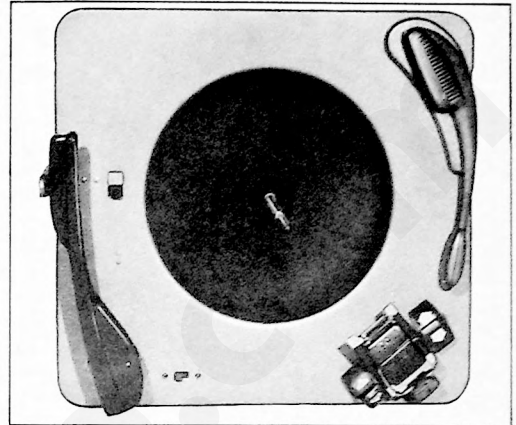


RECORD CHANGERS

MODEL M-9C

INTRODUCTION

The Philco Automatic Record Changer and Record Player Model M-9C, figure 1, incorporates the use of two tone arms. One tone arm is used in conjunction with the record-changer mechanism, which plays ten 12" records or twelve 10" records automatically at the standard speed of 78 r.p.m. The other tone arm is used manually, to play the new Columbia Long Playing Records at a speed of $33\frac{1}{3}$ r.p.m.; the record player shuts off automatically at the end of the Long Playing Record.



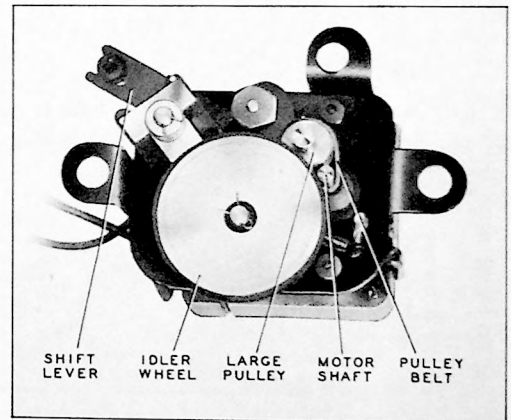
TP-5657

Figure 1. Philco Automatic Record Changer and Record Player Combination, Model M-9C

DESCRIPTION OF OPERATING CYCLE

Power is applied to the motor through an off-on switch and a mercury switch which is controlled by the position of the record-player tone arm. The two switches are connected in series.

A control is mounted on each side of the record-shelf assembly. The REJ.—AUT.—MAN. control controls the record-changer section of the combination. The STD. PLAY—LONG PLAY control has two functions. When it is pushed to LONG PLAY, a link underneath the base plate pulls a selector lever mounted on the base plate. The selector lever is connected to a shift lever which is part of the motor. On this shift lever is mounted a pulley which is connected by a belt to the motor shaft, as shown in figure 2. When the control is in LONG PLAY position, this pulley, which is larger in diameter than the motor shaft, engages and drives the idler wheel, which in turn drives the turntable at the slow speed of $33\frac{1}{3}$ r.p.m. When the control is at STD. PLAY, the larger pulley is retracted and the motor shaft engages the idler wheel, to provide a turntable speed of 78 r.p.m. By action of the STD. PLAY—LONG PLAY control, the double-pole, single-throw switch, mounted on the base plate under the turntable, is actuated. To this switch are connected the output leads of the two tone arms. When the control is at LONG PLAY position, the switch cuts out the output from the record-changer tone arm and closes the circuit for the record-player tone arm. When the control is at STD. PLAY, the reverse action takes place.

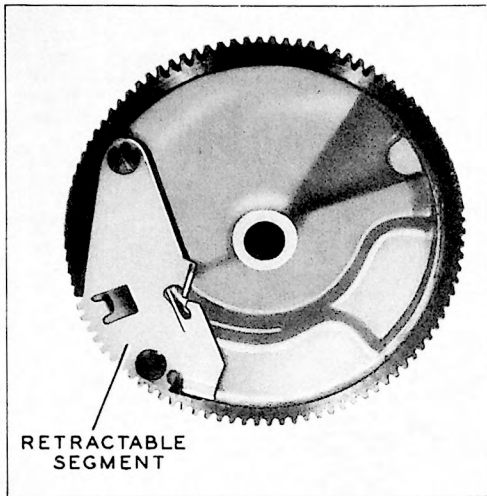


TP-7014

Figure 2. Motor, Showing Pulley, Belt and Shift Lever

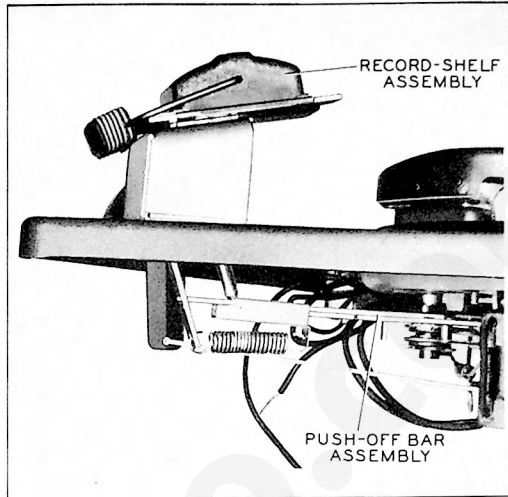
The record-changer change cycle takes place when the turntable hub gear, which is part of the turntable shaft, engages the cam gear through a retractable segment mounted on the cam gear; see figure 3. This retractable segment is brought into position by the

RECORD CHANGERS (MODEL M-9C)



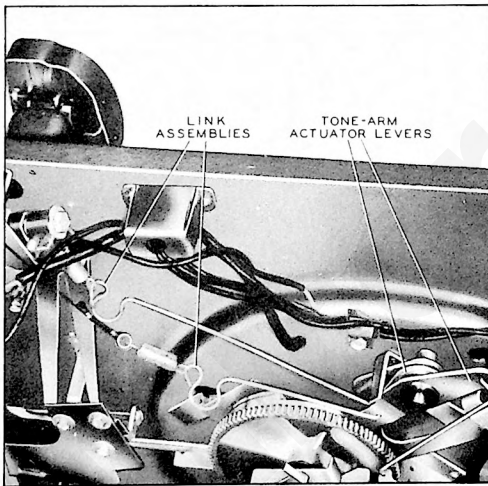
TP-4182-2

Figure 3. Cam Gear, Showing Retractable Segment



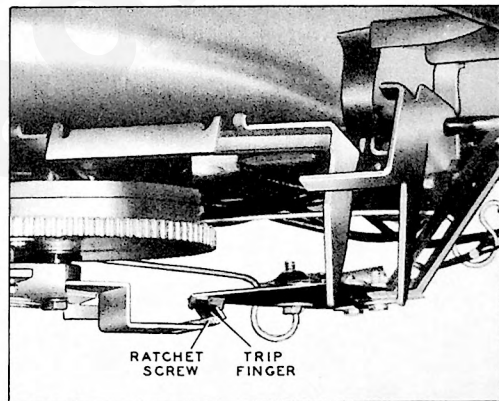
TP-4181

Figure 5. Record-Shelf and Push-Off Assemblies



TP-7017

Figure 4. Link Assemblies and Actuator Levers



TP-7011

Figure 6. Trip Finger and Ratchet Screw

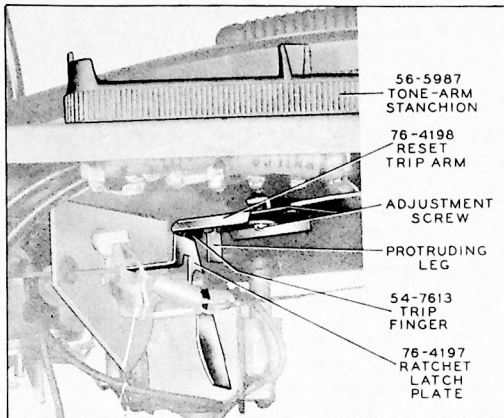
action of the trip mechanism. The cam then operates the changer mechanism.

The record-changer tone arm is operated by two link assemblies (figure 4) attached to actuator levers, which are in contact with the cam surface of the cam gear. The record-shelf push-off mechanism is connected through a series of bars, to a push-off actuator (figure 5). The mechanism is operated when a roller, mounted on the cam gear, comes in contact with the actuator. The trip mechanism is operated by

a trip finger riding over a ratchet screw (figure 6), which starts the change cycle when the needle is traveling in the eccentric finish groove of the record. The trip mechanism is locked in a disengaged position when the REJ.—AUT.—MAN. control is in the MAN. position.

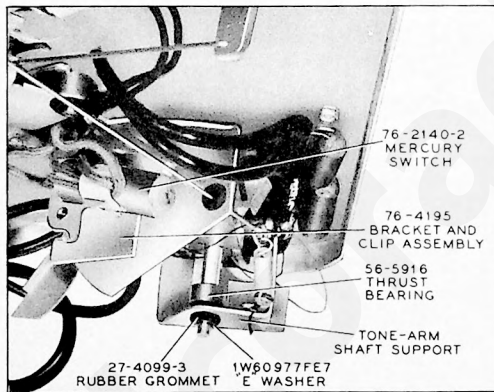
The record-player section contains a separate tone arm. Attached to this tone arm is a reset and trip-arm assembly, which has a protruding leg and trip finger (figure 7). When the tone arm of the record player is resting on the rest post, the leg on the reset trip arm contacts an ear of the bracket-clip assembly (mounted on the switch bracket), and this tips the

RECORD CHANGERS (MODEL M-9C)



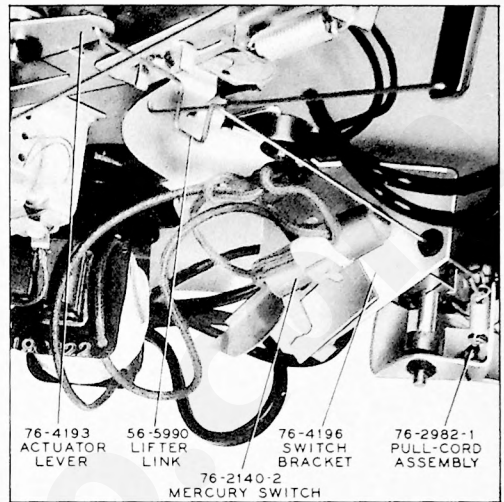
TP-7010

Figure 7. Trip Assembly, Showing Trip Finger Riding Over Ratchet Plate



TP-6663

Figure 8. Mercury Switch, Shown in ON Position



TP-6662

Figure 9. Mercury Switch, Shown in OFF Position

mercury switch mounted on it to the ON position, (figure 8). The motor circuit is now controlled only by the on-off switch.

When the record-player tone-arm needle is traveling in the eccentric finish groove of the record, the trip finger, which is mounted on the reset trip arm, rides over a ratchet on the ratchet latch plate. The ratchet latch plate is mounted on the switch assembly (figure 7), and trips the latch, causing the bracket-clip assembly to drop and tip the mercury switch to the OFF position (figure 9). This opens the motor circuit and stops the turntable.

A pull cord and link assembly is attached to the record-player tone arm, and is connected to a link-actuator lever. This permits the tone arm to be lifted and set on its rest post if the record changer is put into a change cycle. The pull-cord assembly, Part No. 76-2982-1, and the link-actuator lever, Part No. 76-4193, are shown in figure 9.

RECORD-CHANGER TESTING AND TROUBLE-SHOOTING PROCEDURE

PICKUP TEST

Play a familiar record on the phonograph and note the volume and tone quality.

NOTE

It is advisable to carry a familiar record as a part of the service test equipment.

If distortion is noted, try a new needle. If the dis-

tortion persists, a faulty crystal pickup is indicated; refer to page 521.

CHANGER-MECHANISM TEST

The following series of record-changer operating tests is given for quickly locating any trouble that may be encountered. Each test should be performed with several records before making any adjustments.

RECORD CHANGERS (MODEL M-9C)

Set the record shelf to the 10" position and place the tone arm on the rest post. Place a 10" record over the spindle and onto the record shelf. Push the STD. PLAY—LONG PLAY control to STD. PLAY.

Push the REJ.—AUT.—MAN. control to REJ. and observe the record-dropping action. The record should fall smoothly, with the edge of the record leaving the lips of the record shelf *after* the center has started to fall. Adjustment of the record shelf is given on page 518.

The tone arm should rise from the rest post, and the needle should come down on the record, about $\frac{1}{8}$ " from the outer edge. The index adjustment is given on page 515.

Play the record through and observe the tripping action; the trip mechanism should operate within the first two or three revolutions after the needle has entered the eccentric finish groove. Trip adjustments are given on page 518.

Remove the record from the turntable and set the record shelf to the 12" position. Place a 12" record over the spindle and onto the record shelf. Push the REJ.—AUT.—MAN. control to REJ., and observe the record-dropping action. The edge of the record should leave the lips of the record shelf *after* the center has started to fall. (Refer to page 518 for the record-shelf adjustment, if needed.) The tone arm should rise from the rest post and the needle should come down on the record, about $\frac{1}{8}$ " from the outer edge. If the index adjustment is required, refer to page 515.

Observe whether the lower edge of the tone arm, during a change cycle, clears the top of the hook on the tone-arm rest post by a minimum of $\frac{1}{8}$ ". Take the tone arm off the rest post, and place the pickup over the changer base plate; the needle point should clear the base plate by at least $\frac{1}{16}$ ", and should be no higher than the turntable top. Lift and height adjustments are given on page 516.

TURNTABLE AND MOTOR TEST

NOTE

Before making this test, warm up the motor by allowing it to run for at least ten minutes.

Set the REJ.—AUT.—MAN. control to MAN., and set the STD. PLAY—LONG PLAY control to STD. PLAY. Load the turntable with ten 12" records, and place the tone arm on the top record.

Place a stroboscope disc, such as Philco Part No. 45-9531, on the record, and illuminate the disc with a lamp (preferably a neon bulb) operated on 60-cycle a.c. The dots in the row calibrated for 78 r.p.m. should appear to remain stationary, or to drift very slowly, but smoothly, backward or forward.

If the turntable speed is steady, but is appreciably below 78 r.p.m., refer to the lubrication date on the turntable upper bearing, and check the idler wheel, idler spring, wiring, etc.

Unsteady drift of the dots on the stroboscope disc indicates uneven turntable speed, which is the cause of wows; see UNEVEN TURNTABLE SPEED (WOWS), page 520.

RECORD-CHANGER CLEANING AND LUBRICATION

The Model M-9C record changer, like any other mechanism, requires lubrication after long periods of use. Whenever a major part or an assembly is to be replaced, the changer should be cleaned and lubricated. Carbon tetrachloride or other similar cleaning fluids may be used to remove old grease, oil, and dirt. Apply lubricants sparingly.

All lubrication points are shown in figures 10 and 11. It may be necessary to remove some parts and assemblies in order to lubricate their bearings—for example, the actuator and cam gear must be removed to lubricate the actuator stud and the cam-gear spindle.

PARTS NOT TO BE LUBRICATED

The following parts should not be lubricated at any time: Trip receiver, trip finger, ratchet screw on trip plate, selector, and all parts of the record-player section.

PARTS TO BE GREASED

The following parts are to be lubricated with a grease having the consistency of vaseline:

Record-Shelf Assembly (point A of figure 10)

Four protruding dimples.

Bridge Assembly and Slider Control Bar (point B of figure 11)

Three dimples and four upturned ears.

Cam Gear (point C of figure 11)

Cam-gear teeth, cam surfaces, and cam-gear spindle.

Main Assembly (point C of figures 10 and 11)

Trip-plate ear where contact is made with gear segment.

Actuator stud.

All parts with ears sliding on changer base plate.

Index-lever surface which slides on base plate.

Push-off-actuator dimples which slide on base plate.

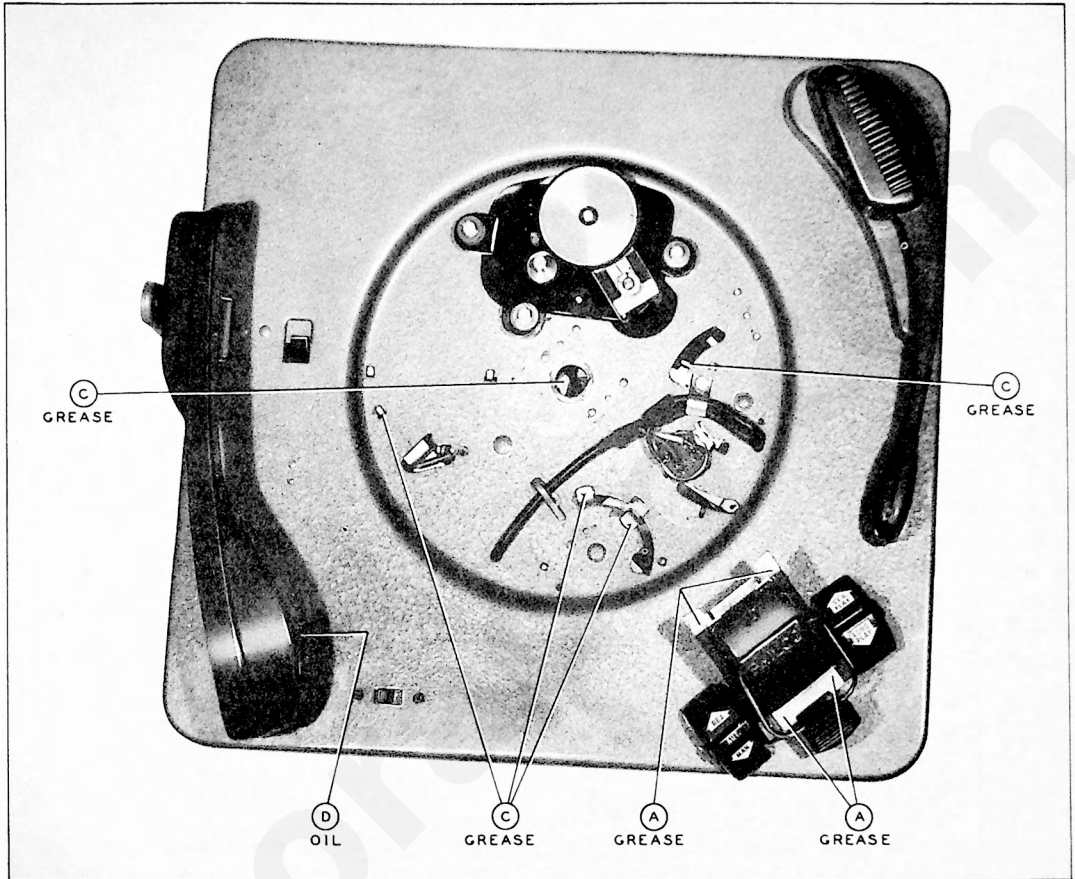
Turntable shaft (upper bearing).

Tone-arm shaft.

PARTS TO BE OILED

The following parts are to be lubricated with S.A.E. 20 oil:

RECORD CHANGERS (MODEL M-9C)



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Figure 10. Top View, Showing Lubrication Points

Tone Arm (point D of figure 10)

Tone-arm pivot pin where pin rides in elongated hole of tone arm—apply one drop with a pointed rod.

Trip-Plate Bushings (point E of figure 11)

Spindle (point E of figure 11)

Cam-Gear Roller (point E of figure 11)

CAUTION

Do not get any oil or grease on the motor shaft or the idler-wheel tire. Should this occur, remove the oil or grease immediately with carbon tetrachloride.

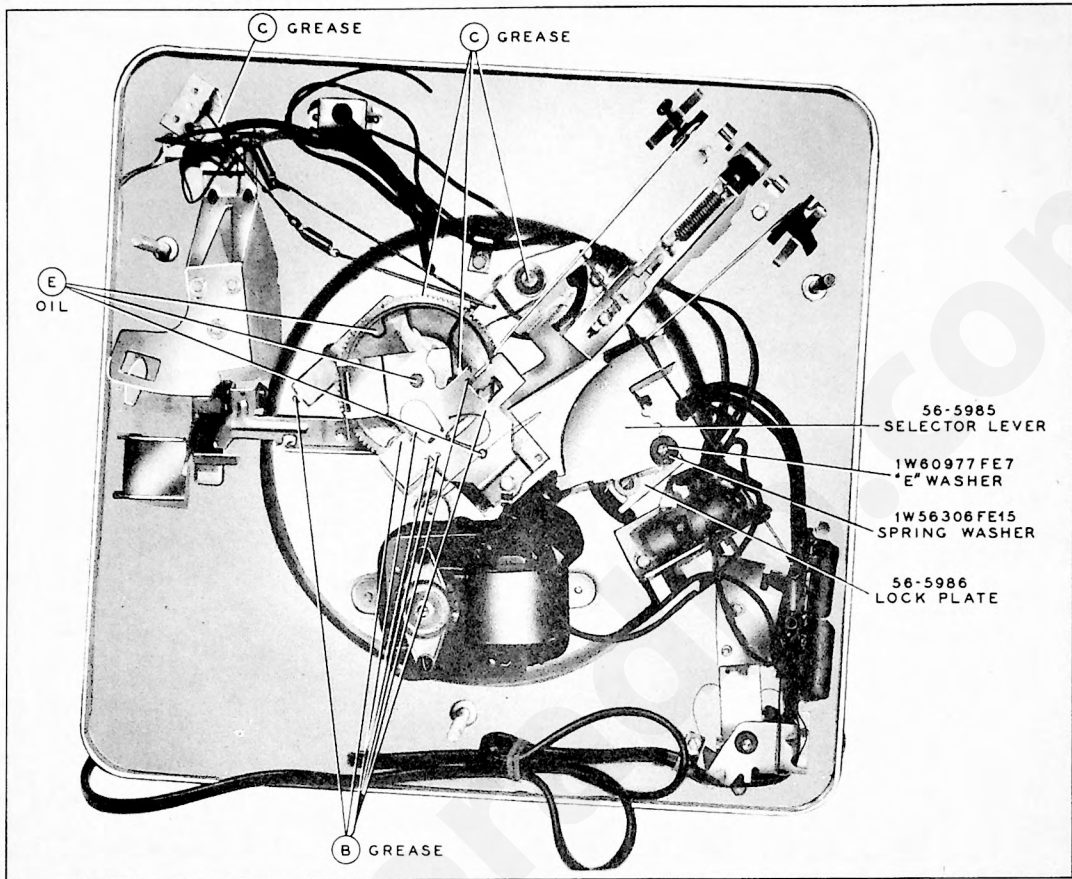
RECORD-CHANGER ADJUSTMENTS

10" INDEX ADJUSTMENT

Place a 10" record on the turntable, push the REJ.—AUT.—MAN. control to REJ., and rotate the turntable $4\frac{1}{2}$ turns by hand. The tone arm should then be approximately $\frac{1}{2}$ " above the record.

Loosen the clamp screw on the trip arm (figure 12). Hold the tone arm (steady) $\frac{1}{8}$ " in from the edge of the record, and set the trip arm so that the trip-arm stop is in contact with the selector hinge (Part No. 56-4617FA3). See figure 13.

RECORD CHANGERS (MODEL M-9C)



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Figure 11. Bottom View, Showing Lubrication Points

Tighten the clamp screw, leaving $\frac{1}{32}$ " vertical play, or clearance, between the trip arm and the base plate.

12" INDEX ADJUSTMENT

Make the 10" index adjustment first. The 12" indexing will ordinarily be satisfactory after the 10" adjustment is made; if not, bend the selector, Part No. 56-4618FE15, slightly to the right or left as required for proper indexing of the needle on the record, as shown in figure 14.

TONE-ARM HEIGHT AND LIFT ADJUSTMENTS

With the changer out of cycle (change cycle completed; tone arm lowered), and the tone arm off the rest post, the needle point should clear the changer base plate by at least $\frac{1}{16}$ ", and should not be higher than the turntable top. To adjust the height, shape the top ear of the tone-arm swivel, shown in figure

15 (bending the ear downward raises the tone arm).

To adjust the lift, take the tone arm off the rest post, push the REJ.—AUT.—MAN. control to REJ., and rotate the turntable approximately $1\frac{1}{2}$ turns by hand until the tone arm comes against the rest post. The lower edge of the tone arm should clear the top of the protruding hook on the rest post by not less than $\frac{1}{8}$ ", and not more than $\frac{1}{4}$ ". Adjust by shaping the lower ear of the tone-arm swivel, shown in figure 16 (bending the ear downward raises the tone arm).

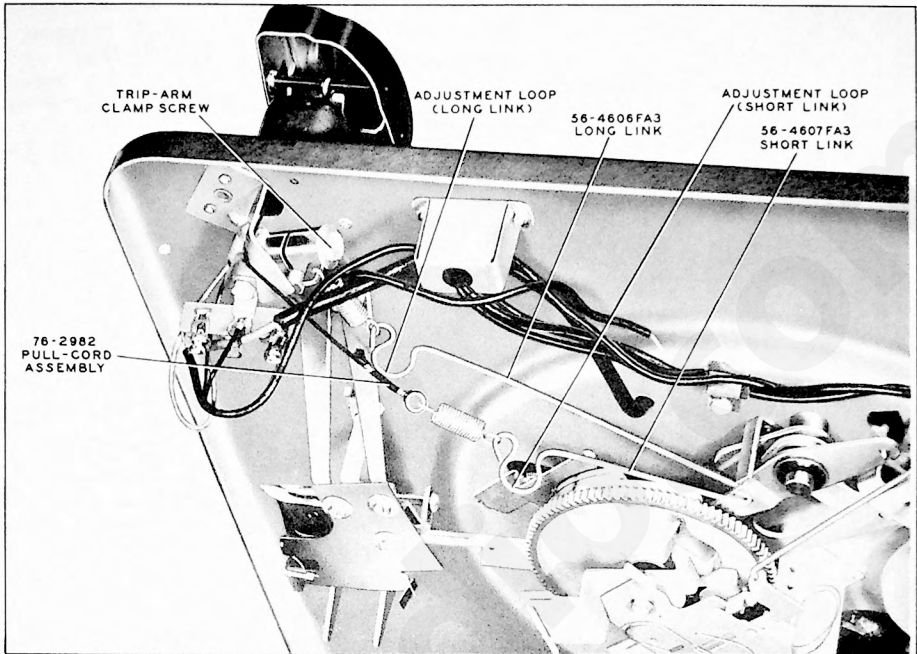
TONE-ARM VERTICAL AND HORIZONTAL TIMING ADJUSTMENTS

NOTE

Before making these adjustments, make the tone-arm height and lift adjustments given above.

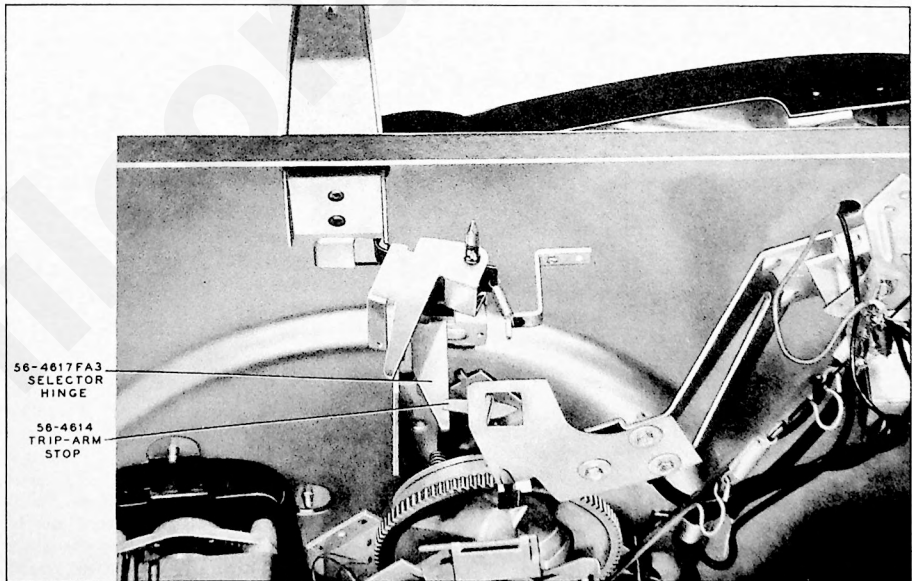
For the vertical adjustment, start with the changer out of cycle. Push the REJ.—AUT.—MAN. control

RECORD CHANGERS (MODEL M-9C)



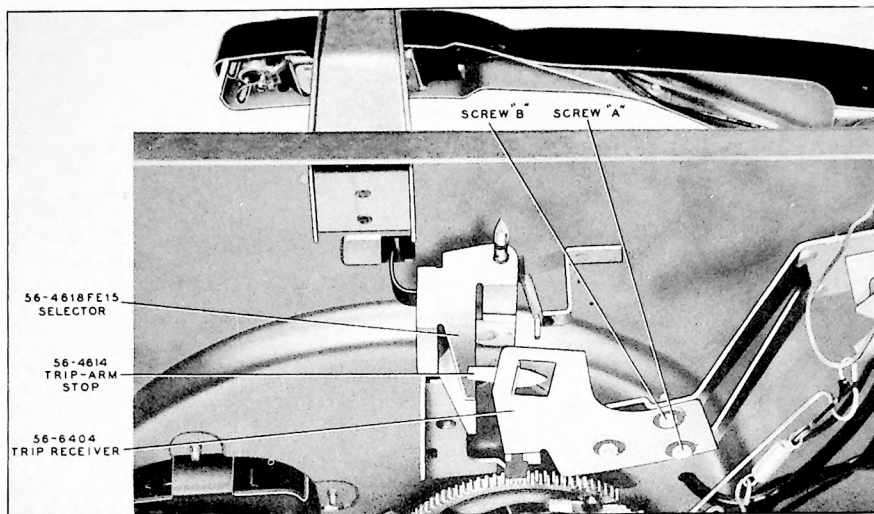
TP-7017A

Figure 12. Loop Adjustments and Trip-Arm Clamp Screw



TP-7013

Figure 13. 10-Inch Indexing Adjustment



TP-7016

Figure 14. 12-Inch Indexing Adjustment, Showing Trip Stop Arm in Contact with Outside Selector

to REJ., and rotate the turntable, by hand, three-quarters of a revolution; this setting can be obtained more accurately by making a mark on the turntable to coincide with some starting point. At the three-quarter-revolution point, the leading edge of the cam surface is approximately $\frac{1}{4}$ " from the end of the lift actuator lever, Part No. 76-4193; this is the lower actuator lever, shown in figure 17. Adjust the wire loop of the short link, cord, and spring assembly (figure 12), attached to the tone-arm lift pin, by squeezing or opening the loop until the tone-arm lift pin makes contact with the lower ear of the tone-arm swivel.

For the horizontal adjustment, rotate the turntable another three-quarters revolution from the point at which the vertical adjustment was made. At this point, the leading edge of the cam surface is approximately $\frac{1}{4}$ " from the end of the horizontal-return actuator lever; this is the upper actuator lever, Part No. 76-2987, shown in figure 18. Adjust the wire loop of the long link and spring assembly (figure 12), attached to the trip arm, by squeezing or opening the loop until the tone arm makes contact with the rubber bumper on the tone-arm rest post.

TRIP-FINGER AND TRIP-RECEIVER ADJUSTMENTS

For the trip-finger adjustment, move the tone arm toward the spindle. Adjust the screw on the trip-receiver plate (figure 19) so that the trip finger, when riding over the ratchet screw on the trip plate, assumes an angle of 25° to 30° with respect to the screw.

For the trip-receiver adjustment, place the tone arm on a record with the needle in the eccentric finish

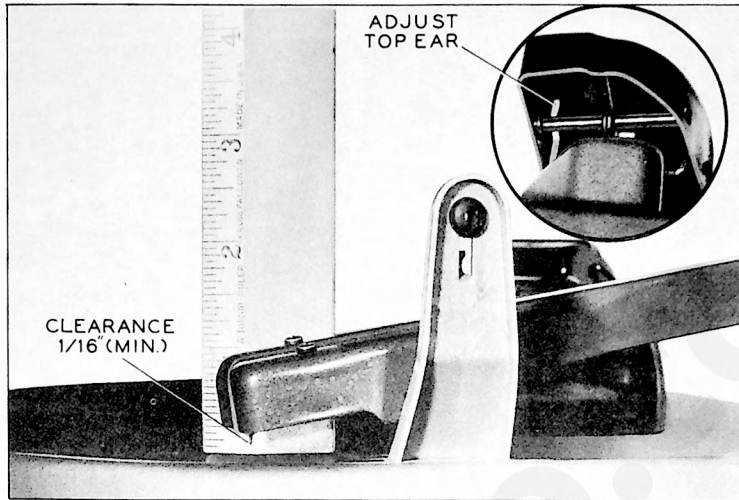
groove. The vertical center line of the trip finger should coincide with the center line of the ratchet screw. To adjust the centering of the trip finger over the ratchet screw, loosen screw B slightly, and screw A completely; see figure 19. Rotate the trip receiver about screw B, as a center. Tighten the screws when the trip finger is centered.

Approximately $\frac{1}{8}$ " of the trip-arm stop should engage the selector; see figure 19. To adjust the engagement of the trip-arm stop, loosen screw A slightly, and screw B completely. Rotate the trip receiver about screw A, as a center, to obtain the correct adjustment. Tighten the screws.

The above adjustments will affect each other slightly; therefore, it may be necessary to repeat each adjustment until both are correct. After making the above adjustments, it will be necessary to correct the index adjustments.

RECORD-SHELF ADJUSTMENT

Place the shelf in the 10" position, and the changer out of cycle. Place the Philco record-shelf gauge, Part No. 45-1470, over the spindle and onto the record shelf, as shown in figure 20. Loosen the two hex-head screws which hold the record-shelf assembly to the changer base plate. Move the record-shelf assembly away from the record spindle until the large curved part of the gauge drops even with the record-shelf lips, as shown in figure 20. 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.



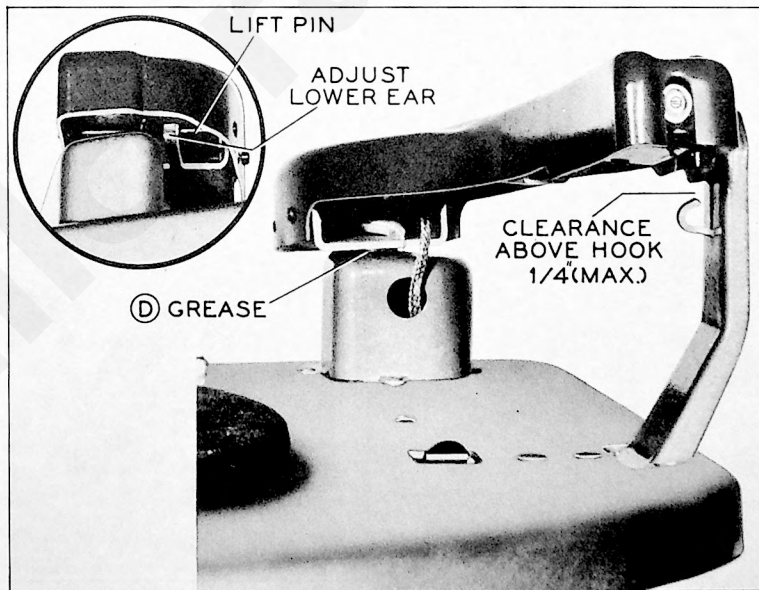
TP-4000

Figure 15. Tone-Arm Height Adjustment

PUSH-OFF ADJUSTMENT

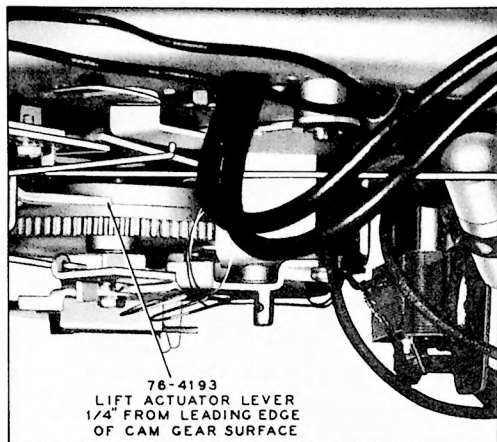
Push the REJ.—AUT.—MAN. control to REJ., and rotate the turntable $2\frac{1}{2}$ revolutions, by hand; at this point, the push-off actuator, Part No. 56-4588FA3, is in its most forward position, in contact with the roller

on the cam gear; see figure 21. Loosen the push-off-bar locking screw, shown in figure 214. Squeeze the push-off-bar ears toward each other to the point where the slider blade on the record shelf extends $\frac{1}{32}$ " beyond the lips of the shelf. Tighten the hex-head locking screw.



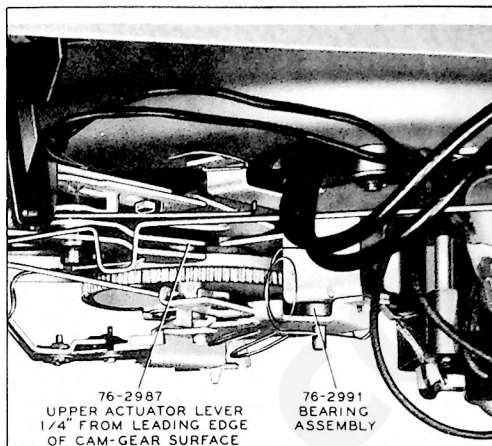
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Figure 16. Tone-Arm Lift Adjustment



TP-6659

Figure 17. Tone-Arm Vertical Timing Adjustment, Showing Lower Actuator Gear Lever in Contact with Cam Gear



TP-6660

Figure 18. Tone-Arm Horizontal Timing Adjustment, Showing Upper Actuator Gear Lever in Contact with Cam Gear

UNEVEN TURNTABLE SPEED (WOWS)

Uneven turntable speed (wows) may be caused by the following:

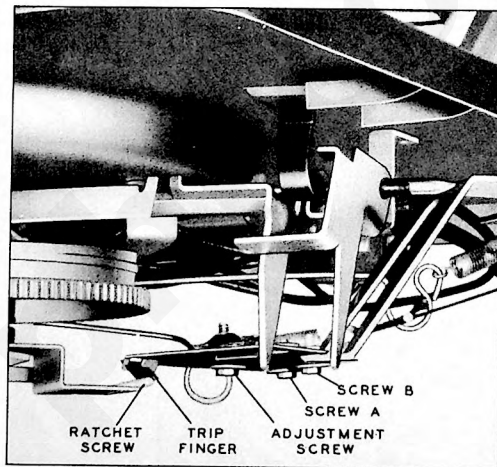
Dirt under and around the turntable or idler-wheel assembly. Remove the turntable and clean out the dirt. Be careful to lift the turntable straight up after removing the spindle first (see page 521). When replacing the turntable, be sure that the idler is behind the turntable rim before the turntable is fully lowered

(the spindle may be used to hold the idler back).

Flat or worn spots, or grease, on the rubber tire of the idler wheel.

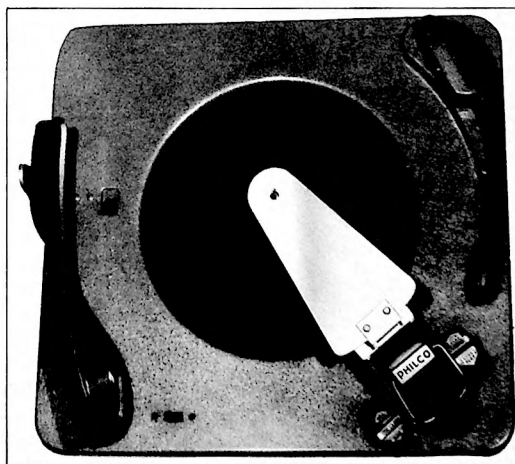
Defective turntable shaft or bearing assembly.

Replace the defective parts as directed under REPLACEMENT OF PARTS AND ASSEMBLIES, page 521. If the 33 $\frac{1}{3}$ r.p.m. speed is incorrect, replace pulley belt, Part No. 45-6479 (remove idler wheel to replace belt).



TP-7011A

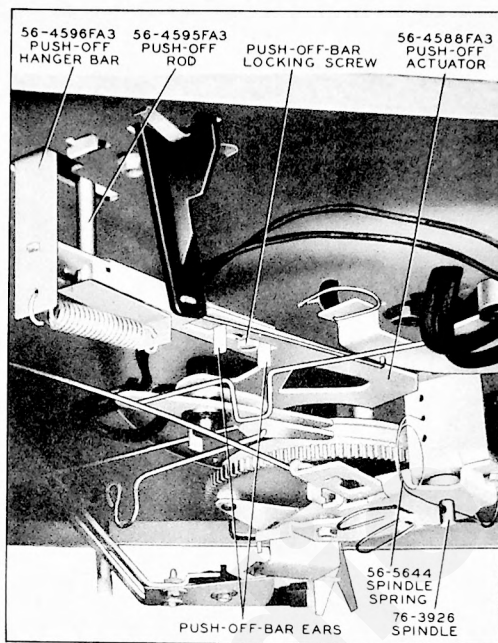
Figure 19. Trip-Finger and Trip-Receiver Adjustments



TP-6670

Figure 20. Shelf Gauge, Shown in Correct Position on Record Shelf and Spindle

RECORD CHANGERS (MODEL M-9C)



TP-6665

Figure 21. Push-Off Adjustment, Showing Push-Off Actuator in Contact with Roller on Cam Gear

REPLACEMENT OF PARTS AND ASSEMBLIES ON RECORD CHANGER

The following procedures are recommended for correct replacement of parts and assemblies on the record changer. The part should be replaced by reversing the order of removal, and adjusted according to the directions given in the RECORD-CHANGER ADJUSTMENTS section.

When any part is to be removed, the REJ.—AUT.—MAN. control should be in the AUT. position, and the changer should be out of cycle.

1. NEEDLE, PART NO. 45-1597

To remove needle, loosen knurled nut under crystal cartridge, and pull needle out.

2. CRYSTAL-PICKUP CARTRIDGE, PART NO. 35-2671-1

- Bring tone arm toward center of turntable.
- Remove the two screws, nuts, lock washers, and spacers which hold cartridge to tone arm.
- Drop cartridge below tone arm sufficiently to allow removal of the two clips from cartridge, as shown in figure 22. If pickup leads are shielded, unsolder shield.

NOTE

When mounting cartridge, be sure to insert long spacer in side toward spindle.

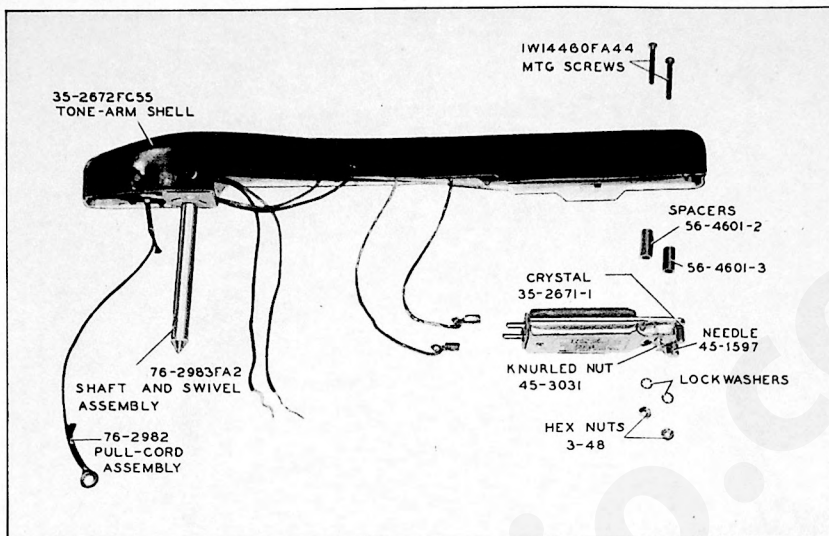
3. SPINDLE NO. 76-3926

- Unhook both ends of spindle spring, Part No. 56-5644, from "U"-shaped bracket mounted under changer base plate (figure 21).
- Uncoil ends of spring through spindle.
- Pull out spindle.

4. MOTOR, PART NO. 35-1371

- Push REJ.—AUT.—MAN. control to MAN. position.
- Remove spindle as directed in paragraph 3 above.
- Unsolder motor lead from mercury switch.
- Disconnect second motor lead by unsoldering it at splice from switch lead. The motor assembly is shown in figure 23.
- Remove ground lead from lug on motor.

RECORD CHANGERS (MODEL M-9C)



TP-6569-1

Figure 22. Record-Changer Tone-Arm Assembly, Part No. 35-2663-2

f. Remove the three screws, washers, and bushings from motor frame (figure 23), and lift out motor.

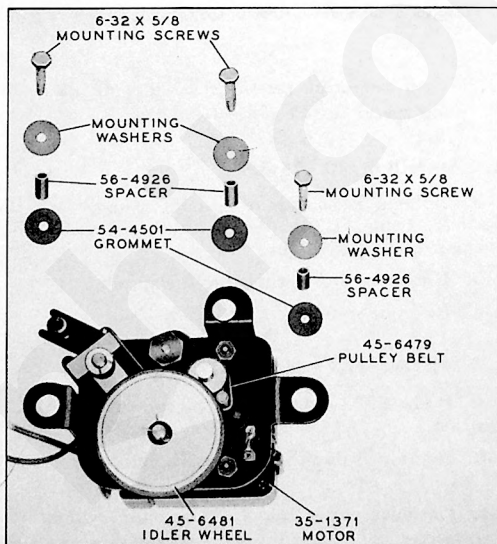
b. Loosen clamp screw which holds trip arm to tone-arm shaft, Part No. 76-2983FA2 (figure 12). Lift out tone arm and shaft. The tone-arm assembly is shown in figure 22.

5. TONE-ARM ASSEMBLY, PART NO. 35-2663-2

6. BRIDGE ASSEMBLY, PART NO. 76-2978

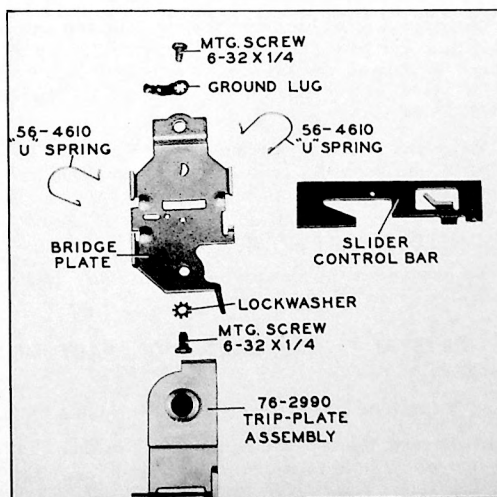
a. Unsolder tone-arm leads from terminal panel on underside of changer base plate.

a. Remove the two hex-head screws from bridge plate.



TP-7014-A

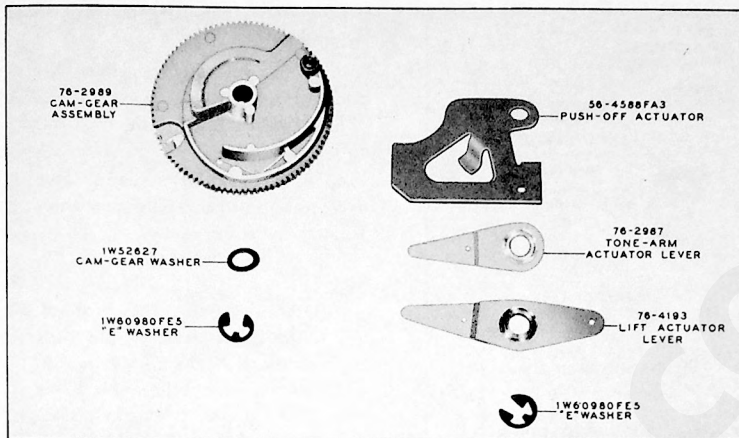
Figure 23. Motor Assembly



TP-4180-1

Figure 24. Bridge Assembly

RECORD CHANGERS (MODEL M-9C)



TP-7015

Figure 25. Cam-Gear Assembly and Actuator Levers

b. Remove link rod, Part No. 56-4589FA3, from slider control bar. Complete assembly of bridge is shown in figure 24.

7. TRIP PLATE PART NO. 76-2990

a. Remove bridge assembly, Part No. 76-2978, as directed in paragraph 6 above.

b. Slide trip plate, Part No. 76-2990, off cam-gear spindle.

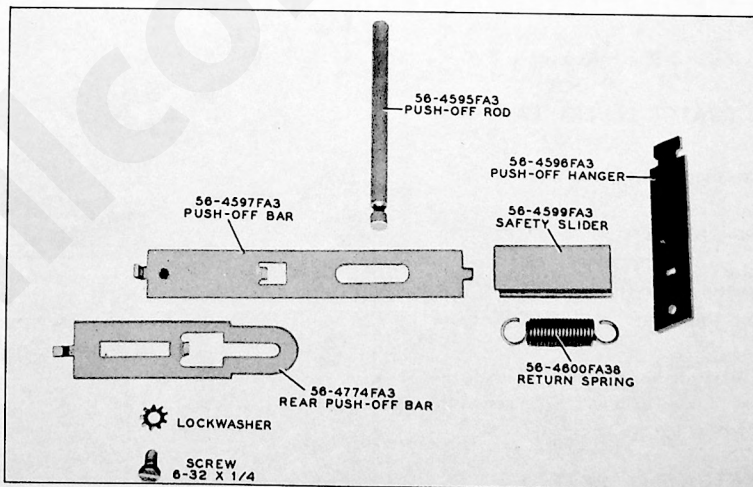
8. CAM-GEAR ASSEMBLY, PART NO. 76-2989

a. Remove bridge assembly and trip plate as directed in paragraphs 6 and 7 above.

b. Remove ball-bearing assembly, Part No. 76-2991 (figure 18), by pulling it off.

c. Remove large "E" washer, Part No. 1W60980FE5, from cam-gear spindle, and slide off cam washer, Part No. 1W52627.

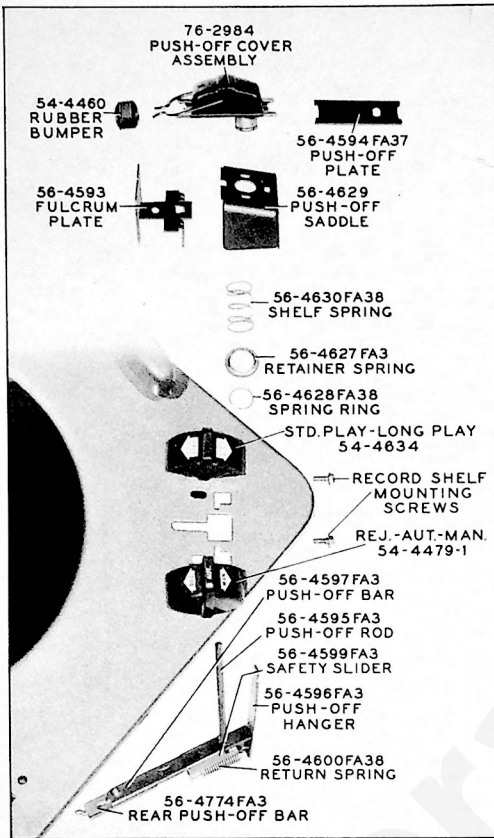
d. Slide cam gear off spindle. The cam-gear assembly is shown in figure 25.



TP-4183

Figure 26. Push-Off Assembly

RECORD CHANGERS (MODEL M-9C)



TP-7012

Figure 27. Record-Shelf Assembly

9. TONE-ARM-ACTUATOR LEVERS, PART NO. 76-2987

- Remove "E" washer, Part No. 1W60980FE5, from actuator stud.
- Disengage short link, Part No. 56-4607FA3, from link spring.
- Slide lower actuator lever from stud.
- Disengage lifter link, Part No. 56-5990, from actuator lever.
- Remove upper actuator lever from stud, and disengage long link, Part No. 56-4606FA3. The actuator-lever assembly is shown in figure 25.

10. PUSH-OFF ACTUATOR, PART NO. 56-4588FA3

- Remove selector lever, Part No. 56-5985, as directed on page 529, paragraph 8.

- Remove tone-arm actuator levers as directed in paragraph 9 above.

- Press push-off rod, Part No. 56-4595FA3, and push-off hanger bar, Part No. 56-4596FA3 (figure 21), together and pull downward, to release the entire assembly.

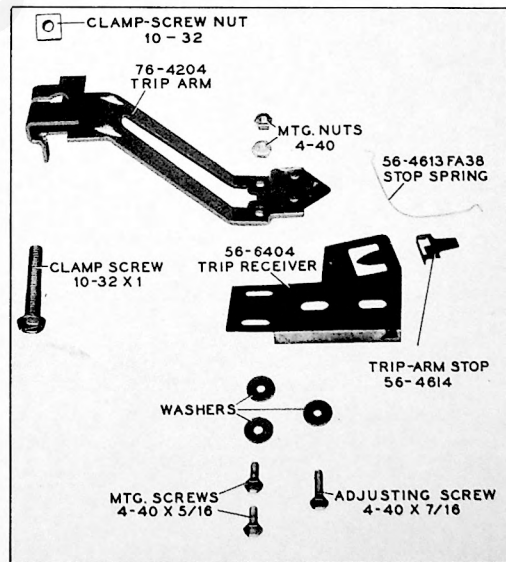
- Slide push-off actuator, Part No. 56-4588FA3, over, to align upturned ears with cut out in base plate. Slide actuator off stud.

NOTE

After removing the push-off actuator and push-off-bar assembly, the slider blade on the record shelf may slide out of the assembly. When reassembling, this blade should be inserted in the record-shelf assembly, with the elongated hole toward the 12" position of the record shelf. The push-off assembly is shown in figure 26.

11. RECORD-SHELF ASSEMBLY

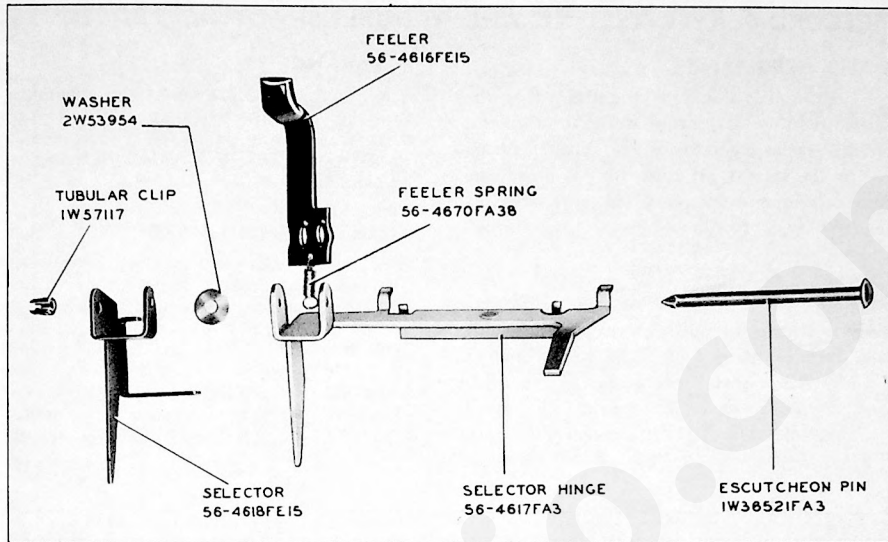
- Remove push-off assembly as directed in step c of paragraph 10.
- Remove the two hex-head screws which hold record-shelf assembly to base plate.
- Align ears on record-shelf assembly with cut out on base plate. Lift out record-shelf assembly. The record-shelf assembly is shown in figure 27.



TP-4227-2

Figure 28. Trip-Arm and Trip-Receiver Assemblies

RECORD CHANGERS (MODEL M-9C)



TP-4123-2

Figure 29. Selector Assembly

12. REJ.—AUT.—MAN. CONTROL ASSEMBLY, PART NO. 54-4479-1.

- Remove flat spring, Part No. 56-4778FA38, by sliding it laterally through underside of button (figure 21).
- Remove the two hex-head screws, and drop bridge assembly, Part No. 76-2978.
- Disengage control link, Part No. 56-4589FA3, from underside of control button (figure 8). Lift out control button.

13. STD. PLAY—LONG PLAY CONTROL, PART NO. 54-4634

- Remove flat spring, Part No. 56-4778FA38, by sliding it laterally through underside of button.
- Remove selector lever, Part No. 56-5985, as directed in paragraph 8, page 529.
- Disengage selector link, Part No. 56-5991, from selector lever (figure 8).
- Lift out control button.

14. TRIP-ARM ASSEMBLY

- Loosen clamp screw on trip arm, Part No. 76-4204 (figure 12).
- Raise tone arm and shaft sufficiently to clear trip arm. Remove trip arm, and disengage link spring.

NOTE

When assembling, maintain $\frac{1}{32}$ " vertical play (clearance between trip arm and base plate) in tone-arm shaft.

15. TRIP-RECEIVER ASSEMBLY, PART NO. 56-6404

- Remove the three screws, washers, and nuts from trip arm (figure 28).
- Remove trip receiver.

16. SELECTOR ASSEMBLY

Remove cam gear as directed in paragraph 8. Remove feeler spring from attachment point on motor board. Tilt selector assembly, and remove from base plate.

NOTE

When assembling the selector assembly, be sure to maintain .005" clearance between selector hinge, Part No. 56-4617FA3, and washer, Part No. 2W53954. For correct assembly, refer to figure 29.

RECORD-PLAYER TESTING AND TROUBLE-SHOOTING PROCEDURE

PICK-UP AND NEEDLE TEST

Place a 12" Columbia Long Playing Record on the turntable, lift the tone arm from the rest post, and place it on the starting groove of the record. Listen to the tone of the record. If distortion is noted, replace crystal cartridge as directed on page 521. If trouble persists, check for loose wiring, bad contact points, etc.

SHUT-OFF TEST

Place the tone arm in the finish groove of the record and observe the shut-off action. The record player should shut off within three revolutions of the turntable, after the pickup needle has entered the finish groove of the record. The trip adjustments are shown on page 518.

CLEARANCE TEST

Remove the record from the turntable and place the tone arm over the base plate. Observe whether there is a minimum of $\frac{1}{16}$ " clearance between the needle point and base plate. Refer to page 519 for adjustment.

TURNTABLE AND MOTOR TEST

Allow the motor to run for at least five minutes; then place a stroboscope, such as Philco Part No. 45-1614, on the turntable, and illuminate the disc with a lamp operating on 60-cycle a.c. The dots in the row calibrated for $33\frac{1}{3}$ r.p.m. should appear to remain stationary or to drift very slowly, but smoothly, forward and backward. If the dots are moving in either direction very fast or with a jerky motion, refer to UNEVEN TURNTABLE SPEED (WOWS), page 520.

RECORD-PLAYER ADJUSTMENTS

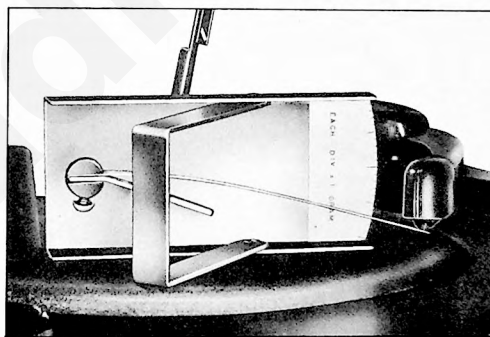
TOPE-ARM NEEDLE PRESSURE AND VERTICAL FRICTION

Hold the Philco Gram Scale, Part No. 45-1614, on its side and set the pointer to the center line of the scale. This is the 0 point, and each small division on either side of 0 is equal to one gram. After the scale has been set to 0, place it on the turntable with the guard on the scale in an open position, at right angles to the scale, as shown in figure 30. Now set the needle of the tone arm into the hole at the end of the pointer and observe the reading on the scale. This reading is the needle pressure; the correct needle pressure is 6 to $7\frac{1}{2}$ grams.

To determine the vertical friction proceed as follows: Press down on the head of the pickup, then let it return to its normal position, and note the reading. Raise the pickup slightly, then gently lower it to the normal position, and again note the reading. The vertical friction is the difference between the two readings obtained. For example: if the scale reading is $7\frac{1}{4}$ grams after the pickup is depressed and released, and is $6\frac{3}{4}$ grams after the pickup is raised and lowered, the vertical friction is $7\frac{1}{4}$ minus $6\frac{3}{4}$ or $\frac{1}{2}$ gram. The vertical friction should not exceed 2 grams.

TOPE-ARM HORIZONTAL FRICTION

Hold the gram scale flat in the palm of the hand and set the pointer to "0". Take the tone-arm off the rest post, and place a counterweight on top of the rear end until the tone arm is balanced in a horizontal position. Place the pointer of the scale against the side of the pickup head (figure 31) and move the pickup toward the center of the turntable. Then



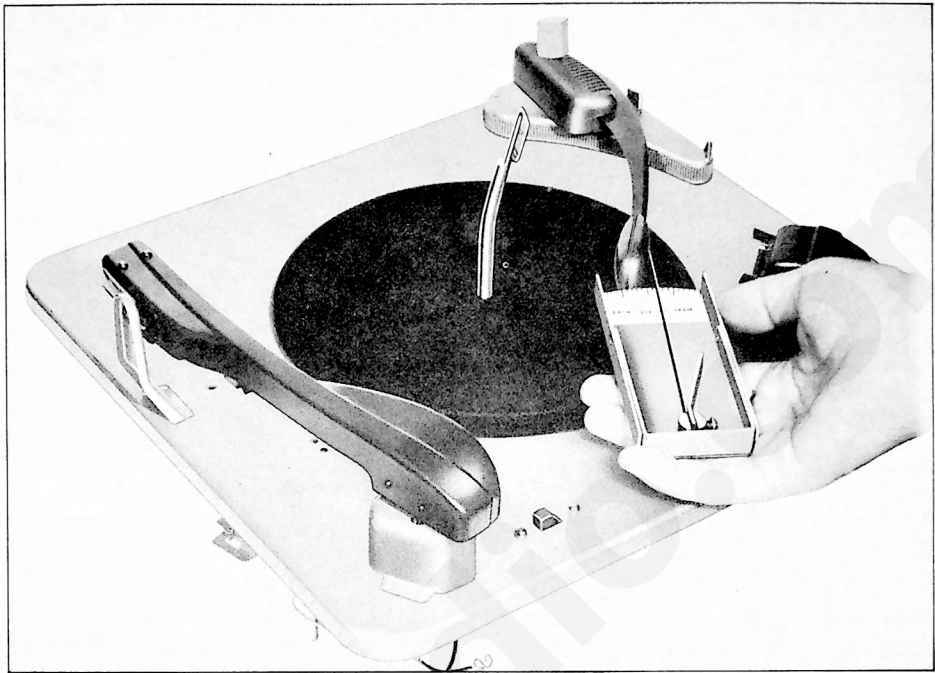
TP-7234

Figure 30. Measurement of Needle Pressure and Vertical Friction with Gram Scale

move the pickup outward, away from the center of the turntable. The horizontal friction is the average of the two readings taken, when the pickup is moved both inward and outward. At no time should it take more than 2 grams pressure on the pointer to move the tone arm.

PICKUP HOLDER

The pickup holder should be centrally spaced between the walls of the tone arm so that there is no binding or rubbing against the inside of the tone arm when the pickup cartridge is moved vertically. To obtain proper spacing, first remove the tone arm (see page 528); loosen the screw which holds the pickup bracket mounting. Move the mounting until it is

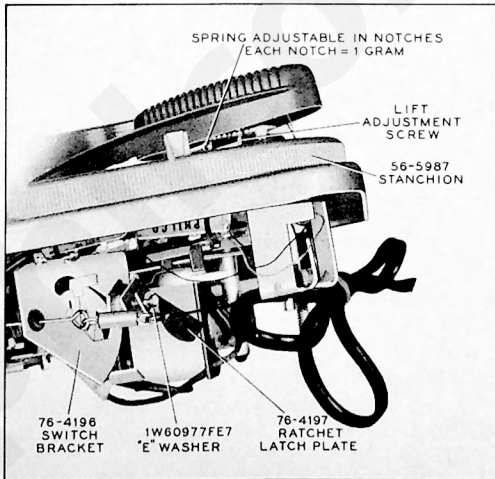


TP-6666

Figure 31. Measurement of Horizontal Pressure

centrally spaced between the walls of the tone arm, and maintain $\frac{1}{32}$ " clearance between the tip of the

ears on the holder and the inside surface at the front end of the tone arm, as shown in figure 33.

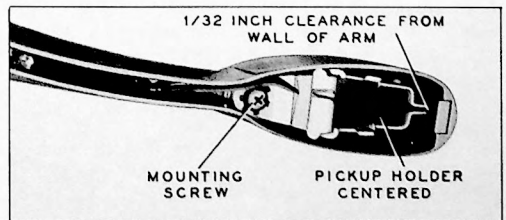


TP-6664

Figure 32. Needle-Pressure Adjustment

PICKUP-BASE-PLATE CLEARANCE AND HEIGHT ADJUSTMENT

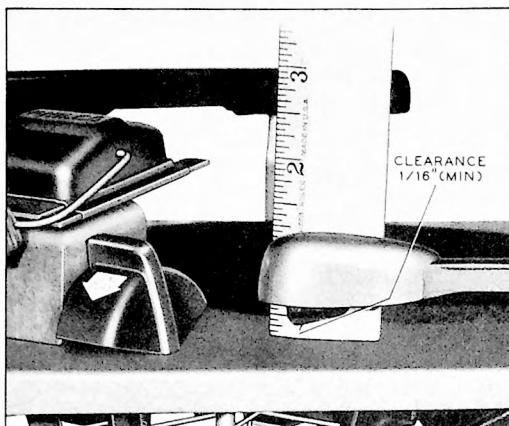
With the tone arm off the rest post and resting over the base plate, the needle should be at least $\frac{1}{16}$ " and not more than $\frac{3}{16}$ " above the base plate, as shown in figure 34. To adjust, grasp the tone arm and raise or lower (whichever is required) with a little pressure to obtain the correct clearance. Then adjust the screw on the pivot assembly (figure 32) so that the tone arm will clear the rest hook on the stanchion, Part No. 56-5987.



TP-6596

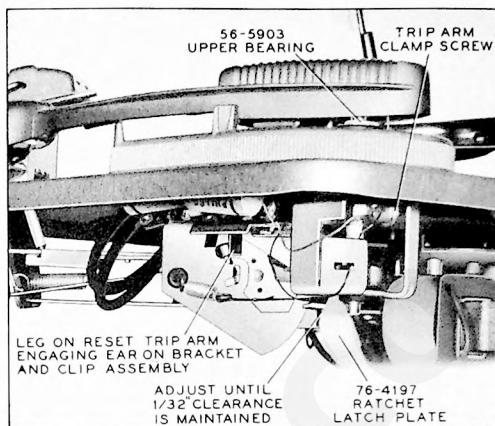
Figure 33. Pickup-Holder Adjustment

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TP-6671

Figure 34. Tone-Arm Height Adjustment



TP-6658

Figure 35. Trip-Switch Adjustment

TRIP-SWITCH ADJUSTMENTS

With the tone-arm on the rest post, the mercury switch attached to the bracket-and-clip assembly, Part No. 76-4195, should be in a horizontal or ON position, as shown in figure 8. To adjust, loosen the reset-trip-arm clamp screw (figure 35), and while holding the tone arm on the rest post, move the trip arm until the leg on the reset trip arm engages the bracket-and-clip ear, and at the same time, the long ear of the bracket and clip is approximately $\frac{1}{32}$ " above the cut-out notch on the ratchet-plate assembly, Part No. 76-4197, as shown in figure 35.

TRIP-FINGER ADJUSTMENTS

Place the tone-arm needle in the finish groove of a

record, and observe the trip finger riding over the ratchet on the ratchet-plate assembly, Part No. 76-4197. The trip finger should assume an angle of 25° to 30° while riding over the ratchet, as shown in figure 7. Adjust the screw on the trip-arm receiver to obtain the proper angle.

SELECTOR-LEVER STOP ADJUSTMENT

The selector-lever "throw" is adjusted by loosening the screw in the lock plate, Part No. 56-5986 (figure 11), and centering the lock plate so that when the STD. PLAY—LONG PLAY control is in either position, the shift lever on the motor will not bind against either side.

REPLACEMENT OF PARTS AND ASSEMBLIES ON RECORD PLAYER

1. CRYSTAL-CARTRIDGE ASSEMBLY, PART NO. 45-1609

To remove the crystal cartridge, grasp the crystal by its sides, and pull it down and out. When replacing the cartridge, push it up into the head of the tone arm, until it is seated in position.

2. TONE-ARM ASSEMBLY, PART NO. 35-2686

a. Unsolder tone-arm leads from terminal panel on underside of changer base plate. The tone-arm assembly is shown in figure 36.

b. Unhook pull cord, Part No. 76-2982-1, from spring and link assembly, Part No. 56-5990 (figure 9).

c. Loosen clamp screw which holds reset trip arm to tone-arm shaft.

d. Lift out tone arm.

3. TONE-ARM THRUST BEARING, PART NO. 56-5916

a. Remove tone arm as directed in paragraph 2 above.

b. Remove "E" washer, Part No. 1W60977FE7, from bearing shaft (figure 8).

c. Lift bearing out of rubber grommet, Part No. 27-4099-3, mounted on tone-arm-shaft support.

4. TONE-ARM STANCHION, PART NO. 56-5987

a. Remove tone arm as directed in paragraph 2 above.

RECORD CHANGERS (MODEL M-9C)

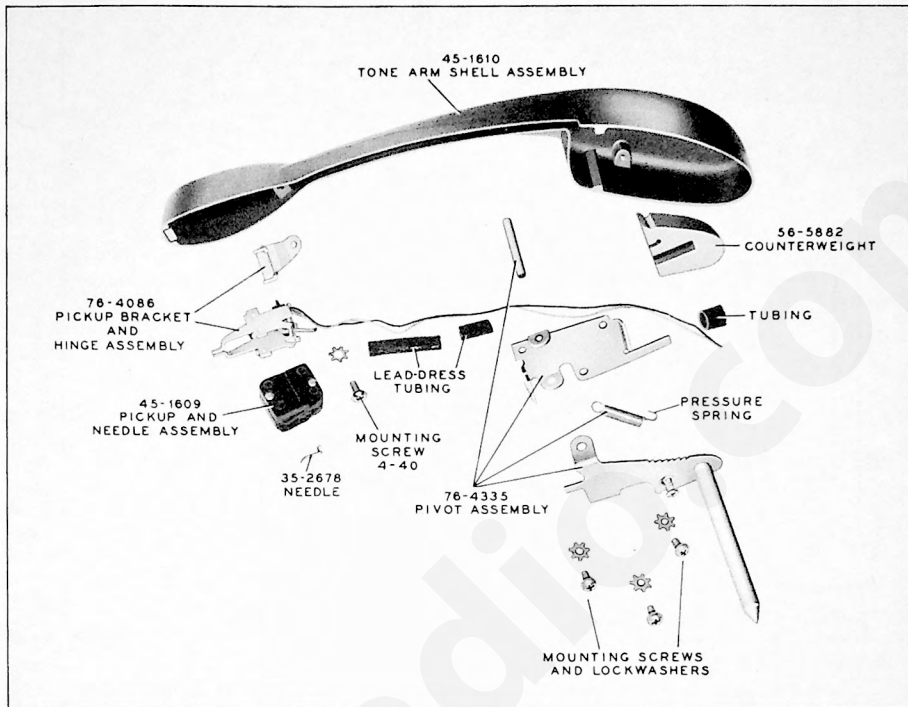


Figure 36. Record-Player Tone-Arm Assembly, Part No. 35-2686

TP-6604-1

- b. Remove hex-head screw from each end of tone-arm stanchion, under changer base plate.
- c. Lift out stanchion (figure 7).

5. TONE-ARM UPPER BEARING, PART NO. 56-5903

- a. Remove tone-arm stanchion, Part No. 56-5987, as directed in paragraph 4 above.
- b. Remove "E" washer, Part No. 1W60981FE7, from bearing shaft mounted on tone-arm stanchion (figure 35).
- c. Remove bearing from grommet, Part No. 54-4624, by sliding it out from underside of stanchion.

6. RATCHET LATCH PLATE, PART NO. 76-4197

- a. Remove "E" washer, Part No. 1W60977FE7, from switch bracket, Part No. 76-4196 (figure 32).
- b. Slide ratchet plate off switch bracket.

7. SWITCH BRACKET, PART NO. 76-4196

- a. Remove mercury switch, Part No. 76-2140-2, from clip.
- b. Unhook pull-cord spring, Part No. 76-2982-1, from link.

- c. Remove two hex-head screws which hold switch bracket to base plate.
- d. Unhook link from actuator.

8. SELECTOR LEVER, PART NO. 56-5985

- a. Remove "E" washer, Part No. 1W60977FE7, from stud which mounts selector lever, Part No. 56-5985, underneath base plate (figure 11).
- b. Remove spring washer, Part No. 1W56306FE15, from stud.
- c. Remove "U"-shaped spring, Part No. 56-5995, between selector lever and base plate.
- d. Loosen lock-plate screw (figure 11).
- e. Loosen motor-mounting screws and cock motor to one side.
- f. Set STD. PLAY—LONG PLAY control to STD. PLAY position.
- g. Align ears of selector lever with cut out on base plate, and pull out selector lever from stud on underside of base plate.
- h. Disengage selector lever from control-button link.

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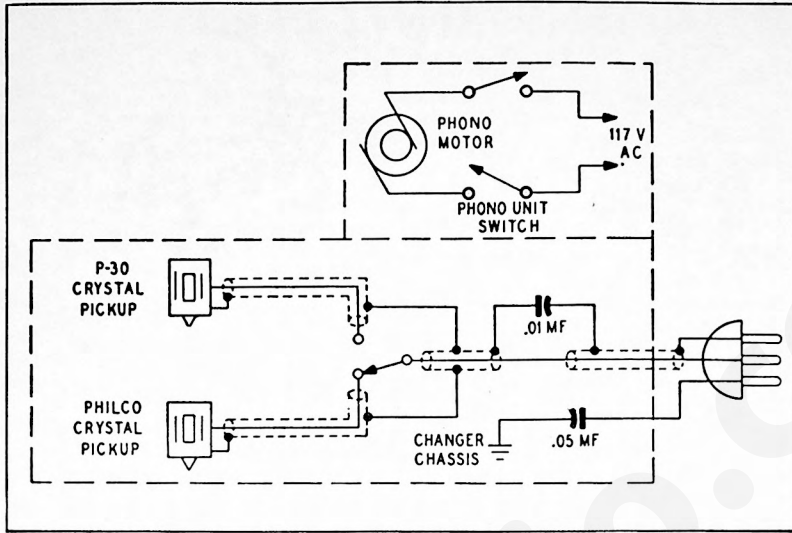


Figure 37. Model M-9C, Wiring Diagram

TP-6447

REPLACEMENT PARTS LIST

Description	Service Part No.	Description	Service Part No.
Motor	35-1371	Spacer	56-4601-2
Tone-arm assembly, record changer	35-2663-2	Spacer	56-4601-3
Crystal, standard	35-2671-1	Index spring	56-4603FA38
Tone-arm shell	35-2672FC55	Pin, tone-arm pivot	56-4604FE15
Needle for special crystal	35-2678	Link, long	56-4606FA3
Tone-arm assembly, record player	35-2686	Link, short	56-4607FA3
Turntable	35-3066-2	Spring	56-4608FA38
Cable and plug	41-3889-2	Spring, "U" (bridge assembly)	56-4610
Switch, motor	42-1750-3	Stop spring	56-4613FA38
Switch	42-1873	Trip-arm stop	56-4614
Needle	45-1597	Feeler (selector assembly)	56-4616FE15
Pickup-and-needle assembly	45-1609	Hinge (selector assembly)	56-4617FA3
Tone-arm assembly (shell)	45-1610	Selector	56-4618FE15
Nut, knurled	45-3031	Record shell	56-4626-1FA7
Pulley belt	45-6479	Retainer, spring (record-shell assembly)	56-4627FA3
Idler wheel	45-6481	Spring, ring	56-4628FA38
Control, REJ.—AUT.—MAN.	54-4479-1	Saddle, push-off (record-shell assembly)	56-4629
Bumper	54-4460	Spring, record shelf	56-4630FA38
Motor-mounting grommet	54-4501	Pin, tone-arm lift	56-4631FA15
Control, STD. PLAY—LONG PLAY	54-4634	Spring, feeler (selector assembly)	56-4670FA38
Trip finger	54-7613	Bar, push-off (rear)	56-4774FA3
Cover, switch	56-1880	Spring, control knob	56-4778FA38
Clamp, cable	56-2832FA3	Spacer, motor	56-4926
Index lever	56-4585FA3	Spring, spindle	56-5644
Actuator, push-off	56-4588FA3	Counterweight	56-5882
Link, control	56-4589FA3	Bearing, upper	56-5903
Plate, fulcrum	56-4593	Thrust bearing	56-5916
Plate, push-off slide	56-4594FA37	Trip receiver, record-player tone arm	56-5981
Rod, push-off	56-4595FA3	Lever, selector	56-5985
Hanger, push-off	56-4596FA3	Plate, lock	56-5986
Bar, push-off	56-4597FA3	Stanchion, record-changer tone arm	56-5987
Slider, safety	56-4599FA3	Link, lifter	56-5990
Spring, return	56-4600FA38		

RECORD CHANGERS (MODEL M-9C)

REPLACEMENT PARTS LIST (Cont.)

Description	Service Part No.	Description	Service Part No.
Link, selector	56-5991	Trip-switch assembly	76-4194
Spring, "U" (selector lever)	56-5995	Bracket-and-clip assembly	76-4195
Trip receiver, record-player tone arm	56-6404	Switch-bracket assembly	76-4196
Switch, mercury	76-2140-2	Ratchet latch plate	76-4197
Bridge assembly	76-2978	Reset trip arm	76-4198
Pull-cord assembly, record-changer tone arm	76-2982	Trip arm (subassembly)	76-4204
Pull-cord assembly, record-player tone arm	76-2982-1	Pivot assembly, record-player tone arm	76-4335
Shaft and swivel, record-changer tone arm	76-2983FA2	Screw (3-48x $\frac{5}{8}$ "), crystal mounting	1W14460FA44
Push-off, cover	76-2984	Pin, escutcheon	1W36521FA3
Actuator lever, record-changer tone arm	76-2987	Cam-gear washer	1W52627
Cam-gear assembly	76-2989	Spring washer, selector-lever assembly	1W56306FE15
Trip-plate assembly	76-2990	Tubular clip	1W57117
Bearing assembly	76-2991	"E" washer (for selector lever, ratchet plate, and thrust bearing)	1W60977FE7
Spindle	76-3926	"E" washer (for cam and actuator stud)	1W60980FE5
Bracket (pickup and hinge)	76-4086	"E" washer (for upper bearing)	1W60981FE7
Base plate	76-4192	Washer, selector assembly	2W53954
Actuator, lift lever	76-4193		

SERVICE HINTS

INOPERATIVE MODEL M-9C

One cause of an inoperative Model M-9C is the failure of the user to observe the correct operating procedure.

The long-play tone arm has an automatic shut-off feature, which automatically shuts off the motor, when the long-playing record is finished. This feature consists of a mercury switch and latch which is

operated through the tone arm by the eccentric grooves at the end of the record. After the mercury switch has been tripped "off", the long-play tone arm must be firmly pushed to the extreme right against the tone-arm rest, to latch the mercury switch in the "on" position. Since the mercury switch is in series with the motor circuit at all times, the long-play tone arm must be on the rest to enable the changer to operate on standard records.

PRODUCTION CHANGES

RUN NO.	DESCRIPTION OF CHANGE	REMOVED PART NO.	ADDED PART NO.	REASON FOR CHANGE
2	Thinner spacer in long-play tone-arm basket assembly changed from .046-inch thickness to .036-inch thickness.			To permit easier interchangeability of crystals.
3	Silk screen with operator instructions added on long-play tone-arm housing.			To provide additional instructions for operator.