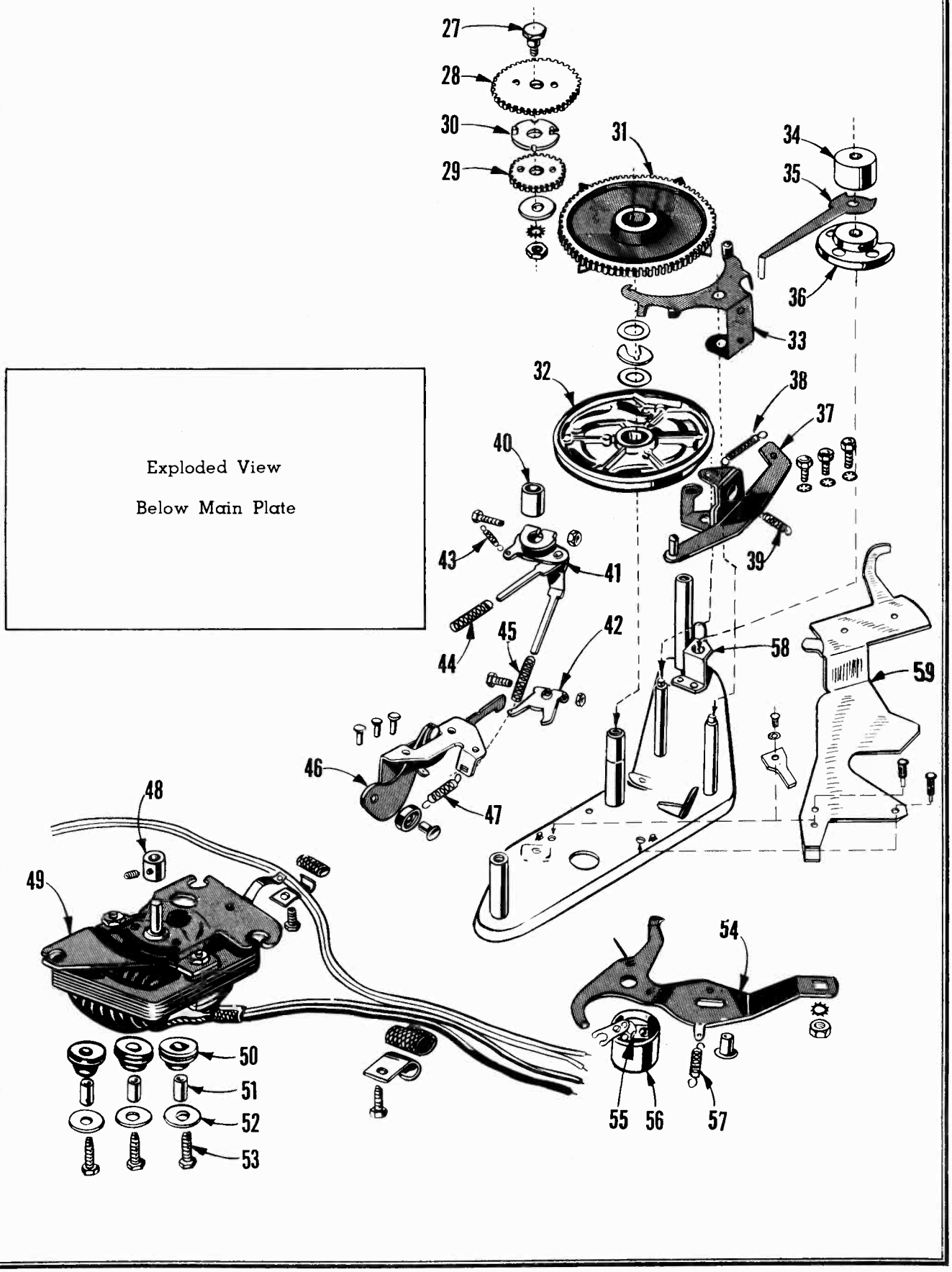

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REPLACEMENT PARTS LIST

Illustration No.	*Part No.*	*Description*
27	41P333	Shoulder Screw
28	47P024	Gear — Large Idler
29	47P023	Gear — Small Idler
30	45P342	Coupler — Idler Gear
31	11X032	Gear — Trip Resetting
32	11X033	Cam and Trigger Assembly
33	11X320	Velocity Trip and Roller
34	41P576	Clutch Weight
35	45P568	Automatic Trip Arm
36	11X227	Tone Arm Raising Disc
37	11X046	Tone Arm Raising Lever
37	46P044	Tension Spring Raising Lever
39	46P139	Tension Spring Raising Lever
40	41P607	Spacer
41	11X287	Lever and Toggle Assembly
42	11X312	Push-off Lever
43	46P162	Tension Spring — Push-off Lever
44	46P151	Compression Spring — Toggle Lever
45	46P152	Compression Spring — Toggle Lever
46	11X319	Cam Lever and Bracket
47	46P158	Tension Spring — Cam Lever
48	17X412-12	Motor Shaft Sleeve — 60 Cy.
48	17X412-11	Motor Shaft Sleeve — 50 Cy.
49	15X090	Motor — 117 V., A. C. — 60 Cycle
50	25P363	Rubber Motor Shock Mount
51	41P592	Motor Mount Sleeve
52	25P367	Motor Mount Washer
53	26P312	Motor Mount Belt
54	11X291	Trip Lever and Wire Assembly
55	32X045	A. C. Switch
56	32X039	A. C. Switch Cover
57	46P117	Tension Spring Trip Lever
58	45P347	Pickup Arm Pivot Bracket
59	11X316	No-Record Lever

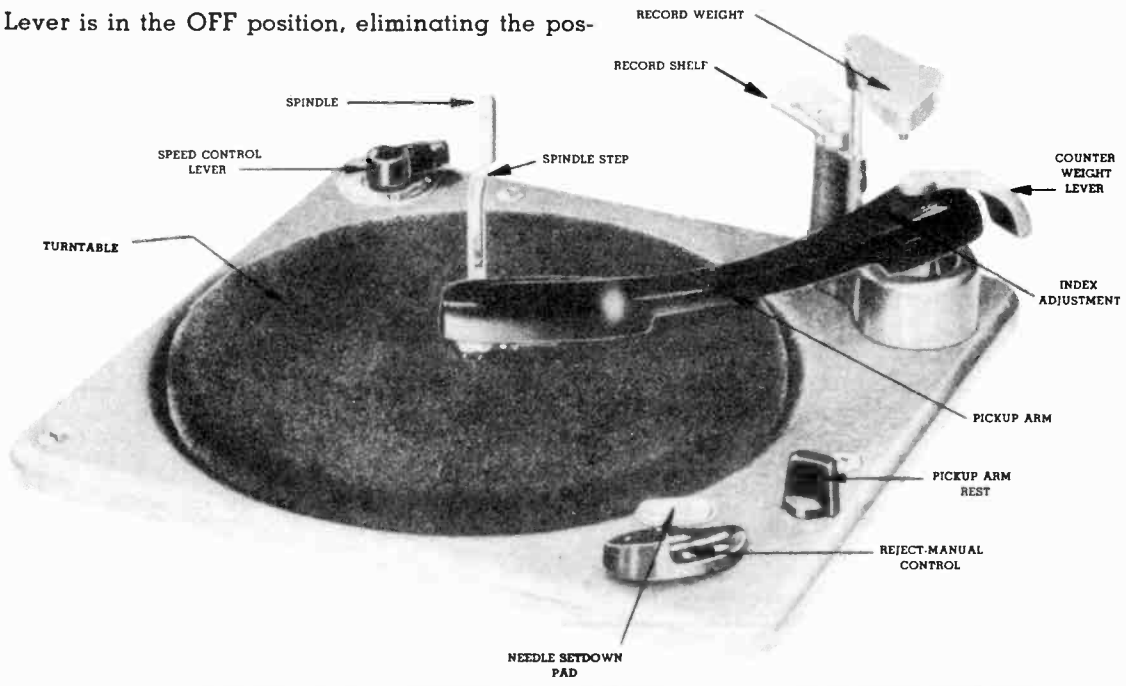
DESCRIPTION

The Webster-Chicago Model 246 is a dual speed, single post, spring cushioned spindle automatic record changer. Simple in design and operation, it provides automatic or manual playing of up to a 1" stack of 10" or 12" standard 78 R.P.M. or microgroove 33⅓ R.P.M. records.

Model 246 returns the pickup arm to the rest position after playing the last record, although the motor continues to revolve until the "33⅓ — OFF — 78" Speed Control Lever is moved to the OFF position. This is especially important when playing microgroove records for it eliminates the necessity of manually lifting the pickup arm or setting it down on the easily scratched microgrooves. The idler wheels are also pulled away from the motor shaft when the Speed Control Lever is in the OFF position, eliminating the possibility of a flat spot developing on the rubber wheels with consequent "wow"

Model 246 also features the exclusive Webster-Chicago velocity trip mechanism. The pickup arm is not actuated by "lead-in" springs and there is a minimum of lateral pressure. The arm travels freely in either direction. This lack of lateral pressure or inertia adds immeasurably to the life of records and is considered to be as important as extra-light vertical pressure, which in some instances would result in poor tracking at extremely low or high frequencies. The free floating arm permits "home recordings" or "inside out" records up to 12" size to be played manually.

Model 246 will change warped or rough edged records, at the same time assuring maximum protection to the finest discs.



OPERATION

PICKUP

The special pickup cartridge supplied has a replaceable tandem point needle. A unique connection between the cartridge and the needle weight counterbalance automatically lowers the proper point into playing position when the counterbalance is adjusted for light or normal needle pressure. When the counterbalance weight is turned back, the needle pressure is the 7 grams required for proper playing of the microgroove records. When it is turned forward to the side of the pickup arm the normal weight for standard 78 R.P.M. records is at the needle point.

The voltage output is normally lower when playing microgroove records. The volume control of the radio or amplifier must be turned up further when they are played.

Any 33⅓ R.P.M. records other than microgroove should be played with the standard needle and standard needle weight.

MOTOR

Connect the motor cord to a source of 105-120 volt, 60 cycle current only. If it is desired to operate the changer on 50 cycle current, special motor shaft bushings must be used in order to drive the turntable at the required speed of 78 R.P.M. or 33⅓ R.P.M.

Do not under any circumstances connect the motor to a source of direct current (DC) or alternating current of any other frequencies.

SPEED CONTROL ADJUSTMENTS

1. Move the Speed Control Lever to either "33⅓ or 78" as required for microgroove or standard records.

   Moving the Speed Control Lever also turns the motor power on.

2. Move the needle pressure counterbalance weight back for 7 gram needle pressure and the .001" tip radius needle point required by microgroove records Move the weight lever forward for normal pressure and the .003" tip radius needle point required by the usual 78 R.P.M. records.

The Red or White dots on the Pickup Arm and the Speed Control Knob should match. The proper needle point will then be in position for the record speed selected.

FOR AUTOMATIC RECORD CHANGE

1. Turn the Record Shelf forward or back for ten or twelve-inch records. Do not turn this shelf while a record is changing or the mechanism is in cycle.
2. With the record ballast weight lifted and turned forward out of position, place up to a 1" stack of 12" or 10" records on the spindle so that the bottom record rests on the step of the spindle and on the Record Shelf.
3. Turn the record ballast weight and lower it until it rests on the top record.
4. Move the "Manual-Reject" Control toward you, to the "Reject" position, and release it. The Control will then drop back into the automatic playing position and the records will be changed automatically until the last record is completed. The pickup arm will then return to the "Rest" position and the motor will continue to revolve until the Speed Control is turned to the OFF position.
5. To reject any record while playing in the automatic position, move the "Manual-Reject" Control to the REJECT position and release.

The pickup arm may be moved horizontally at any time without damage to the mechanism. However, after the last record is completed or while the mechanism is in cycle the pickup arm cannot be returned to the pickup arm rest until the change cycle has been completed.

After the last record has been played, the entire stack may be removed from the turntable at one time. The simplest procedure is as follows:

a. Place the pickup arm on the pickup arm rest.

b. Lift and turn the record ballast weight out of position.

c. Place the fingers of both hands under opposite edges of the bottom record.

d. Do not apply pressure to the top record. (Keep your thumbs free.)

e. Lift the stack of records straight up following the contours of the spindle. This permits the stack of records to follow the curve of the spindle without binding and greatly facilitates the removal of the stack.

FOR "MANUAL" RECORD CHANGE

CAUTION: We recommend that microgroove records never be played with the control in the "Manual" position. The microgrooves are easily scratched and the automatic rest position of the pickup arm plus the use of the "Reject" position of the control knob make manual playing unnecessary. However, manual operation when playing standard 78 R.P.M. records is often desirable.

1. Place a record on the turntable.
2. Move the "Manual-Reject" Control Knob toward the spindle to the "Manual" position, as indicated by the arrow on the Control Knob. No harm will result if the knob is accidentally moved to the "Reject" position. If a twelve-inch record is on the turntable, the arm will automatically index to the edge of the record. If a ten-inch record is on the turntable, the needle will be set down gently on the rubber pad and the arm may be moved to the edge of the record.
3. Place the needle gently on the edge of the record.
4. To stop the mechanism at any time move the Speed Control Lever to the OFF position.

MODEL 246

SERVICE INFORMATION

All units are accurately adjusted, lubricated and tested at the factory. However, service repairs and adjustments sometimes become necessary. This bulletin should be studied carefully before making any adjustments or replacing parts.

The functions and most probable misadjustments of the main assemblies are as follows (reference numbers refer to the exploded views

THE AUTOMATIC TRIP FAILS TO FUNCTION

The Main Cam Assembly (32) and Actuating Gear (31) are the heart of the record changer. The Main Cam Assembly drives the mechanism associated with the action of the Pickup Arm (7) and the Record Selector assemblies. It, in turn, is driven by the gear train (28, 29, 30) and the Turntable which is rim driven by the phonograph motor.

The Main Cam Assembly and Actuating Gear is put in motion or "tripped" by means of the "automatic" trip or by the manually operated "reject" trip. When the movement of the Pickup Arm toward the spindle is greater than 1/8" in 1/2 revolution of the turntable, the Automatic Trip Arm (35) trips the Velocity Trip and Roller Assembly (33). This releases the Actuating Pawl on the Main Cam Assembly (32), allowing it to engage the Main Cam Actuating Gear (31) and driving it through the change cycle. The pressure from the Automatic Trip Arm required to actuate the trip mechanism is negligible.

The Automatic Trip Arm follows the movement of the Pickup Arm through a weighted friction clutch (34). This clutch must be kept free of oil and grease. If the clutch does not cause the Automatic Trip Arm to trip the mechanism, clean the clutch parts with carbon tetrachloride. This clutch should operate the trip mechanism without placing undue drag on the movement of the pickup arm.

Also check for:

1. Velocity Trip and Roller Assembly (32) binding.
2. Slight burr on end of the Actuating Pawl or on the underside of the hook end of the Velocity Trip and Roller Assembly.
3. Actuating Pawl stuck (part of Main Cam Assembly (32) engaged by the hook end of the Velocity Trip and Roller Assembly (33).
4. Automatic Trip Arm (35) bent and not hitting the Velocity Trip and Roller Assembly (33).
5. Automatic Trip Arm (35) fails to touch the Velocity Trip and Roller Assembly.
6. Velocity Trip and Roller Assembly (33) rubbing on the underside of the Main Cam Actuating Gear (31).
7. No velocity lead-in groove or eccentric groove in the center of record.

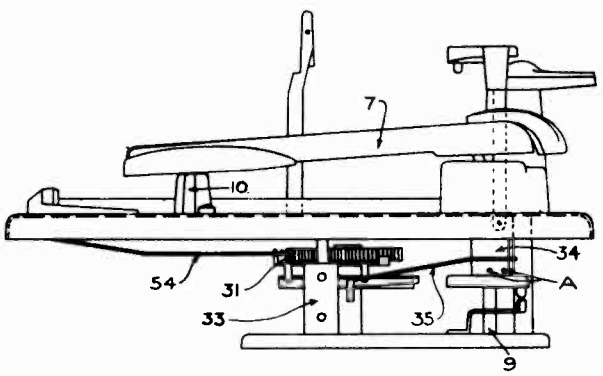
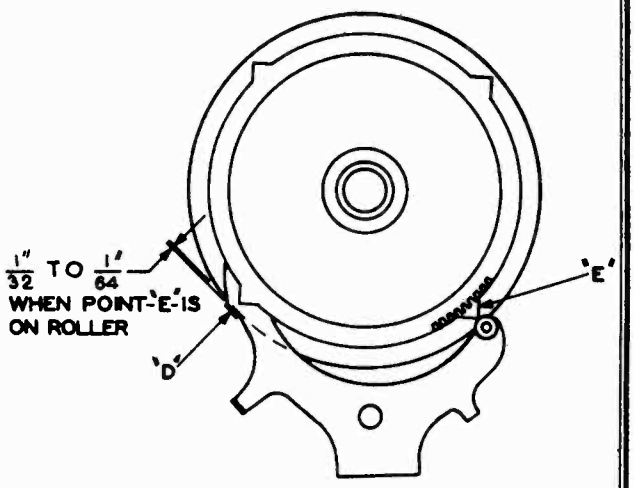


Fig. 1



ADJUST IF NECESSARY BY BENDING AT POINT "D".

Fig. 2

8. Foreign matter in record groove.
9. Badly worn record.
10. Badly bent or worn needle.

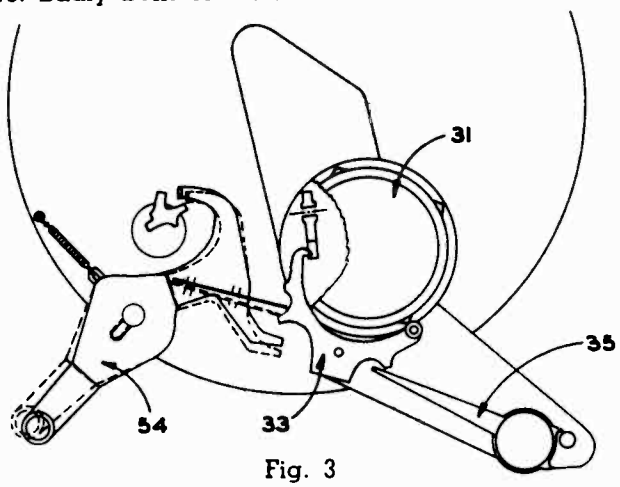


Fig. 3

IF THE "REJECT" TRIP FAILS TO FUNCTION

When the control knob is moved to the extreme START-REJECT position, the hair spring of the Reject Trip Lever Arm (54) actuates the Velocity Trip and Arm Assembly, putting the change mechanism in cycle. See Fig. 3.

Check for:

1. "Reject" trip hair spring of Lever 54 bent or broken.
2. Velocity Trip and Roller Assembly (33) binding.
3. Actuating Pawl (32) stuck (part of Main Cam Assembly).

IF THE MECHANISM CONTINUES TO CYCLE

At the completion of the change cycle, the Actuating Pawl is disengaged from the Main Cam Assembly Actuating Gear by the hook end of the Velocity Trip and Roller Assembly, which has been returned to its normal position by the reset points on the Main Cam Drive Gear, Fig. 2.

If the clearance between the lip on the Velocity Trip Lever and the edge of the Main Cam is too small, it will prevent the hooked end of the Velocity Trip Lever from engaging the trigger. Adjust the clearance between the lip ("D" of Fig. 2) on the Velocity Trip Lever and the Main Cam to be within $\frac{1}{32}$" and $\frac{1}{64}$" when the roller is contacting the point of one of the reset points on the Actuating Gear.

Also check for:

1. Velocity Trip and Roller Assembly (33) rubbing on Main Cam Actuating Gear (31).
2. Manual Trip Lever (54) binding.
3. "Disengage Roller" broken on Velocity Trip and Roller Assembly (33).

PICKUP ARM LIFT TOO HIGH OR TOO LOW

The vertical movement of the pickup arm is controlled by the angle of the pickup arm raising lever (37 and Fig. 4). The needle should approach the top record of a full 1" stack of records on the turntable with approximately $\frac{1}{16}$" clearance.

To adjust:

1. Put a full 1" stack of records ON THE TURNTABLE.
2. Trip the "Start-Reject" control and rotate the turntable clockwise until the needle clears the top record of the stack by about $\frac{1}{16}$"
3. Be sure the notch in the pickup arm raising disc engages the pickup arm raising lever.
4. If the needle does not clear the top record or if it raises too high, adjust by holding the pickup arm raising lever (37) at point X and bending at Y as indicated in Fig. 4.

CAUTION: All adjusting bends should be made slowly, using slight but firm, easy pressure.

Be sure the set screws in the Pickup Arm Raising Disc (36) are not loose and are properly positioned in the alignment holes as explained in the paragraph on Needle Setdown Indexing.

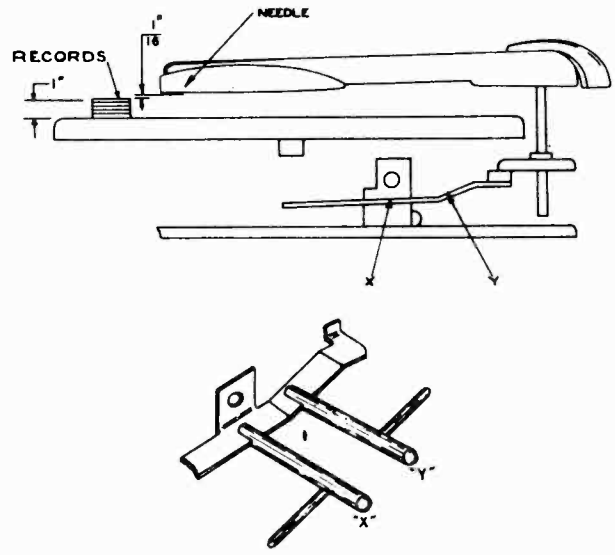


Fig. 4

MODEL 246

NEEDLE SET DOWN INDEXING INCORRECT

The horizontal movement of the pickup arm (7) is controlled by the eccentric excursion of the Pickup Arm Raising Lever (37) moving the Pickup Arm Raising Disc (36) when actuated by the Main Cam Assembly (32). The eccentric screw (part of 8) accessible through the top of the pickup arm (7), should take care of any normal position adjustment. Turn this screw clockwise to index the needle in toward the spindle and counter-clockwise to index the needle out away from the spindle.

Should further adjustment be necessary, proceed as follows:

1. Set the eccentric screw, just mentioned, to a middle position.
2. Set the Record Shelf (4) to the 10" position.
3. Operate the mechanism by revolving the turntable manually until the needle drops to within 1/8" of a ten inch record on the turntable.
4. Be sure the notch in the Pickup Arm Raising Disc (36) engages the Pickup Arm Raising Lever (37).
5. The No. 8 Bristol set screws "A" of the Pickup Arm Raising Disc (36, Fig. 1) have pointed ends which fit into off center holes in the Pickup Arm Pivot (9). Alternately loosen one screw and tighten the other until the needle rests above the record lead-in groove at the desired point. Be sure that both set screws are tight when this adjustment is completed.
6. Complete the change cycle of the mechanism and place the pickup arm on the Pickup Arm Rest (10). The tongue of the Pickup Arm Raising Disc (36) should now rest against the post which supports the sub plate assembly. If the pickup arm does not rest in the proper position on the pickup arm rest, bend the tongue closer to or away from this post until the pickup arm is correctly positioned.
   REMEMBER: Always slight but firm, easy bends!
7. Turn the Record Shelf to 12" and check the needle drop on a twelve inch record. Make any additional adjustments with the eccentric screw mentioned previously.

PICKUP ARM DROPS OFF REST

The upturned end of the Pickup Arm Pivot Shaft Bracket (Fig. 3) prevents the Pickup Arm from falling off the Pickup Arm Rest. There should be 1/64" clearance between the tongue of the Pickup Arm Raising Disc (36) and the bottom of the groove formed by the Bracket and the Base Plate Post. Bend the Bracket end up or down to secure proper positioning of the Disc tongue and the Pivot bracket. Be careful to bend the end only or the Bracket will bind on the Pickup Arm Pivot Shaft. The Bracket should not be too high or the Disc tongue will rub on it when the needle approaches the edge of a 12" record, causing "glide in" on the first few grooves of the record.

ERRATIC INDEXING

Indexing in either the 10" or the 12" position is controlled through the presence or absence of pressure from the Compression Spring (45), on the Pickup Arm Raising Lever bracket, forcing the stud to travel the inside edge or the outside edge of the groove in the bottom of the Main Cam. The compression on this spring is changed as the Record Shelf is changed from the 10" to the 12" position. Improper adjustment of the spring tension will result in erratic indexing.

In the 12" position, the spring should be just free. In the 10" position the compression of the spring holds the stud of the Pickup Arm Raising Lever against the outside edge of the groove. If the compression tension needs adjustment:

1. Turn the Record Shelf (4) to the 12" position.
2. Trip the Reject control and rotate the Turntable clockwise until the push off Blade reaches its farthest forward position. At this point the cam follower will be at the highest point on the Main Cam ("A" of Fig. 5).
3. Loosen the lock bolts of (41) and (42).
4. Be sure that the Record Shelf is held in the extreme 12" position while adjusting the Record Shelf and Push-off Blade fingers.
5. At the same time, push the Push-off Blade forward as far as possible and push the Push-off Blade and Record Shelf Assembly downward tight against the Housing (6).
6. Position the Record Shelf finger and the Toggle Assembly (41) so the 12" finger of the Push-off

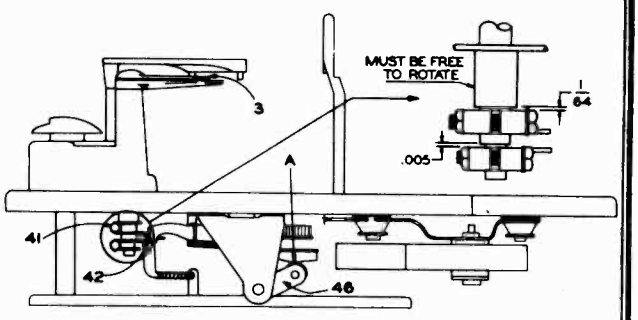


Fig. 5

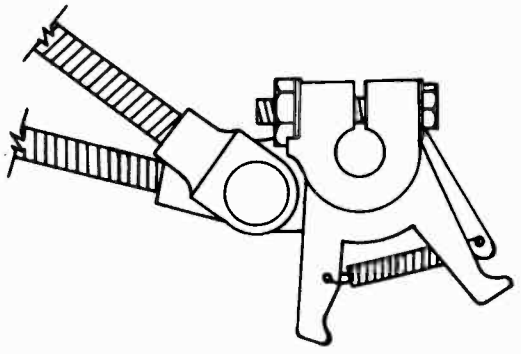


Fig. 6

Blade finger (42) looks like Fig. 6. A visual spacing of approximately 1/64" between the rounded edge of the toggle assembly and the Push-off Blade finger when viewed directly from the bottom of the record changer is required. See Fig. 6. Since these two parts lie on different planes, this adjustment must be made by observation only.

7 While holding the Push-off Blade and Record Shelf Assembly tight against the Housing (6), push the Index Toggle Assembly (41) against the spacer (40) and tighten the lock bolt.

8. Tighten the Push-off Blade bracket lock bolt, leaving approximately 1/64" clearance between the shoulder of the Record Shelf shaft and the Push-off Blade finger bracket (42).

RECORD FAILS TO DROP

The record must leave the spindle step just prior to or at least by the time it leaves the record shelf. If the spindle is too far from the record shelf, the record will hang up on the spindle step and fail to drop.

To adjust:

Press down on the edge of the turntable nearest the Record Shelf to secure proper spacing. DO NOT bend the spindle itself. Also be sure a standard record is used when aking this adjustment. A standard 10" record has a diameter of 9 7/8" ± 1/32". A standard 12" record measures 11 7/8" ± 1/32" in diameter.

If the changer still fails to drop records, put the mechanism in cycle and watch the movement of the Push-off Blade. If it fails to protrude beyond the edge of the Record Shelf when at its greatest forward position, adjust the Push-off Blade finger position:

1. Turn the record Shelf (4) to the 12" position.
2. Trip the Reject control and rotate the Turntable until the Push-off Cam Follower reaches the highest point on the Main Cam ("A" of Fig. 5).
3. Loosen the Push-off Blade finger (42) clamp bolt.
4. Push the Push-off Blade forward as far as possible and hold the Push-off Blade and Record Shelf assembly downward tight against the housing (6).
5. Tighten the Push-off Blade finger clamp bolt (42), leaving 1/64" vertical clearance between the shoulder of the Record Shelf shaft and the Push-off Blade finger (42).

CHANGE CYCLE STARTS BEFORE END OF RECORD

If the Trip Assembly chatters while the changer is running or if the changer cycles before the entire record is played, there is probably insufficient clearance between the hook end of the Velocity Trip and Roller Assembly and the actuating gear. This clearance should be adjusted to be within 1/32" to 1/64" by bending the lever at point "C" as shown in Fig. 7.

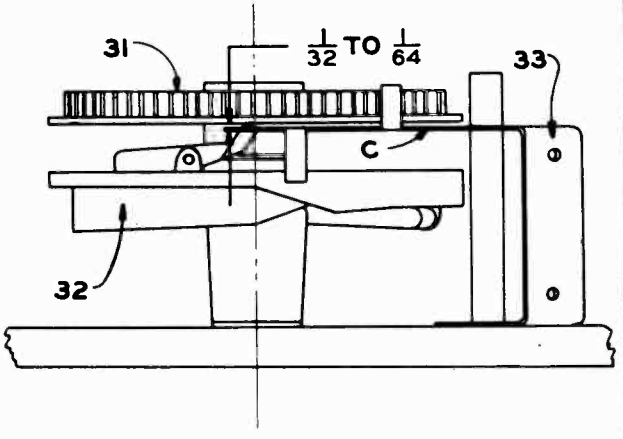


Fig. 7

LAST RECORD REPEATS

The weight of the records on the Spindle keeps the Automatic Shut Off Lock Lever (59) from dropping and engaging the Pickup Arm Raising Disc. The dropping of the last record releases the Automatic Shut Off Lock Lever, permitting it to engage the Pickup Arm Raising Disc and prevent the Pickup Arm from moving onto the record. The Pickup Arm then comes to rest on the Rest Button.

MODEL 246

If the last record continues to play:

1. Check the Spindle to be sure that it moves up and down freely.
2. With no records on the Spindle, and with the mechanism at rest, the hook "D" of the Automatic Shut Off Lock Lever (59) should clear the top of the Pickup Arm Raising Disc by 1/32" Adjust, if necessary, by bending the Automatic Shut Off Lock Lever slightly.

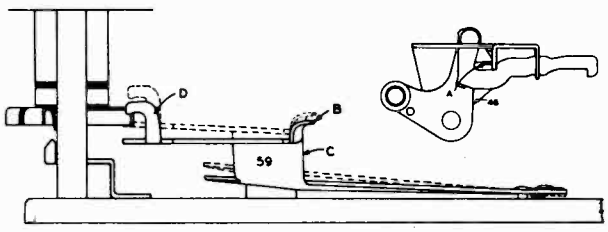


Fig. 8

LAST RECORD WILL NOT PLAY

As explained above, the weight of records on the spindle prevents the Automatic Lock Lever (59) from dropping. As the Cam Lever and Bracket assembly (46) moves forward to engage the Push-off Blade Actuating Lever (42), Fig. 5, point A of the Cam Lever (46), Fig. 8, should also move forward under point B of the Automatic Shut Off Lock Lever (59) to make certain it does not drop until the last record has dropped to the turntable and the Pickup Arm is in position to play. If point A does not engage point B, the Lock Lever (59) will drop to engage the Pickup Arm Raising Disc (36) and the Pickup Arm will return to the rest position without playing the last record.

To adjust, bend B so they engage properly. It may be necessary to bend (46) at point C, then readjust point D so it engages the Pickup Arm Raising Disc (36) correctly.

78 R.P.M. AT BOTH SPEED SETTINGS

The 78 R.P.M. bushing on the motor shaft should be low enough to clear the 33⅓ R.P.M. idler wheel. If it is too high:

1. Loosen the bushing set screw, using a No. 8 Bristol wrench.
2. Lower the bushing until it just clears the idler wheel.
3. Tighten the set screw.

SLOW SPEED

1. Idler wheel (23) or (74) may be cocked at an angle. Bend the mounting bracket (25).
2. Too strong tension on Idler Link Tension Spring (26) or (85). Stretch spring slightly.
3. Lip of Idler Wheel Link (25) may be binding in mounting hole. Carefully bend out the lip so the Idler Wheel rides more firmly on the rim of the Turntable.

MOTOR DOES NOT TURN ON

The top switch leaf of the AC switch (60) may be bent, preventing contact when the Speed Control Lever is moved to 33⅓ or 78. Bend the Switch leaf by means of a small screw driver inserted through the small opening in the plastic protecting cover or bend the switch mounting bracket.

STALLS DURING CHANGE CYCLE

Too weak tension on Idler Link Spring (26) or (85). Tighten spring as required.

ERRATIC SPEED ("WOW")

Remove any dirt or excess flocking from the inside rim of the turntable. Check the rubber drive wheel for a flat spot or "out of round".

The idler wheel links (25) should be loose on the shoulder rivets but not sloppy. If too loose, erratic speed will result.

1. Remove the motor.
2. Carefully stake the shoulder rivet move securely to insure smooth operation.
3. Idler wheel cocked at an angle. This may have been caused by forcing the Turntable onto the spindle and bearing (18) with the Speed Control Lever in either the "33⅓" or "78" position. Remove the Turntable and carefully bend the idler wheel (23 or 74) so the idler wheel link stud (part of 84) is perpendicular. Always have the Speed Control at OFF when putting on the Turntable.

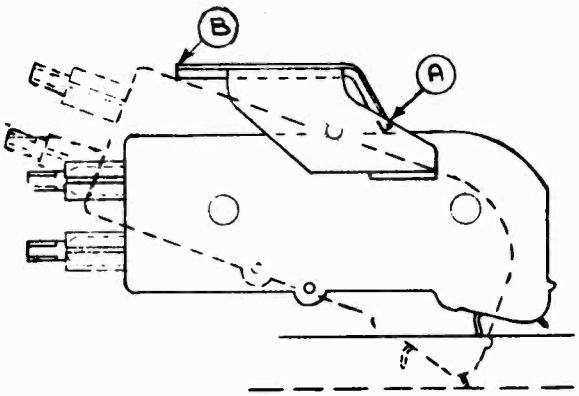


Fig. 9

NEEDLE JUMPS GROOVES ON 33⅓ R.P.M.

Check the needle pressure, using a Clarkstan needle pressure gauge. Pressure should be between 7 grams and 9 grams.

To increase the pressure, use a heavy wire or small steel rod to turn the spring shaft (63).

BOTH NEEDLE POINTS TOUCH AT ONCE

1. Needle point is bent. Replace needle.
2. Needle mounting bracket "fingers" improperly bent. See Fig. 9.

REPLACEMENT OF PARTS

TO REPLACE THE NEEDLE

1. Loosen the needle set screw, using a small screw driver.
2. Remove the needle.
3. Insert new needle with the flat side of the needle shank facing the needle set screw. Be sure the needle shank is all the way in to the bottom of the needle hole.
4. Tighten the set screw. The needle point should be parallel to the sides of the needle slot and evenly spaced between the walls of the slot.

TO REPLACE THE CARTRIDGE

1. Remove the two set screws, one on each side of the cartridge.
2. Lift the cartridge from the pickup arm mounting studs and remove the Tilt Spring from its mounting hole.
3. Insert the Tilt Spring in the new cartridge.
4. Seat the cartridge on the mounting studs, insert and tighten the two set screws.

The holes in the cartridge bracket are elongated. Position the cartridge so it fits solidly against the back finger of the mounting bracket when the needle weight counterbalance lever is in the "forward" or microgroove position and solidly against the front finger of the bracket when the counterbalance lever is in the "back" or 78 R.P.M. position.

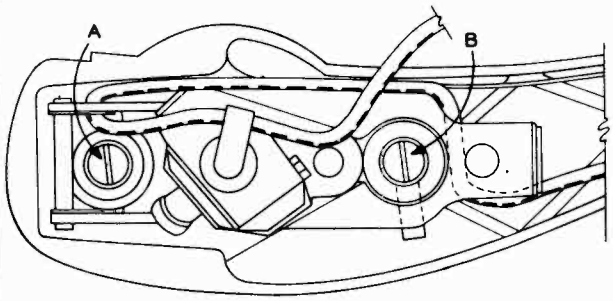


Fig. 10

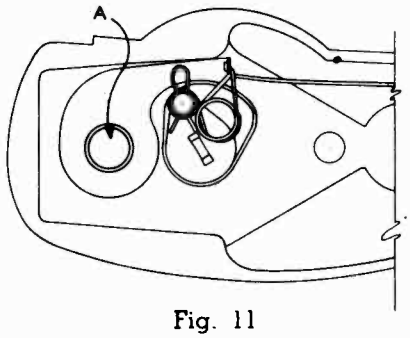


Fig. 11

TO REPLACE THE PICKUP ARM

CAUTION: Closely observe the original placement of the pickup cord and replace it in the same position. (See Fig. 10.) **Do Not** push hard on the needle end of the cartridge. Bending the mounting bracket will cause improper tracking or even cause both needle points to touch the record at once.

1. Remove mounting screws from mounting studs A and B, Fig. 10.
2. Gently remove hinge assembly from the mounting studs.
3. Remove tension spring anchor from mounting stud A. (See Fig. 11.)
4. Loosen No. 8 Bristol set screw and remove needle pressure counterbalance arm.
5. Remove the tilt control Lever. Do not disassemble the springs from this lever.
6. Remove the pickup cord and tilt spring brackets.
7. Remove the cartridge mounting screws and the cartridge.

Reassemble the parts to the new pickup arm in reverse order. Read the paragraph regarding replacement of the cartridge.

MODEL 246

LUBRICATION

Model 246 Record Changers leave the factory completely oiled and lubricated. Under normal conditions this should be sufficient for approximately one year or 1,000 hours of operation. When operated under extreme conditions of dust or heat, this operation should be performed more frequently as required.

Do not permit any oil or grease to get on the rubber Idler Drive Wheel or the Motor Sleeve, on Turntable Drive Rim or on the Automatic Trip Arm clutch. Any oil or grease on these points should be removed using Carbon Tetrachloride. *The recommended lubricants and points of lubrication are as follows:*

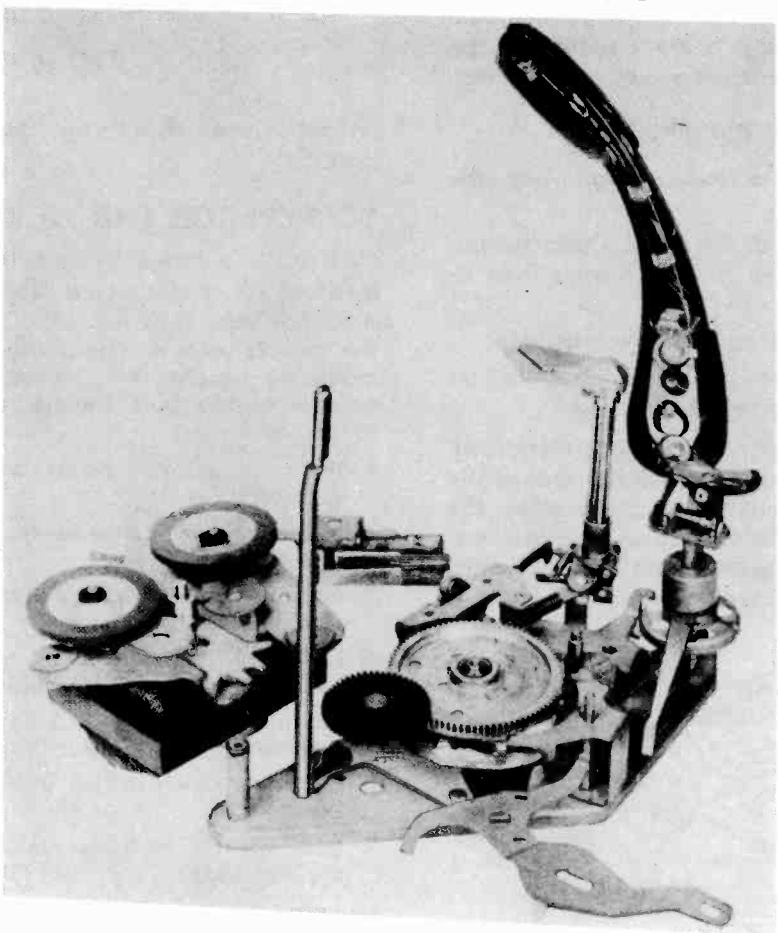
A — No. 10 OIL (Apply With Small Oil Can or Medicine Dropper)

1. Motor Bearings. Saturate top and bottom felts.
2. Pickup Arm Shaft. Drop one drop each to bottom bearing point, bracket hole through Main Base Plate.
3. Ball Bearing Assembly.
4. Idler Wheel Felt.

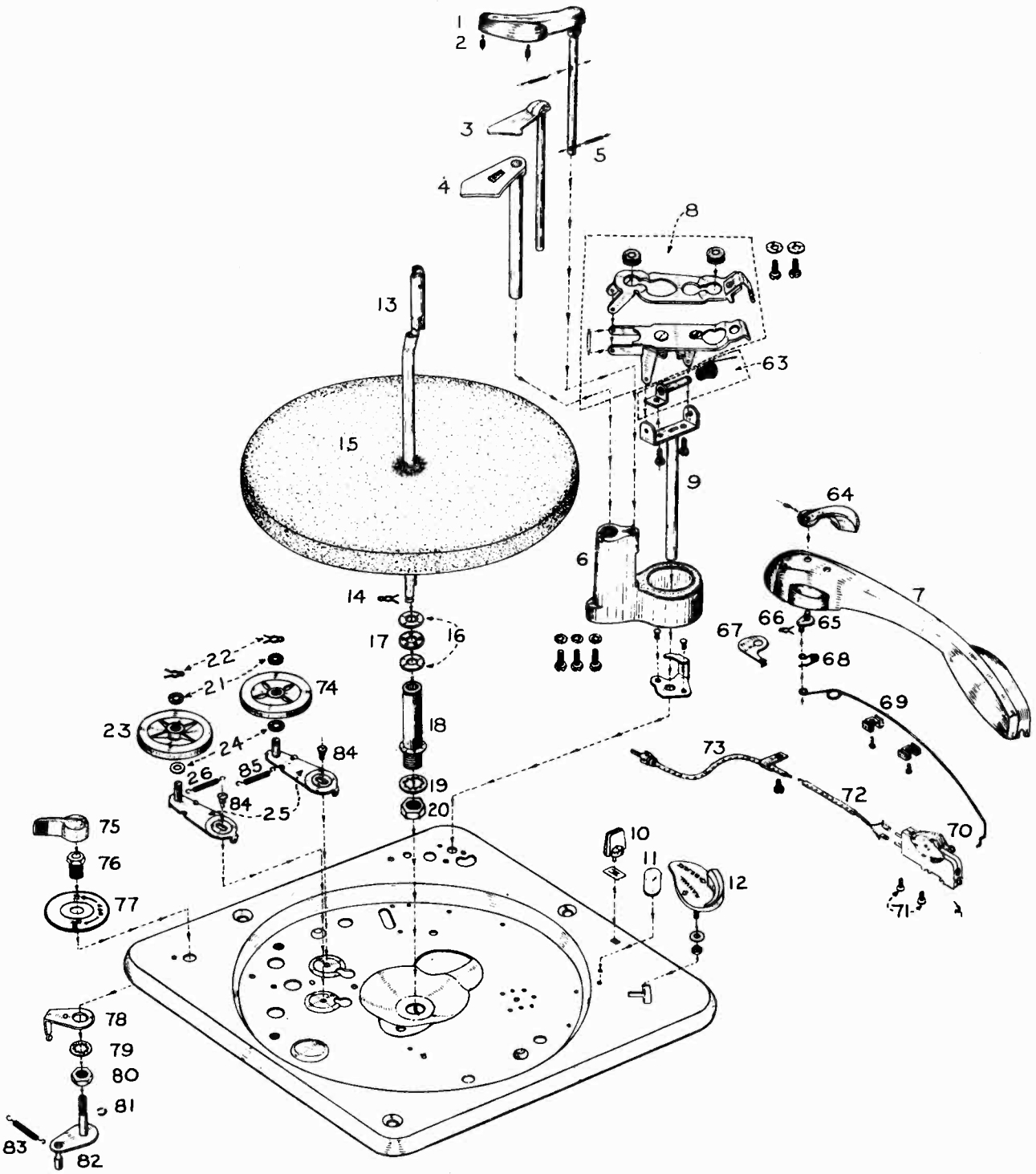
B — A NON FLUID LUBRICANT (Apply With Small Brush)

1. Idler Wheel Link.
2. Turntable Shaft Stud.
3. Pickup Arm Hinge Pins.
4. Knife edge of Pickup Arm Raising Lever.
5. Main Cam Bearing. (It is necessary to remove the sub-plate assembly to lubricate this bearing.)
6. Teeth of Main Cam Actuating Gear.
7. Track of Main Cam Gear.
8. Teeth of Large and Small idler gears.
9. Raising lever Bracket bearing surfaces.

AVOID EXCESSIVE LUBRICATION



Cut Away View

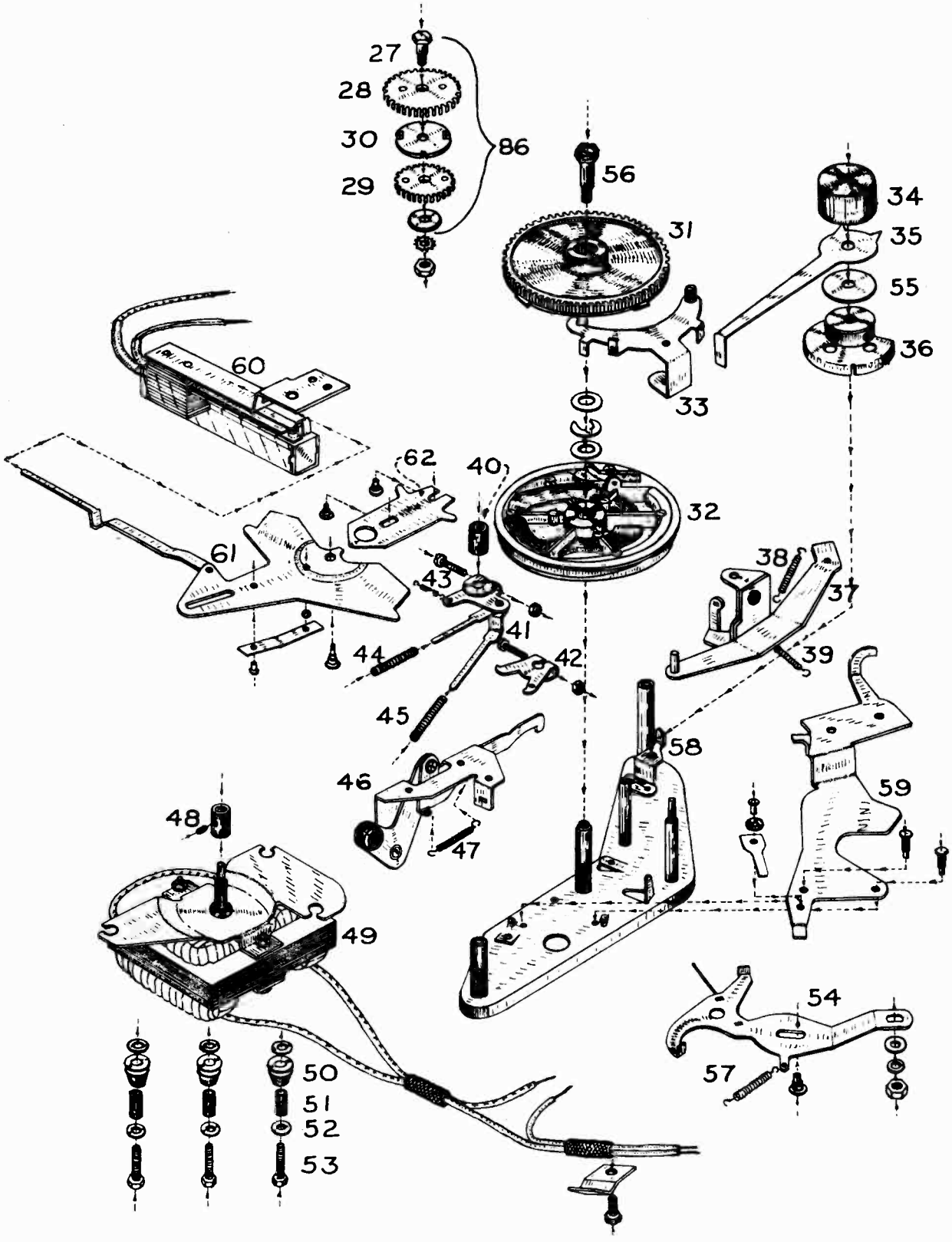


Exploded View above Main Plate

MODEL 246

REPLACEMENT PARTS LIST

Illustration No.	*Part No.*	*Description*
1	42X196	Record Weight Assembly
2	24P013	Record Weight Cushion
3	42X183	Push Off Blade
4	42X184	Record Shelf
5	27P157	Record Weight Groove Pin
6	42P199	Housing
7	49X063	Pickup Arm
8	21X283	Pickup Arm Hinge Assembly
9	11X385	Pickup Arm Shaft
10	49P099-C	Pickup Arm Rest
11	24P004-C	Needle Pad
12	49X-89-C	"Reject-Manual" Lever
13	11X358	Spindle
14	50P204	Spindle Retainer Clip
15	11X292-C	Turntable
16	25P269	Bearing Race Washer
17	11X058	Bearing Race
18	41P414	Turntable Bearing
19	25P333	Turntable Bearing Lock Washer
20	26P687	Turntable Bearing Nut
21	25P030	Felt Washer
22	50P125	Spring Clip
23	11X366	Idler Wheel (78 R.P.M.)
24	25P041	Fibre Washer
25	11X375	Idler Link
26	46P179	Link Tension Spring (78 R.P.M.)
63	11X386	Pickup Arm Counterbalance Spring
64	42P201	Counter Weight Lever
65	11X405	Crank Lever Assembly
66	50P125	Spring Clip
67	45P700	Crank Lever Spring Retainer
68	46P176	Crank Lever Spring
69	46P178	Cartridge Tilt Spring
70		Cartridge
71	26P474	Cartridge Mounting Screw
72	20X1244	Light Pickup Cord Assembly
73	20X1247	Heavy Pickup Cord Assembly
74	11X368	Idler Wheel (33⅓)
75	39P044	Speed Control Lever
76	41P632	Bushing
77	78P410	Dial
78	45P757	Toggle Bracket
79	25P345	Lock Washer
80	26P276	Hex Nut
81	50P216	Retainer for 11X381
82	11X381	Two Speed Shaft Assembly
83	46P175	Tension Spring
84	27P102	Shoulder Rivet
85	46P134	Link Tension Spring



Exploded View below Main Plate

MODEL 246

REPLACEMENT PARTS LIST

Illustration No.	*Part No.*	*Description*
27	41P333	Shoulder Screw
28	47P024	Large Idler Gear
29	47P023	Small Idler Gear
30	45P342	Idler Gear Coupler
31	11X032	Trip Resetting Gear Assembly
32	11X033	Cam and Trigger Assembly
33	11X320	Velocity Trip
34	41P576	Velocity Trip Clutch Weight
35	45P568	Automatic Trip Arm
36	11X227	Pickup Arm Raising Disc
37	11X036	Pickup Arm Raising Lever
38	46P044	Tension Spring
39	46P139	Tension Spring
40	41P607	Spacer
41	11X287	Lever and Toggle Assembly
42	11X312	Push-Off Blade Actuating Lever
43	46P162	Tension Spring
44	46P151	Compression Spring
45	46P152	Compression Spring
46	11X319	Cam Lever and Bracket Assembly
47	46P158	Tension Spring
48	17X450	Drive Sleeve
49	15X097-1	Motor
50	25P363	Motor Shock Mounts
51	41P592	Motor Mount Sleeve
52	25P367	Motor Mount Washer
53	26P312	Motor Mount Bolt
54	11X291	Trip Lever and Wire Assembly
55	23P009	Friction Disc
56	41P333	Stud Mounting Screw
57	46P117	Tension Spring
58	45P347	Pickup Arm Pivot Bracket
59	11X316	Automatic Shut Off Lock Lever
60	32P052	Motor Switch
61	11X397	Two Speed Lever Assembly
62	45P755	Link Release
86	11X132	Complete Gear Assembly

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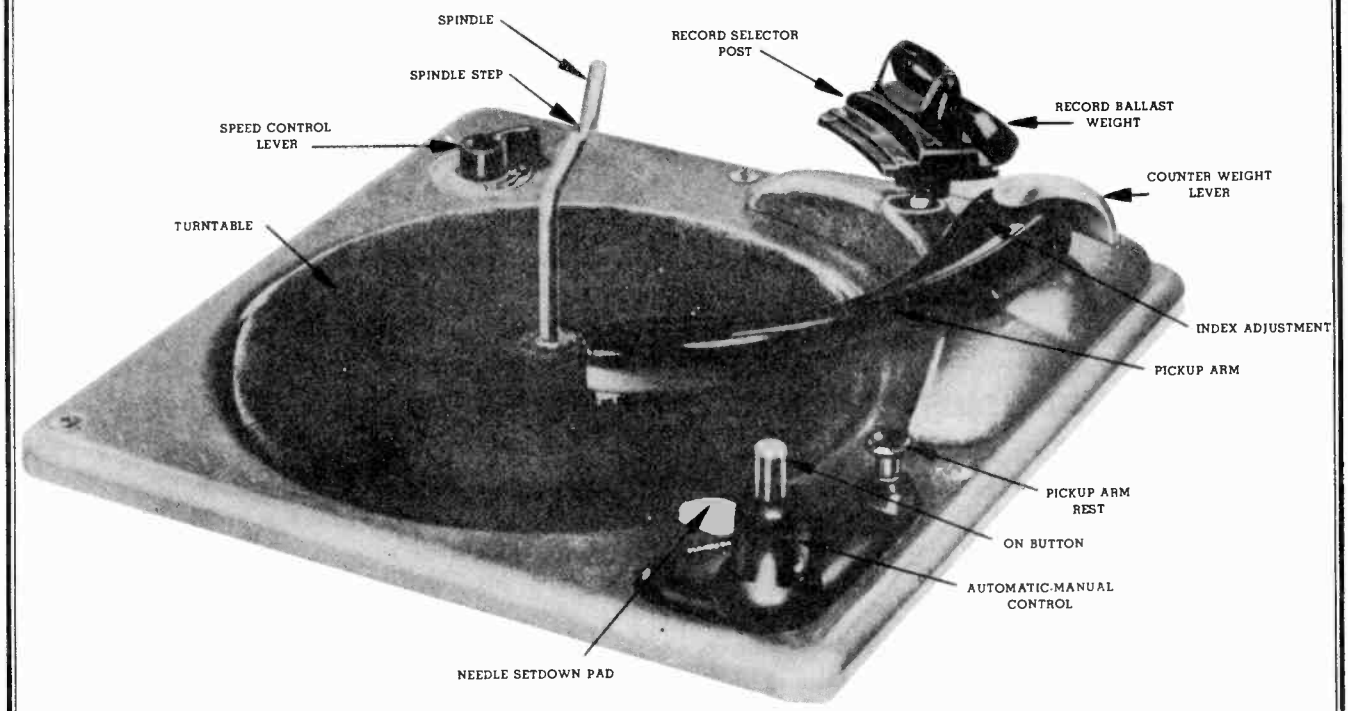

DESCRIPTION

The Webster-Chicago Model 256 is a dual speed, single post, spring cushioned spindle, automatic record changer. Simple in design and operation, it provides automatic or manual playing of up to a 1" stack of 10" or 12" standard 78 R.P.M. or microgroove 33⅓ R.P.M. records.

Model 256 returns the pickup arm to the rest position after playing the last record, although the motor continues to revolve until the "33⅓ OFF — 78" Speed Control Lever is moved to the OFF position. This is especially important when playing the microgroove records for it eliminates the necessity of manually lifting the pickup arm or setting it down on the easily scratched microgrooves. The idler wheels are also pulled away from the motor shaft when the Speed Control Lever is in the OFF position, eliminating the possibility of a flat spot developing on the rubber wheels with consequent wow.

Model 256 also features the exclusive Webster-Chicago velocity trip mechanism. The pickup arm is not actuated by "lead-in" springs and there is a minimum of lateral pressure. The arm travels freely in either direction. This lack of lateral pressure or inertia adds immeasurably to the life of records and is considered to be as important as extra-light vertical pressure, which in some instances would result in poor tracking at extremely low or high frequencies. The free floating arm permits "home recordings" or "inside out" records up to 12" size to be played manually.

Model 256 will change warped or rough edged records, at the same time assuring maximum protection to the finest discs.

OPERATION

PICKUP

The special pickup cartridge supplied has a replaceable tandem point needle. A unique connection between the cartridge and the needle weight counterbalance automatically lowers the proper point into playing position when the counterbalance is adjusted for light or normal needle pressure. When the counterbalance weight is turned back, the needle pressure is the 7 grams required for proper playing of the microgroove records. When it is turned forward to the side of the pickup arm the normal weight for standard 78 R.P.M. records is at the needle point.

The voltage output is normally lower when playing microgroove records. The volume control of the radio or amplifier must be turned up further when they are played.

Any 33⅓ R.P.M. records other than microgroove should be played with the standard needle and standard needle weight.

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MOTOR

Connect the motor cord to a source of 105-120 volt, 60 cycle current only. If it is desired to operate the changer on 50 cycle current, special motor shaft bushings must be used in order to drive the turntable at the required speed of 78 R.P.M. or 33⅓ R.P.M.

Do not under any circumstances connect the motor to a source of direct current (DC) or alternating current of any other frequencies.

SPEED CONTROL ADJUSTMENTS

1. Move the Speed Control Lever to either "33⅓" or "78" as required for microgroove or standard records.

   Moving the Speed Control Lever also turns the motor power on.

2. Move the needle pressure counterbalance weight back for 7 gram needle pressure and the .001" tip radius needle point required by microgroove records. Move the weight lever forward for normal pressure and the .003" tip radius needle point required by the usual 78 R.P.M. records.

The Red or White dots on the Pickup Arm and the Speed Control Knob should match. The proper needle point will then be in position for the record speed selected.

FOR AUTOMATIC RECORD CHANGE

1. Turn the Record Selector Post to "10" or "12" for ten or twelve inch records. The Record Selector Post is pivoted and turns in a counterclockwise direction to the 10" position and clockwise to the 12" position as indicated by the arrows. Do not use the Ballast Weight as a handle to turn the post. Turn by grasping the head of the Record Selector Post with the thumb and forefingers.
2. Turn the Selector Switch (sleeve of ON button) to AUTOMATIC.
3. With the Record Ballast Weight turned back, place up to a 1" stack of 12" or 10" records on the spindle so that the bottom record rests on the step of the spindle and the shelf of the Record Selector Post.
4. Turn the Record Ballast Weight forward to rest on the top record.
5. Press the ON button.

   To reject any record while playing in the AUTOMATIC position, press the ON button.

6. After the last record has been played, the entire stack may be removed from the turntable at one time. The simplest procedure is as follows:
   a. Turn the Record Ballast Weight back out of position.
   b. Place the fingers of both hands under opposite edges of the bottom record.
   c. Do *not* apply pressure to the top record. (Keep your thumbs free.)
   d. Lift the stack of records straight up following the contours of the spindle. This permits the stack of records to follow the curve of the spindle without binding and greatly facilitates the removal of the stack.

FOR "MANUAL" RECORD CHANGE

CAUTION: We recommend that microgroove records never be played with the control in the "Manual" position. The microgrooves are easily scratched and the automatic rest position of the pickup arm plus the use of the "Reject" position of the control knob make manual playing unnecessary. However, manual operation when playing standard 78 R.P.M. records is often desirable.

1. Place a record on the turntable.
2. Turn the Record Selector Post to the "12" position. (This is not essential but permits more clearance in loading and unloading records.)
3. Turn the Selector Switch (sleeve of ON button) to MANUAL.
4. Place a record on the turntable. It may facilitate this operation if the record is placed over the spindle at an angle, with one edge of the record held below the level of the Record Selector Post Shelf. Records may be removed in the same manner.
5. Press the ON button.
6. Place the needle gently on the edge of the record. Do not lift the pickup arm too high as this will cause it to catch in the Automatic Stop Lock position.
7. To stop the mechanism at any time, turn the Speed Control to the "OFF" position.

SERVICE INFORMATION AND ADJUSTMENTS

All units are accurately adjusted, lubricated and tested at the factory. However service repairs and adjustments sometimes become necessary. This bulletin should be studied carefully before making any adjustments or replacing parts.

The functions and most probable misadjustments of the main assemblies are as follows (reference numbers refer to the exploded view

THE AUTOMATIC TRIP FAILS TO FUNCTION

The Main Cam Assembly (38) and Actuating Gear (36) are the heart of the record changer. The Main Cam Assembly drives the mechanisms associated with the action of the Pickup Arm (5) and the Record Selector assemblies. It, in turn, is driven by the gear train (29, 30, 31) and the Turntable which is rim driven by the phonograph motor.

The Main Cam Assembly and Actuating Gear is put in motion or "tripped" by means of the "automatic" trip or by the manually operated "reject" trip. When the movement of the Pickup Arm toward the spindle is greater than ⅛" in ½ revolution of the Turntable, the Automatic Trip Arm (33) trips the Velocity Trip and Roller Assembly (37). This releases the Actuating Pawl on the Main Cam Assembly (38), allowing it to engage the Main Cam Actuating Gear (36) and driving it through the change cycle. The pressure from the Automatic Trip Arm required to actuate the trip mechanism is negligible.

The Automatic Trip Arm (33) follows the movement of the Pickup Arm through a weighted friction clutch (32). This clutch must be kept free of oil and grease. Should it become necessary, clean the clutch parts with carbon tetrachloride. This clutch should operate the trip mechanism without placing undue drag on the movement of the pickup arm.

Also check for:

1. Velocity Trip and Roller Assembly binding.
2. Slight burr on end of the actuating pawl or on the underside of the Velocity Trip hook.
3. Actuating Pawl stuck (part of Main Cam Assembly (38) engaged by the hook end of the Velocity Trip and Roller Assembly (37).
4. Automatic Trip Arm (33) bent and not hitting the Velocity Trip and Roller Assembly (37).
5. Automatic Trip Arm (33) fails to touch the Velocity Trip and Roller Assembly.
6. Velocity Trip and Roller Assembly (37) rubbing on the underside of the Main Cam Actuating Gear (36).
7. No velocity lead-in groove or eccentric groove in the center of record.
8. Foreign matter in record groove.
9. Badly worn record.
10. Badly bent or worn needle.

IF THE "REJECT" TRIP FAILS TO FUNCTION

When the "On" button is pressed, the hair spring of the "reject" trip lever arm (65), actuates the Velocity Trip and Arm Assembly, putting the change mechanism in cycle.

Check for:

1. "Reject" trip hair spring of Lever (65) bent or broken.
2. Velocity Trip and Roller Assembly (37) binding.
3. Actuating Pawl (part of Main Cam Assembly 38) stuck.

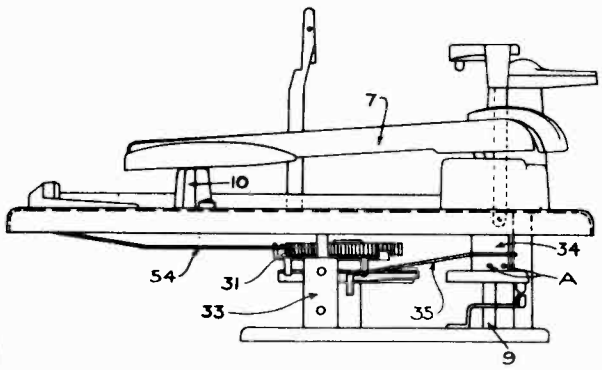

Fig. 1

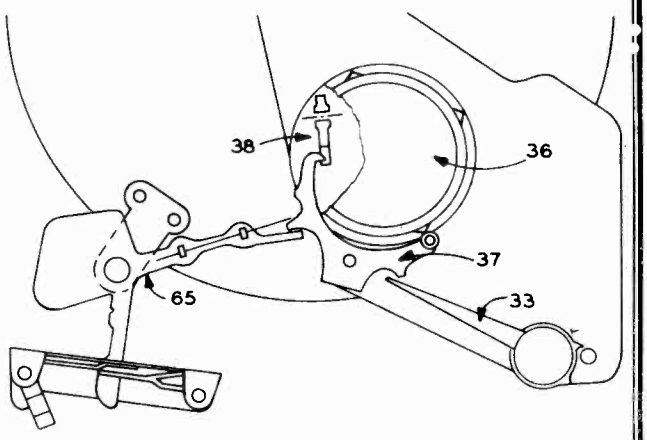

Fig. 2

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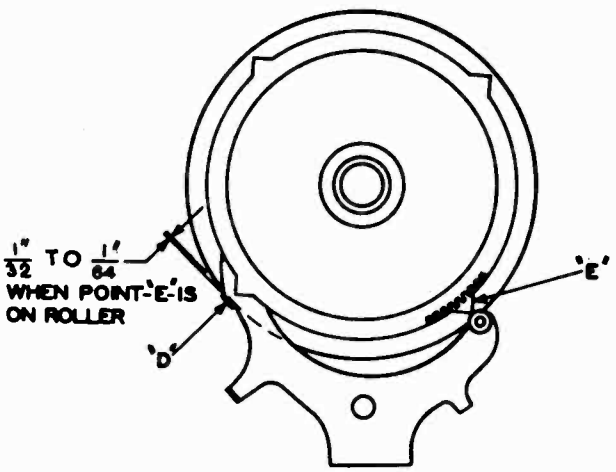
IF THE MECHANISM CONTINUES TO CYCLE

At the completion of the change cycle, the Actuating Pawl is disengaged from the Main Cam Assembly Actuating Gear (36) by the hook end of the Velocity Trip and Roller Assembly (37) which has been returned to its normal position by the reset points on the Main Cam Drive Gear (Fig. 3). This hook should be adjusted for about 1/64" clearance from the bottom of the Main Cam Drive Gear (36), Fig. 1. Greater clearance may permit the pawl to bounce past the hook and re-engage, causing the mechanism to continue to cycle.

If the clearance between the lip on the Velocity Trip Lever and the edge of the Main Cam is too small, it will prevent the hook end of the Velocity Trip Lever from engaging the trigger. Adjust the clearance between the lip (D, Figs. 3 and 5) on the Velocity Trip Lever of the Main Cam to be within 1/64" when the roller is contacting the point of one of the protrusions on the Actuating Gear.

Also check for:

1. Velocity Trip and Roller Assembly (37) rubbing on Main Cam Actuating Gear (36).
2. Manual Trip Lever (65) binding.
3. "Disengage Roller" broken on Velocity Trip and Roller Assembly (37).



ADJUST IF NECESSARY BY BENDING AT POINT "D".

Fig. 3

PICKUP ARM LIFT TOO HIGH OR TOO LOW

The vertical movement of the pickup arm is controlled by the angle of the Pickup Arm Raising Lever (40), Fig. 4. The needle should approach the top record of a full stack of 10" records on the turntable with approximately 1/8" clearance.

To adjust:

1. Put a full stack of 10" records ON THE TURNTABLE.
2. Press the "On" button and rotate the Turntable clockwise until the needle clears the top record of the stack by about 1/8".
3. Be sure the notch in the Pickup Arm raising disc (34) engages the pickup arm raising lever (40).
4. If the needle does not clear the top record or if it raises too high, adjust by bending the pickup arm raising lever at the point indicated in Fig. 4.

CAUTION: All adjusting bends should be made slowly, using slight but firm, easy pressure.

Be sure the set screws (A of Fig. 1) of the pickup arm raising disc are not loose and are properly positioned in the alignment holes as explained in the paragraph on Needle Setdown Indexing.

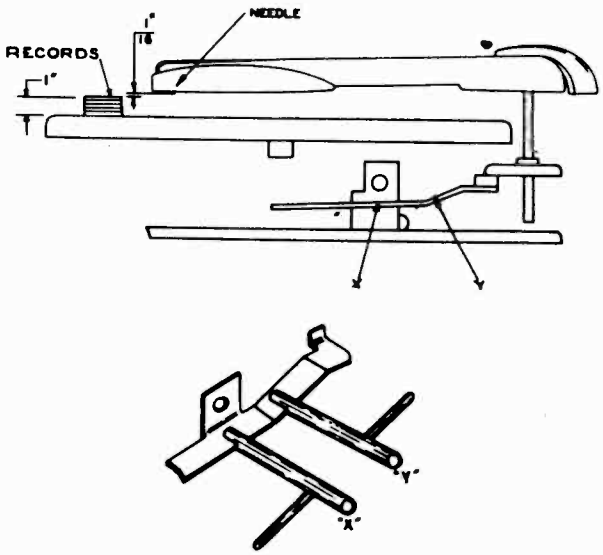


Fig. 4

NEEDLE SET DOWN INDEXING INCORRECT

The horizontal movement of the pickup arm (5) is controlled by the eccentric excursion of the Pickup Arm Raising Lever (40) moving the Pickup Arm Raising Disc (34) when actuated by the Main Cam Assembly (38). The eccentric screw (part of 6), accessible through the top of the pickup arm (5), should take care of any normal position adjustment. Turn this screw clockwise to index the needle in toward the spindle and counter-clockwise to index the needle out away from the spindle.

Should further adjustment be necessary, proceed as follows:

1. Set the eccentric screw, just mentioned, to a middle position.
2. Set the Record Selector Post (42) to the 10" position.
3. Operate the mechanism by revolving the Turntable manually until the needle drops to within 1/8" of a 10" record on the turntable.
4. Be sure the notch in the Pickup Arm Raising Disc (34) engages the Pickup Arm Raising Lever (40).

5. With a No. 8 Bristol wrench in each of the set screws of the Pickup Arm Raising Disc (35) as indicated in A, Fig. 1, alternately loosen one screw and tighten the other until the needle rests above the record lead-in groove at the desired point.
6. Complete the change cycle of the mechanism and position the Pickup Arm on the rest button (10). If necessary, bend the tongue of the Pickup Arm Raising Disc closer to or away from the Base Plate Post until the Pickup Arm is correctly seated on the rest button when the tongue is touching the Base Plate Post.

NOTE: All adjusting bends should be slight but firm, easy bends.

CHANGE CYCLE STARTS BEFORE END OF RECORD

If the trip assembly chatters while the changer is running, or if the changer cycles before the entire record is played, there is probably insufficient clearance between the hook end of the Velocity Trip and Roller Assembly (37) and the Actuating Gear (36). This clearance should be adjusted to be within $\frac{1}{32}$" to $\frac{1}{64}$" by bending the lever at point "C" shown in Fig. 5.

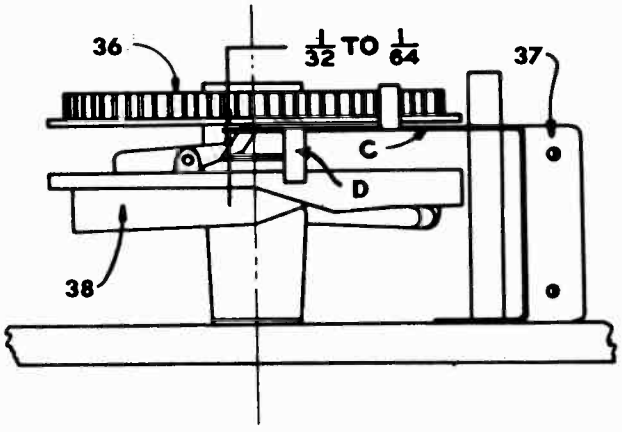


Fig. 5

MORE THAN ONE RECORD IS DROPPED DURING A CHANGE CYCLE

The floating latch at the top of the Record Spindle is so spaced that only one record at a time can slide between the heel of the latch and the step of the spindle. The hole in the latch is elongated so that the latch can slip into the spindle recess when records are being removed.
If more than one record is dropped at a time, it will be found to be due to:

1. Foreign matter in spindle recess causing the latch to stick.
2. Exceptionally thin records.

RECORD DROPS ON PICKUP ARM

As the change cycle is started, the first motion of the inclined outer bottom surface of the Main Cam (38) causes the Record Selector Post (42) to move toward the Spindle about $\frac{3}{32}$ inch. This position is maintained until the Pickup Arm has made its full outward lateral excursion at which time the Record Selector Post again moves toward the spindle, causing the bottom record to drop into playing position.

If the Record Selector Post (42) has been bent back, away from the Record Spindle, it is possible for a standard record to rest on the spindle step with its edge just over the edge of the Record Selector Post shelf. Then as the change cycle is started, the record is pushed off the spindle by the initial movement of the Record Selector Post, so that it drops on the Pickup Arm.

To correct this condition, the Rocker Arm Assembly must be adjusted so that the Record Selector Post is brought nearer to the spindle. This adjustment is made in the following manner:

1. With the mechanism at rest, remove the Turntable and replace the Record Spindle. Set the Record Selector Post to the position for playing 12-inch records and place a 12-inch record on the Record Spindle.
2. Insert a short screwdriver through the motorboard opening into the screw slot as shown at "A" in Fig. 6. Clockwise rotation of the screw will increase the distance between the Record Spindle and the Record Selector Post; counterclockwise rotation will decrease it.

It is recommended that the distance between the edge of the record and the step of the Record Selector Post be held to just over $\frac{1}{32}$ of an inch so that records with rough or sharply beveled edges will not catch on the outer edge of the Record Selector Post.

CAUTION: Be certain that a standard size record is used in making this adjustment. A standard 10" record measures $9\frac{7}{8}$" $\pm$ $\frac{1}{32}$" diameter. A standard 12" record measures $11\frac{7}{8}$" $\pm$ $\frac{1}{32}$" diameter.

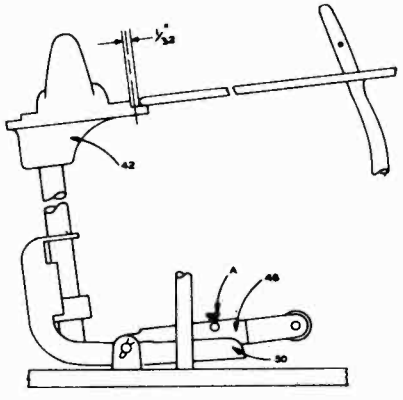


Fig. 6

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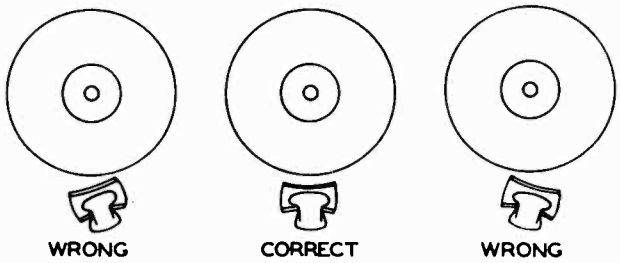
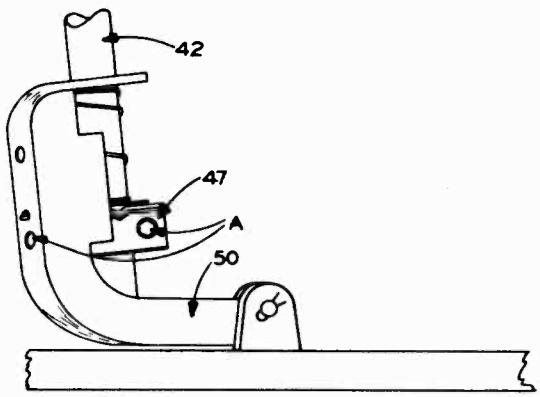
PUSH OFF POST ANGLE INCORRECT

The Record Selector Post should be adjusted so that the curve of the shelf matches the curve of the record. See Fig. 7.

To adjust this angle:

1. Turn the Record Selector Post to the "10" position.
2. Place a ten-inch record on the Spindle in the normal position for automatic playing.
3. With a No. 8 Bristol wrench in each of the set screws (point A, Fig. 7), alternately loosen one and tighten the other until the Record Selector post angle is correct. Be sure that both set screws are tight at the completion of this adjustment.





ERRATIC INDEXING

Indexing in the 10" or the 12" position is controlled through the presence or absence of pressure from the Compression Spring (47A) on the Pickup Arm Raising Lever (40). The compression on this spring is changed as the Record Selector Post (42) is changed to the 10" or 12" position. Improper adjustment of the spring tension will result in erratic indexing. In the 12" position, the spring should be just free. In the 10" position, the compression of the spring holds the stud of the Pickup Arm Raising Lever (40) against the outside edge of the groove, forcing the stud to travel the inside edge or the outside edge of the groove in the bottom of the Main Cam (38).

To adjust:

Bend the slotted arm (part of 40) for proper tension and smooth clearance of the spring guide arm (47).

GLIDE IN ON 12" RECORDS

1. Check tension of compression spring (47A) as explained above. Spring should be free in 12" position.
2. Remove any cause of friction in Index Lever (47).
3. Tongue of Pickup Arm Raising Disc (34) should not touch beveled edge of pickup arm pivot shaft bracket (35) when the needle is on the edge of a 12" record. Bend the end of the bracket if necessary.

LAST RECORD DOES NOT PLAY

The weight of the records on the Spindle keeps the Automatic Shut Off Lock Lever (44) from dropping and engaging the Pickup Arm Raising Disc (38), thus permitting the mechanism to continue to cycle.

The Push Off Post (50) moves forward slightly at the beginning of each change cycle. The bracket "B" on this post is then underneath the elevated hook "A" on the Automatic Shut Off Lock Lever (44). This forward movement takes place before the last record drops so the change cycle should continue. However the dropping of the last record releases the Automatic Shut Off Lock Lever, permitting it to drop and shut off the mechanism when the change cycle starts after the last record.

If the last record does not play:

1. Bend the elevated hook "A", Fig. 8 forward so that it will overlap the Push Off Post bracket "H" about $\frac{1}{32}$" with a record on the spindle.

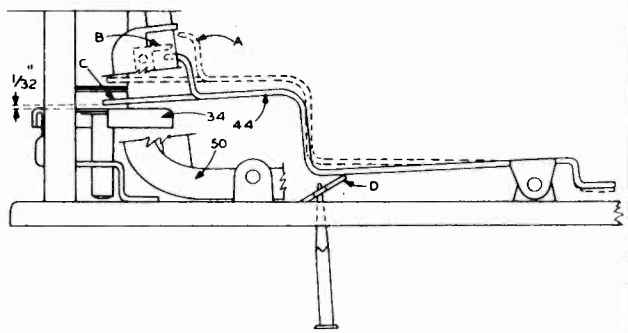


Fig. 8

LAST RECORD CONTINUES TO PLAY

1. Check the record spindle to be sure that it moves up and down freely.
2. With no records on the spindle, check the Automatic Shut Off Lock Lever (44). The lower hook end of this arm ("C") should catch the Pickup Arm Raising Disc (34) at the beginning of the cycle to prevent travel of the Pickup Arm, causing it to drop on the OFF button. With no records on the Spindle and with the mechanism at rest, this hook should clear the top of the Pickup Arm Raising Disc by $\frac{1}{32}$". Adjust, if necessary, by inserting a screw driver in the hole in the bottom base plate and bending

lip "D". Never attempt to move the Pickup Arm Raising Disc up or down.

3. The elevated hook "A" on the Automatic Shut Off Lock Lever will sometimes lock with the bracket "B" on the Record Selector Post (50) if the drop of the record is delayed. More clearance can be obtained by bending the elevated hook "A" away from the bracket.

78 R.P.M. AT BOTH SPEED SETTINGS

The 78 R.P.M. bushing on the motor shaft should be low enough to clear the 33⅓ R.P.M. idler wheel. If it is too high:

1. Loosen the bushing set screw, using a No. 8 Bristol wrench.
2. Lower the bushing until it just clears the idler wheel.
3. Tighten the set screw.

SLOW SPEED

1. Idler wheel (24) or (91) may be cocked at an angle. Bend the mounting bracket (26).
2. Too strong tension on Idler Link Tension Spring (27) or (90). Stretch spring slightly.
3. Lip of Idler Wheel Link (26) may be binding in mounting hole. Carefully bend out the lip so the Idler Wheel rides more firmly on the rim of the Turntable.

MOTOR DOES NOT TURN ON

The top switch leaf of the AC switch (61) may be bent, preventing contact when the Speed Control Lever is moved to 33⅓ or 78. Bend the Switch Leaf by means of a small screw driver inserted through the small opening in the plastic protecting cover or bend the switch mounting bracket.

STALLS DURING CHANGE CYCLE

Too weak tension on Idler Link Spring (25 or (90). Tighten spring as required.

ERRATIC SPEED ("WOW")

Remove any dirt or excess flocking from the inside rim of the turntable. Check the rubber drive wheel for a flat spot or "out of round".

The idler wheel links (26) should be loose on the shoulder rivets but not sloppy. If too loose, erratic speed will result.

1. Remove the motor.
2. Carefully stake the shoulder rivet more securely to insure smooth operation.
3. Idler wheel cocked at an angle.

BOTH NEEDLE POINTS TOUCH AT ONCE

1. Needle point is bent. Replace needle.
2. Needle mounting bracket "fingers" improperly bent. See Fig. 9.

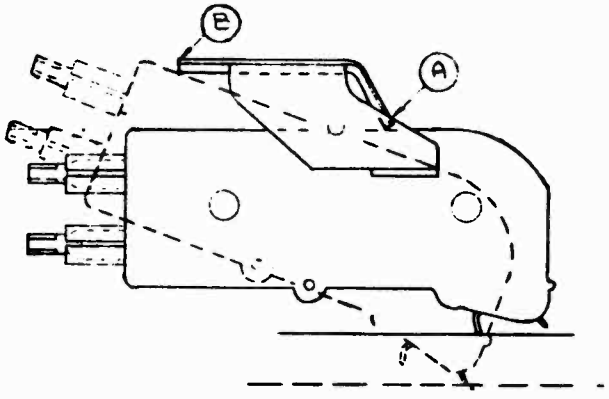


Fig. 9

REPLACEMENT OF PARTS

TO REPLACE THE NEEDLE

1. Loosen the needle set screw, using a small screw driver.
2. Remove the needle.
3. Insert the new needle with the flat side of the needle toward the set screw. Be sure the needle shank is all the way in to the bottom of the needle hole.
4. Tighten the set screw. The needle point should be parallel to the sides of the needle slot and evenly spaced between the walls of the slot.

TO REPLACE THE PICKUP ARM

CAUTION: Closely observe the original placement of the pickup cord and replace it in the same position. (See Fig. 10). *Do not* push hard on the needle end of the cartridge. Bending the mounting bracket will cause improper tracking or even cause both needle points to touch the record at once.

1. Remove mounting screws from mounting studs A and B, Fig. 10.
2. Gently remove hinge assembly from the mounting studs.

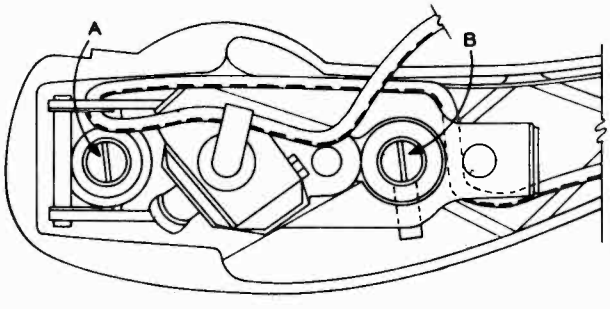


Fig. 10

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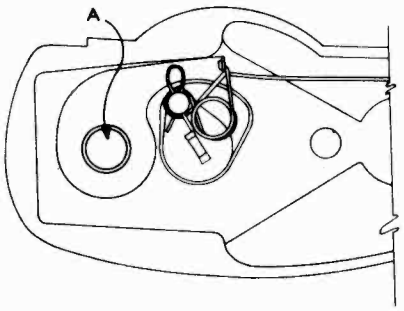


Fig. 11

3. Remove tension spring anchor from mounting stud A. (See Fig. 11.)
4. Loosen No. 8 Bristol set screw and remove needle pressure counterbalance arm.
5. Remove the tilt control lever. Do not disassemble the springs from this lever.
6. Remove the pickup cord and tilt spring brackets.
7. Remove the cartridge mounting screws and the cartridge.

Reassemble the parts to the new pickup arm in reverse order. Read the paragraph regarding cartridge replacement.

TO REPLACE THE CARTRIDGE

1. Remove the two set screws, one on each side of the cartridge.
2. Lift the cartridge from the pickup arm mounting studs and remove the Tilt Spring from its mounting hole.
3. Insert the Tilt Spring in the new cartridge
4. Seat the cartridge on the mounting studs, insert and tighten the two set screws.

The holes in the cartridge bracket are elongated. Position the cartridge so it fits solidly against the back finger of the mounting bracket when the needle weight counterbalance lever is in the "forward" or 78 R.P.M. position and solidly against the front finger of the bracket when the counterbalance lever is in the "back" or micro-groove position.

REPLACE PICKUP ARM BRACKET AND SHAFT ASSEMBLY

1. Loosen Bristol screws in Pickup Arm Raising Disc.
2. Remove Disc and Clutch parts by sliding them off the bottom of the Pickup Arm Shaft and pull shaft out of changer from above.

To replace, reverse the procedure and adjust the Pickup Arm Raising Disc for proper operation.

REPLACE RECORD POST AND ROCKER ARM ASSEMBLY

1. Remove the Pickup Arm Assembly.
2. Remove the four nuts under the main plate which hold the Crescent Assembly.
3. Unhook the Rocker Arm Return Spring.
4. Remove the Rocker Arm Pivot Pin.
5. Lift out the Record Selector Post, Rocker Arm and Crescent Assembly as a unit.
6. In replacing the Rocker Arm Assembly, note paragraph "Replacing the Sub-Plate Assembly."

LUBRICATION

Model 256 Record Changers leave the factory completely oiled and lubricated. Under normal conditions this should be sufficient for approximately one year or 1,000 hours of operation. When operated under extreme conditions of dust or heat, this operation should be performed more frequently as required.

Do not permit any oil or grease to get on the rubber Idler Drive Wheel or the Motor Sleeve, on Turntable Drive Rim or on the Automatic Trip Arm clutch. Any oil or grease on these points should be removed using Carbon Tetrachloride.

The recommended lubricants and points of lubrication are as follows:

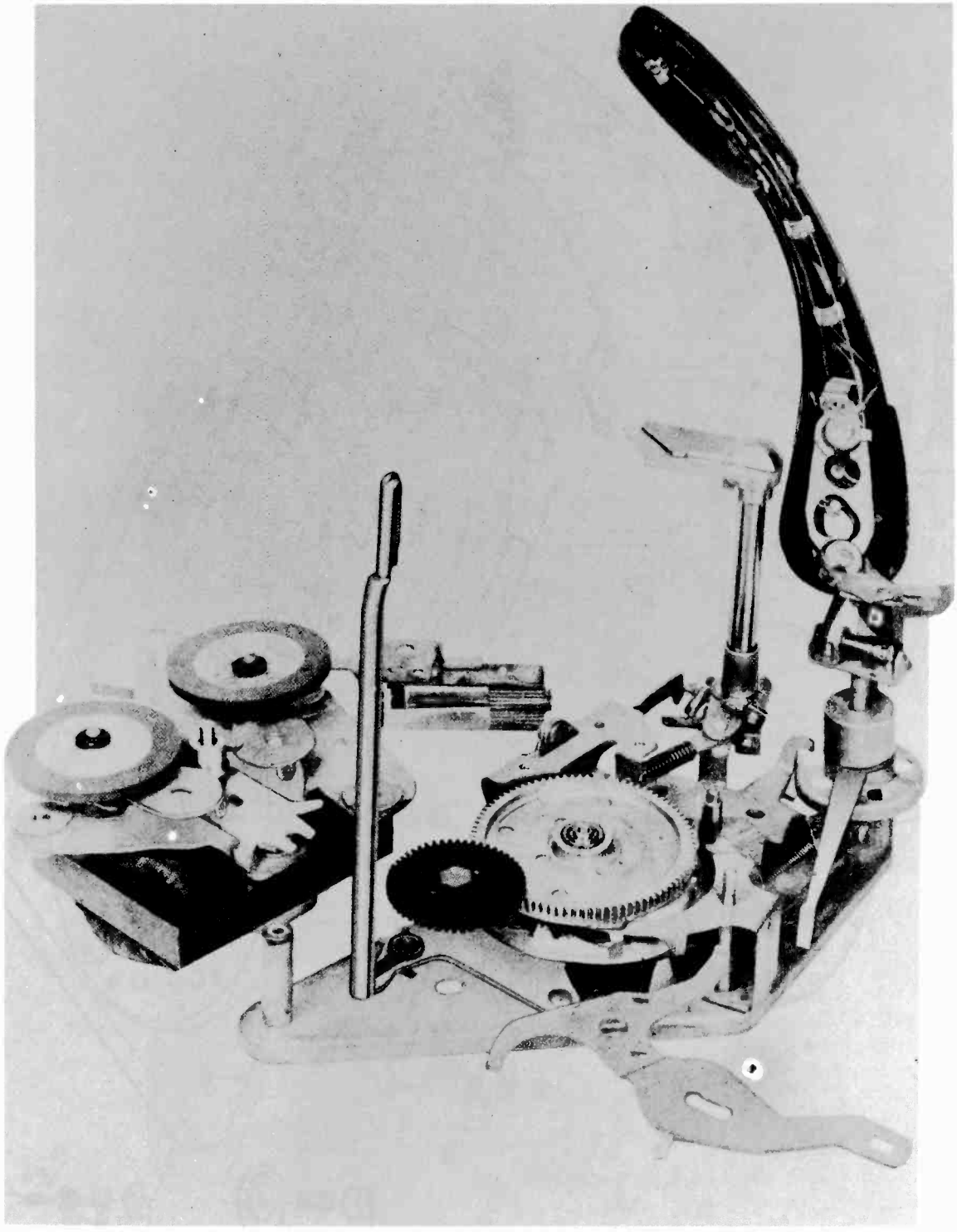
A — No. 10 OIL (Apply With Small Oil Can or Medicine Dropper)

1. Motor Bearings. Saturate top and bottom felts.
2. Pickup Arm Shaft. Drop one drop each to bottom bearing point, bracket hole through Main Base Plate.
3. Ball Bearing Assembly.
4. Idler Wheel Felt.

B — A Non Fluid Lubricant (Apply With Small Brush)

1. Idler Wheel Link.
2. Turntable Shaft Stud.
3. Pickup Arm Hinge Pins.
4. Knife edge of Pickup Arm Raising Lever.
5. Main Cam Bearing. (It is necessary to remove the sub-plate assembly to lubricate this bearing.)
6. Teeth of Main Cam Actuating Gear.
7. Track of Main Cam Gear.
8. Teeth of Large and Small idler gears.
9. Raising lever Bracket bearing surfaces.

AVOID EXCESSIVE LUBRICATION



Cut Away View

This view shows a Model 246 mechanism. It is used because it shows the dual speed mechanism and main actuating gear assembly.

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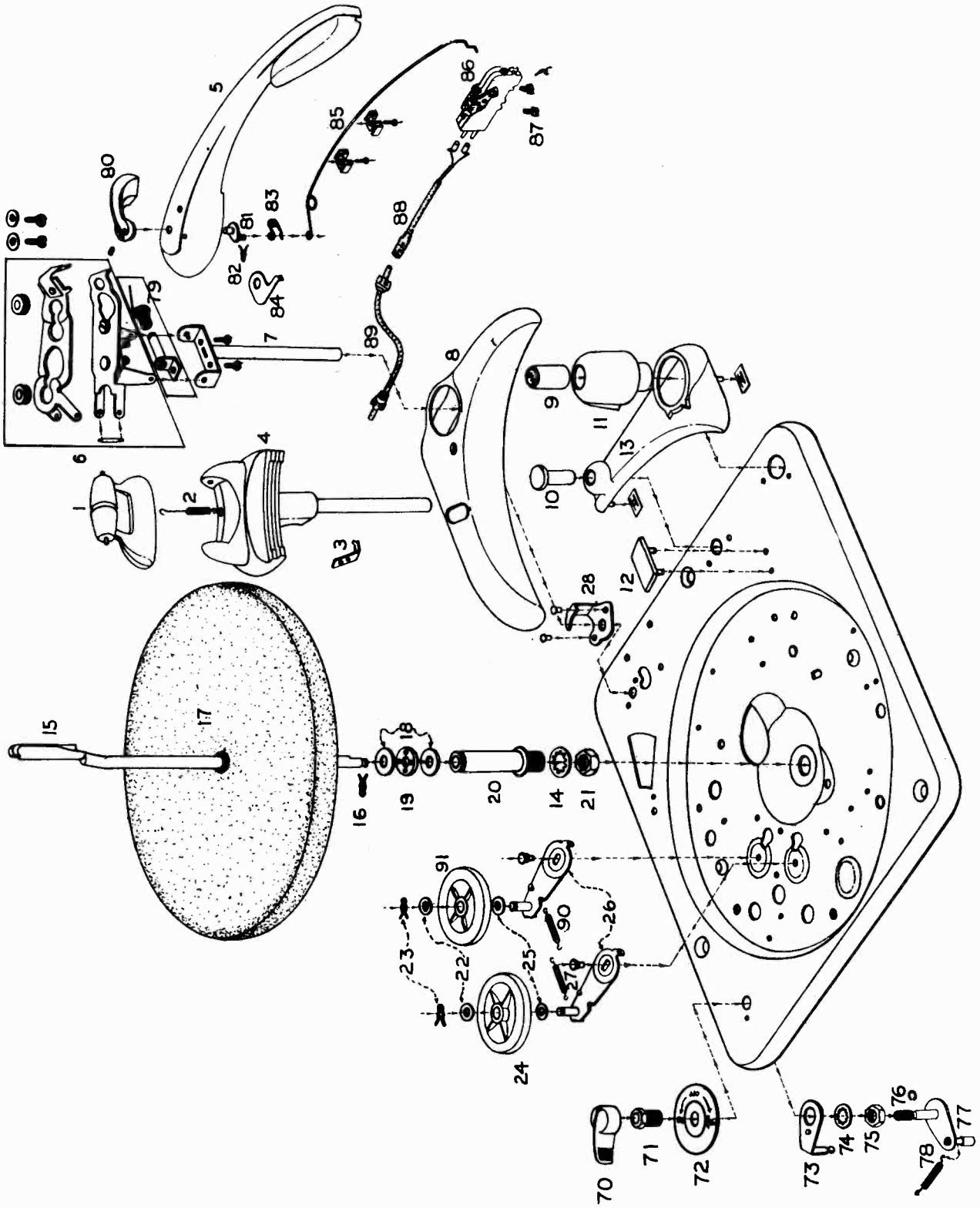

Exploded View above Main Plate

PARTS LIST

Illustration No.	*Part No.*	*Description*
1	49P074	Record Stabilizer Weight
2	46P126	Tension Spring — Record Weight
3	45P464	Spring Retaining Bracket
4	49X029	Record Selector Post
5	49X068	Pickup Arm — less cartridge and hardware
6	21X283	Pickup Arm Mounting Hinge
7	11X385	Pickup Shaft Assembly
8	45P350	Crescent Plate
9	49P111	Reject Button
10	49P112	Pickup Arm Rest
11	11X139	"Automatic-Manual" Control
12	24P022	Needle Pad
13	49P027	Escutcheon
14	25P333	Lock Washer
15	11X133	Spindle
16	50P204	Spindle Retaining Clip
17	11X289	Turntable
18	25P269	Bearing Race Washer
19	11X058	Bearing Race Assembly
20	41P414	Turntable Bearing
21	26P687	Bearing Nut
22	25P030	Felt Washer
23	50P125	Retaining Clip
24	11X366	Idler Wheel — 78 R.P.M.
25	25P046	Fibre Washer
26	11X375	Link Assembly
27	46P179	Link Tension Spring — 78 R.P.M.
70	39P044	Speed Control Knob
71	41P632	Shaft Bushing
72	78P410	Dial
73	45P757	Toggle Bracket
74	25P345	Lock Washer
75	26P276	Hex Nut
76	50P216	Retainer for 11X381
77	11X381	Two Speed Shaft Assembly
78	46P175	Tension Spring
79	11X386	Pickup Counterbalance Assembly
80	11X429	Counterbalance Weight Lever and Set Screw
81	11X405	Crank Lever Assembly
82	50P125	Spring Clip
83	46P176	Crank Lever Spring
84	45P700	Crank Lever Spring Retainer
85	46P180	Cartridge Tilt Spring
86		Cartridge and Bracket Assembly
87	26P474	Cartridge Mounting Screw
88	20X1244	Pickup Cord Assembly — Internal
89	20X1247	Pickup Cord Assembly — External
90	46P134	Link Tension Spring — 33⅓ R.P.M.
91	11X368	Idler Wheel — 33⅓ R.P.M.

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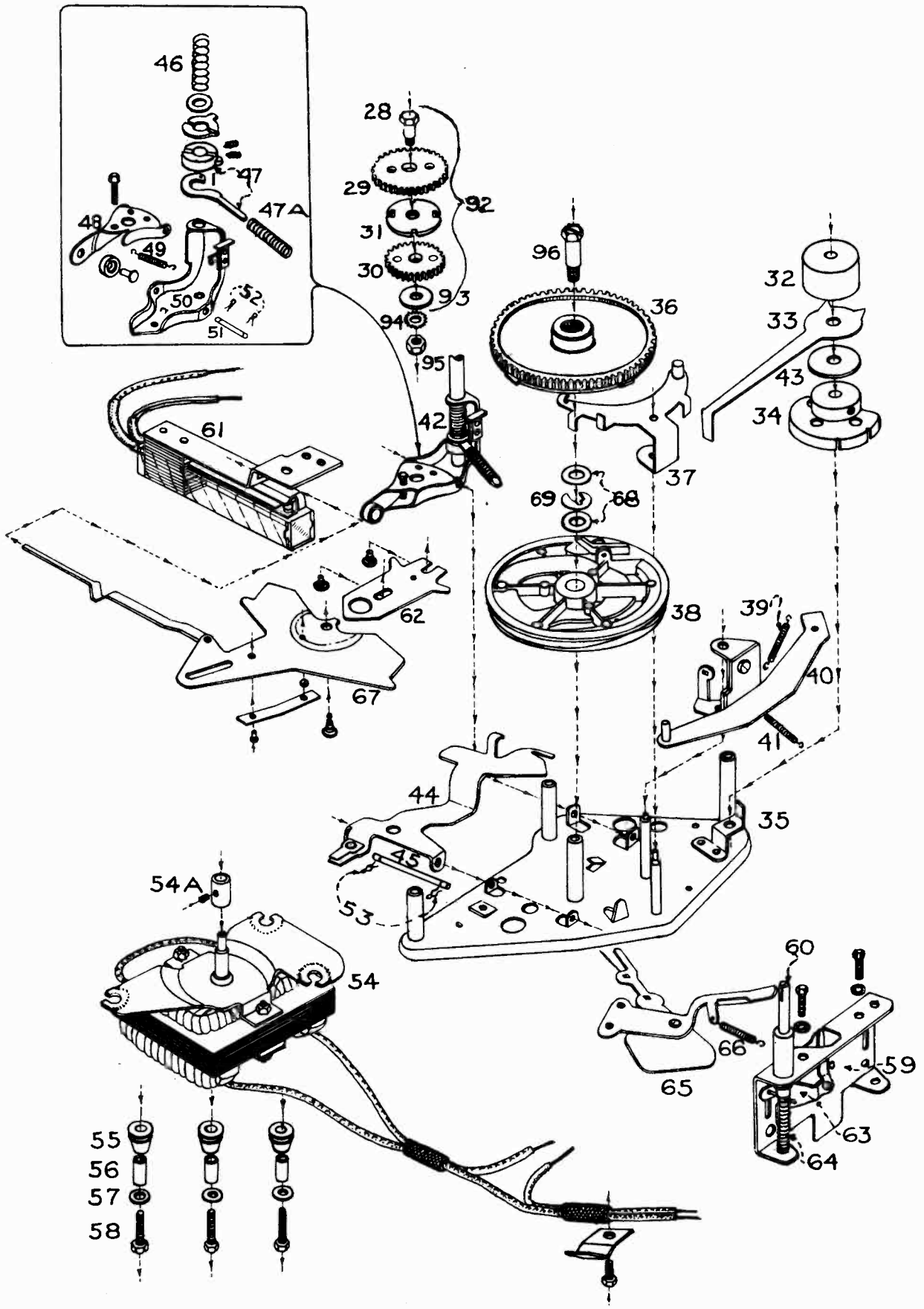

Exploded View below Main Plate

PARTS LIST

Illustration No.	*Part No.*	*Description*
28	41P333	Shoulder Screw
29	47P024	Large Fibre Gear
30	47P023	Small Fibre Gear
31	45P342	Idler Gear Coupler
32	41P576	Velocity Trip Clutch Weight
33	45P568	Automatic Trip Arm
34	11X227	Tone Arm Raising Disc
35	Not stocked as replacement item	
36	11X032	Trip Reset Gear
37	11X320	Velocity Trip
38	11X033	Cam and Trigger Assembly
39	46P139	Tension Spring
40	11X046	Raising Arm Lever Assembly (includes springs)
41	46P022	Tension Spring
42	Not a replacement item	
43	23P009	Friction Disc
44	11X079	No-Record Lever
45	41P443	Pin
46	46P012	Compression Spring
47	11X049	Selector Lever and Collar Assembly
47A	46P011	Compression Spring
48	11X141	Rocker and Roller Assembly
49	46P017	Tension Spring
50	11X142	Rocker Arm Lever
51	41P421	Retaining Pin
52	50P125	Clip
53	50P125	Clip
54	15X097	Motor
54A	17X450	Motor Shaft Sleeve (60 cycle)
55	25P363	Rubber Shock Motor Mounts
56	41P592	Motor Mounting Sleeve
57	25P367	Motor Mounting Washer
58	26P312	Motor Mounting Bolt
59	11X396	"Automatic-Manual" Control Assembly
60	41P444	"Automatic-Manual" Control Shaft
61	32P052	A.C. Switch and Bracket Assembly
62	45P755	Link Release
63	45P361	"Reject" Trip Actuating Lever
64	46P123	Compression Spring
65	11X158	"Reject" Trip Lever and Wire Assembly
66	46P117	Trip Lever Tension Spring
67	11X397	Two Speed Lever Assembly
68	25P343	Washer
69	25P342	"C" Washer
92	11X132	Idler Gear Assembly
93	25P367	Washer
94	25P222	Lock Washer
95	26P046	Nut
96	26P748	Shoulder Screw