

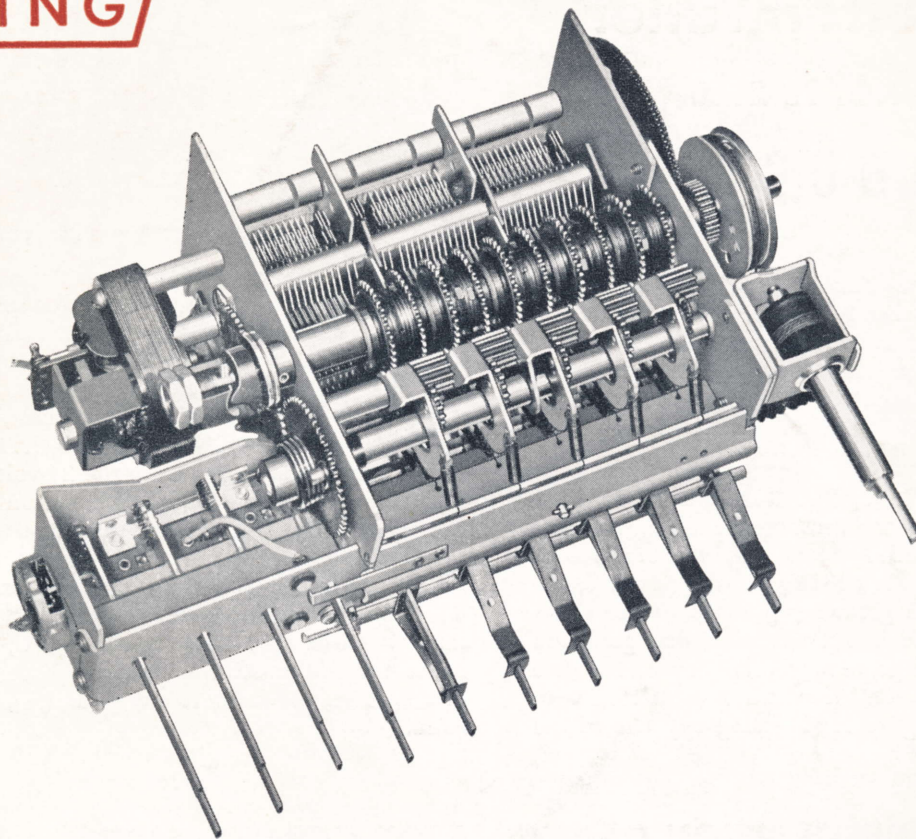
# PHILCO



# SERVICE

## HOME RADIO

**SERVICING/**



## The Philco Electromechanical Push-Button Tuner

SERVICE DIVISION

PHILCO CORPORATION, PHILADELPHIA, PENNA.



# The Philco Electromechanical Push-Button Tuner

PART NO. 76-2150

## INTRODUCTION

The Philco Electromechanical Push-Button Tuner, Part No. 76-2150 (figures 1 and 2), is a motor-driven push-button station-selector mechanism by means of which any one of five preselected stations may be tuned in quickly and accurately. Each station-selector push button may be set to select a station on either the broadcast or FM band.

Briefly, the operation of the Tuner is as follows: Pressing a station-selector button closes the latching switch to connect the series-wound, 24-volt tuning motor (figure 3) to the 24-volt winding of the power transformer. The motor is geared (figure 4) to the main-pinion shaft, upon which five spaced pinion gears are mounted. The pinion gears may drive any one of five individual gear trains, each of which is associated with a push button. See figure 1. Pressing any one of the

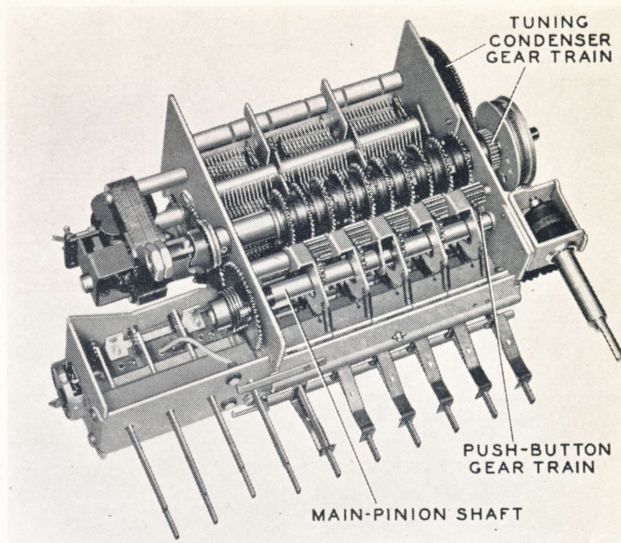


FIGURE 1. TOP VIEW OF TUNER

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five station-selector push buttons engages the related gear train (figure 1) to the main-pinion shaft. Power is thus transferred to a system of cam washers and idlers, which rotate the tuning condenser from its previous position directly to the position for which the push button has been set. At this point, the gear trains lock and the motor torque unlatches the latching switch, to disconnect the motor from the 24-volt circuit. Pressing another station-selector push button disengages the first gear train, and repeats the cycle to select a new tuning-condenser position. A special mechanical arrangement in the Tuner prevents depressing more than one push button at a time. Depressing any one of the three band-selector push buttons (BC, SW, FM) releases the station-selector mechanism so that the radio may be tuned manually to any station within the selected band.

## DESCRIPTION OF THE MAJOR COMPONENTS

A brief description of the major components of the Tuner is given to aid in understanding its operation, which is described under DETAILED ACTION OF THE TUNER.

1. **MOTOR** (figure 3): A 24-volt, a-c, series-wound brush type, for high starting torque.
2. **MOTOR GEAR TRAIN** (figure 3): Consists of a motor pinion, reduction gear, idler gear, drive gear, and torque spring. It is geared to give high power with moderate main-pinion-shaft speed.
3. **ARMATURE** (figures 4 and 11): A curved, stamped, and formed steel member, upon which a pinion gear is mounted by means of a shoulder rivet. It functions to engage the station-selector gear train to the main-pinion shaft.

4. **MAIN-CAMSHAFT ASSEMBLY** (figure 5): Consists of gears, drive and idler washers, bushing, locking cam, yoke, clutch, and pulley. It functions to determine the correct direction of rotation and the proper stopping place for the tuning condenser.

5. **TUNING-CONDENSER GEAR TRAIN** (figure 19): Consists of a pinion and a large anti-backlash split gear, and provides step-down gearing between the tuning-condenser shaft and the main camshaft.

6. **PUSH-ROD ASSEMBLY** (station selector): Consists of a pawl riveted to a forked flat rod. It lowers the armature to engage the drive pinion, and also operates the actuator assembly.

7. **ACTUATOR ASSEMBLY** (figure 15): Pivoted to the main-frame assembly in such a position that the push-rod pawl contacts it and causes it to close and to latch the motor-and-muting switch.



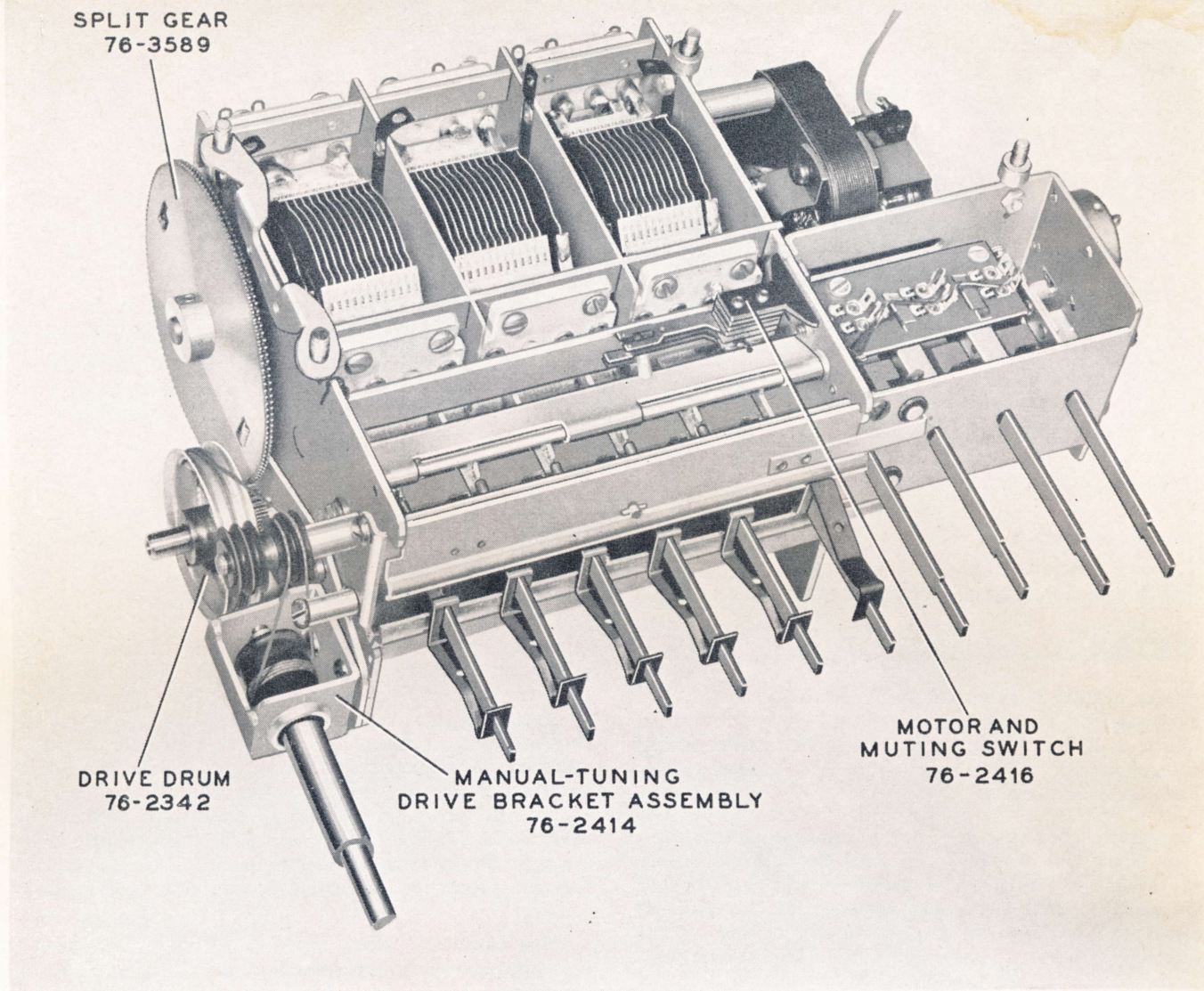


FIGURE 2. BOTTOM VIEW OF TUNER

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8. **RELEASE-LEVER ASSEMBLY** (figure 22): Pivoted with the actuator assembly, and operated by an extension on the kickout bracket to trip the pawls, to unlatch the actuator, and to open the motor and muting circuits.

9. **KICKOUT BRACKET** (figure 20): Mounted on the end frame, its pivot point is in the same plane as the motor shaft. Mounted on it are the reduction gear and the idler gear. It functions to engage the release assembly when the idler gear climbs up the main-pinion-shaft drive gear.

10. **TORQUE SPRING** (figure 4): A heavy coiled spring mounted around the collar on the main-pinion shaft, to couple the drive gear to the collar. It functions to allow the load to be applied to the motor gradually, to cushion the shock to the motor when the idler washers lock, and to aid in returning the kickout bracket to its normal running position.

11. **MAIN-PINION-SHAFT COLLAR AND DRIVE GEAR** (figure 4): Consists of a gear and collar; the gear rotates independently of the collar to the extent permitted by the flexing of the torque spring. Its purpose is to transmit power from the motor to the main-camshaft assembly.

12. **MANUAL-TUNING DRIVE** (figure 2): Consists of a bracket, shaft, and drum. It allows tuning to stations other than those which are set up for push-button selection.

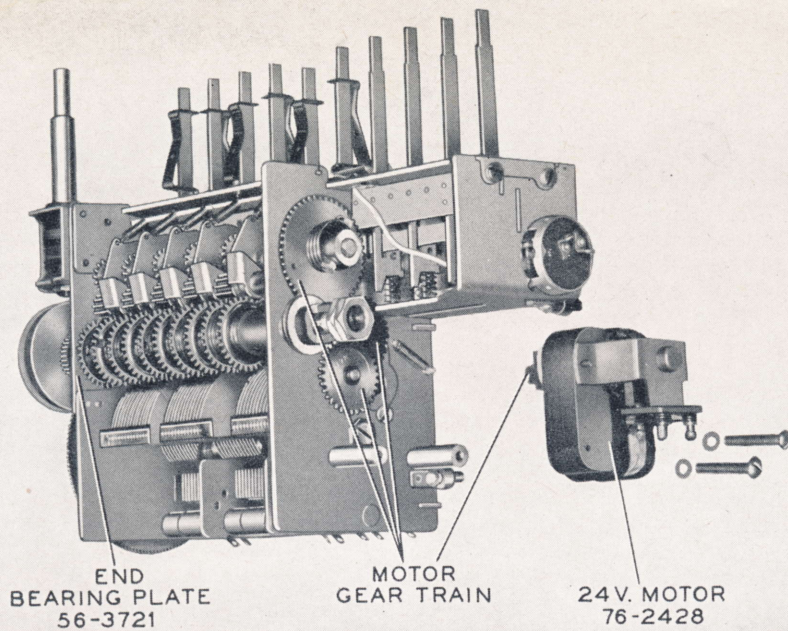
13. **STATION SET-UP SWITCH**: A single-pole slide switch located on the rear of the main chassis assembly. It parallels the motor switch on the Tuner to provide a complete circuit when the Tuner motor switch has been opened. It is used only when setting up stations.

14. **ROCKER BARS** (figure 4): Each consists of a pivoted bar on which a spring contact is riveted. The rocker bars function to complete the band-switch motor circuit to rotate the band switch to either the broadcast or FM position.

15. **MOTOR-AND-MUTING SWITCH** (figure 2): A leaf switch operated by the actuator assembly. It completes the motor circuit and mutes the set during the selection of a station.

16. **CLUTCH ASSEMBLY** (figures 4 and 5): Consists of two flat washers separated by a spring washer. It is used to lock the drive washers to the shaft of the main-camshaft assembly.





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FIGURE 3. MOTOR GEAR TRAIN AND MOTOR, SHOWING DETAILS OF MOTOR MOUNTING

## DETAILED ACTION OF THE TUNER

The normal position of the operating parts with a band-selector push button depressed is as shown in figures 1, 2, and 15. In this position, the manual-tuning control may be used to set the tuning condenser to any position in its range.

Operation of any one of the five station-selector push rods (Part No. 76-3684) depresses the actuator assembly (Part No. 76-2415) by means of the pawl riveted to the push rod. The stud fastened to the actuator closes the contacts of the motor-and-muting switch (Part No. 76-2416). See figure 16. The construction of the switch is such that the muting contacts close before the motor contacts. With the motor circuit completed, the motor gear train, mounted on the kickout bracket assembly (Part No. 76-2412 in figure 17), is set in motion, causing the main-pinion shaft to revolve.

The drive to the main-pinion shaft is cushioned by the torque spring (Part No. 56-3720 in figure 17). At the same time, the armature associated with the selected push button is lowered, being aided by the armature spring (Part No. 56-3710). This action engages the armature pinion with the associated gear on the main-pinion shaft, and sets in motion the corresponding station-selector gear train. See figure 18. This gear train drives the two cam gears of the main-camshaft assembly. The gearing is arranged to drive one cam gear clockwise, and the other counterclockwise. Located midway between these two gears is a drive washer, locked to the shaft, and having a projecting ear. On each side of this drive washer are four idler washers not locked to the shaft. Each washer has a projecting ear so formed that it will engage the ear on the adjacent washer. Formed into each cam gear is an ear which engages the adjacent idler-washer ear when the cam gear is rotated. See figures 5 and 18. As rotation is continued, the first idler-washer ear engages the ear on the next washer. This action is repeated until the fourth washer engages the drive washer. This washer, being locked to the shaft, rotates the shaft, which in turn rotates the tuning condenser through a set of gears. See figure 19. At the same time, the other cam gear

and set of idler washers have been rotating in the opposite direction. The direction in which the shaft initially rotates is determined by which set of idler washers engages the drive washer first. Eventually, within four revolutions of the cam gear, all the idler washers are engaged and are pressed against the drive washer. Since the driving power to each cam gear is equal and opposite, the net result is zero rotation of the shaft. This locks all the gear trains, which tends to stall the motor. Before the motor stalls, the torque of the motor is employed to disconnect the motor circuit.

The kickout bracket assembly (Part No. 76-2412), pivoted on the same axis as the motor shaft, is held in the normal operating position by the kickout spring (Part No. 56-3676) connected from the main frame to an ear on the bracket. See figure 20. When the gear trains lock, the motor, continuing to rotate, causes the idler gear to climb up the main-pinion-shaft drive gear. This action raises the kickout bracket (figure 21), and forces the release lever (Part No. 76-3726) upward. See figure 22. The release lever, in turn, presses against the pawl of the depressed push rod, thereby releasing the switch actuator and opening the motor circuit. See figure 22. Since the motor is not energized, the tension on the motor gear train is released, and the kickout spring pulls the kickout bracket back to its normal operating position. This restoring action is aided by the energy supplied by the torque spring as it unwinds. The unit is now ready for another cycle of operation.

The selection of broadcast or FM stations is determined by the position of the spring-brass push-rod extension (Part No. 56-3737) on the push-rod shaft. With the extension spring in position to engage the upper rocker bar (figure 23), broadcast stations are selected. FM stations are selected by positioning the extension spring to engage the lower rocker bar. See figure 24. When either rocker bar is depressed, the contact spring riveted to that bar closes the band-switching motor circuit through its associated insulated contact, which is mounted on the front frame plate. The upper contact spring and contact closes the broadcast band-switching circuit; the lower contact combination closes the FM band-switching circuit.



## SETTING UP THE STATION-SELECTOR PUSH BUTTONS

1. Depress the BC push button, and rotate the tuning control until the Allen setscrew in the main camshaft is accessible from the rear of the chassis. See figure 4.

2. Loosen the setscrew four turns. This should produce a 1/32-inch gap between the two clutch washers, which are separated by the spring washer. If the gap is more or less than 1/32 inch, adjust the two nuts on the end of the shaft for the correct washer spacing.

**CAUTION:** Remove the wrench before proceeding to the next step.

3. Determine the dial positions of the desired stations (both FM and broadcast) in order, from the left edge of the dial scale, and place the station tabs of the selected stations in the station-selector push buttons in that order. Position the push-rod extension spring of each station-selector push button so that it will engage the correct rocker bar — the upper bar for broadcast, and the lower for FM.

4. Depress the band-selector push button for the band of the selected station to be set up on the left-hand station-selector push button. Manually tune the radio to this station, and, while holding the manual-tuning control, depress the station-selector button.

5. After the tuning motor stops, operate the set-up switch and hold it closed until the motor stalls; then release the switch.

6. Set up the remaining four station selectors progressively from the left in the same manner.

7. Depress the BC push button and rotate the tuning control until the Allen setscrew in the main camshaft is accessible from the rear of the chassis.

8. Tighten the setscrew and remove the wrench.

## SERVICING

**NOTE:** The majority of the parts and assemblies of the Philco Electromechanical Push-Button Tuner can be serviced with the Tuner mounted in the chassis. There are, however, a few components which require removal of the Tuner from the chassis before servicing. Components marked with an asterisk in the text and in figure 28 cannot be replaced unless the Tuner is removed from the chassis.

### REMOVING TUNER FROM CHASSIS

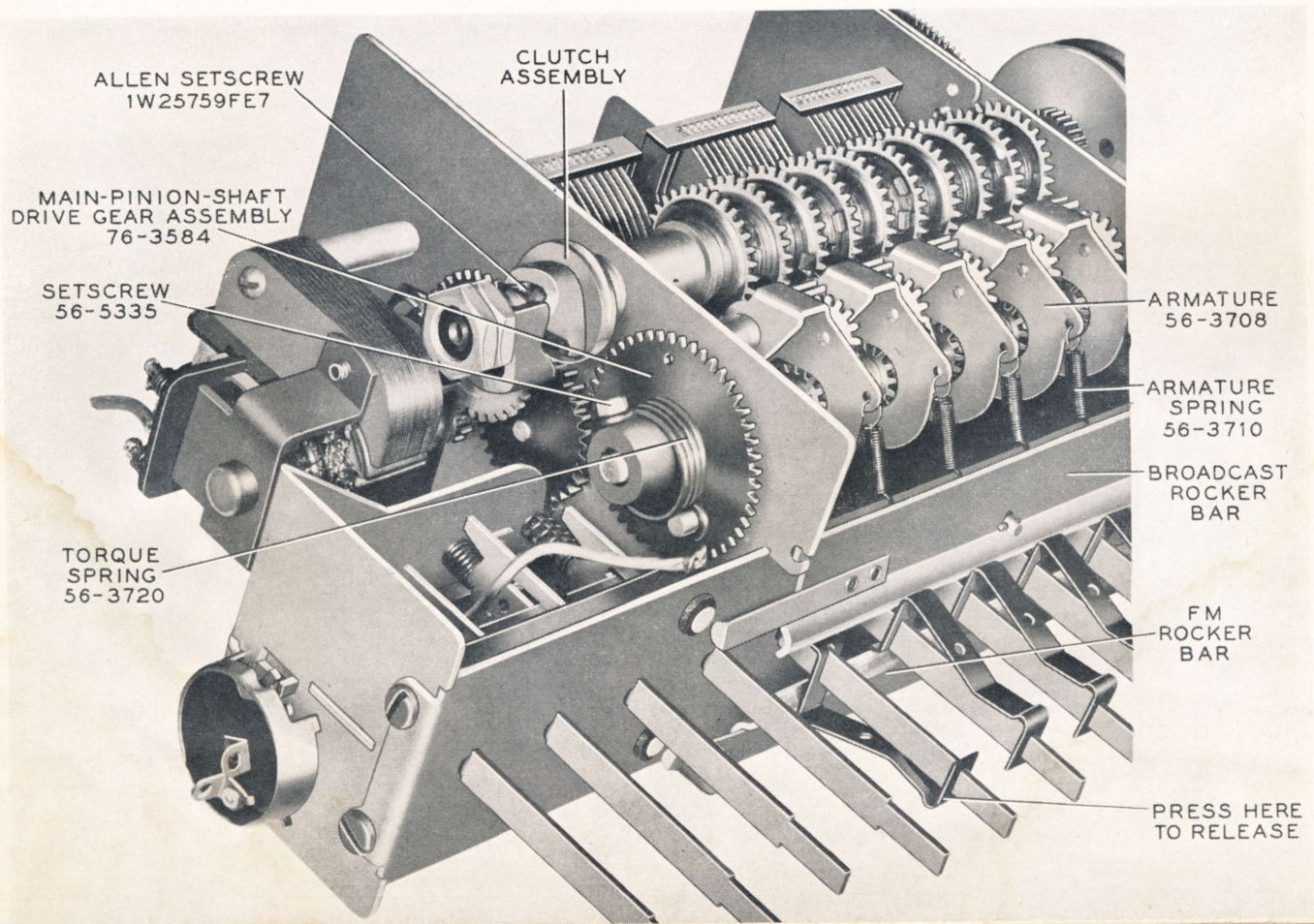
To remove the Tuner from the chassis, the following procedure is recommended:

1. Disconnect leads from tuning-condenser sections. Be careful not to disturb FM coil leads.

2. Disconnect motor lead running to 24-volt supply.

**FIGURE 4. MOTOR GEAR TRAIN, LOCKING CAM, YOKE, NUTS, AND CLUTCH ASSEMBLY ON MAIN CAMSHAFT**

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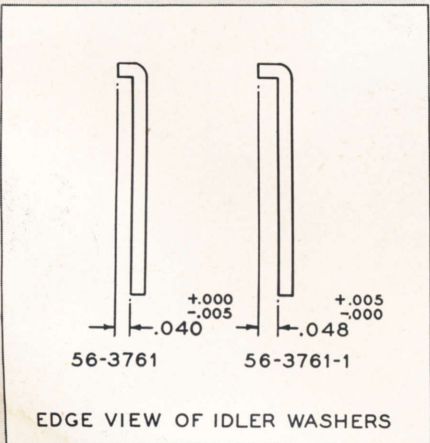
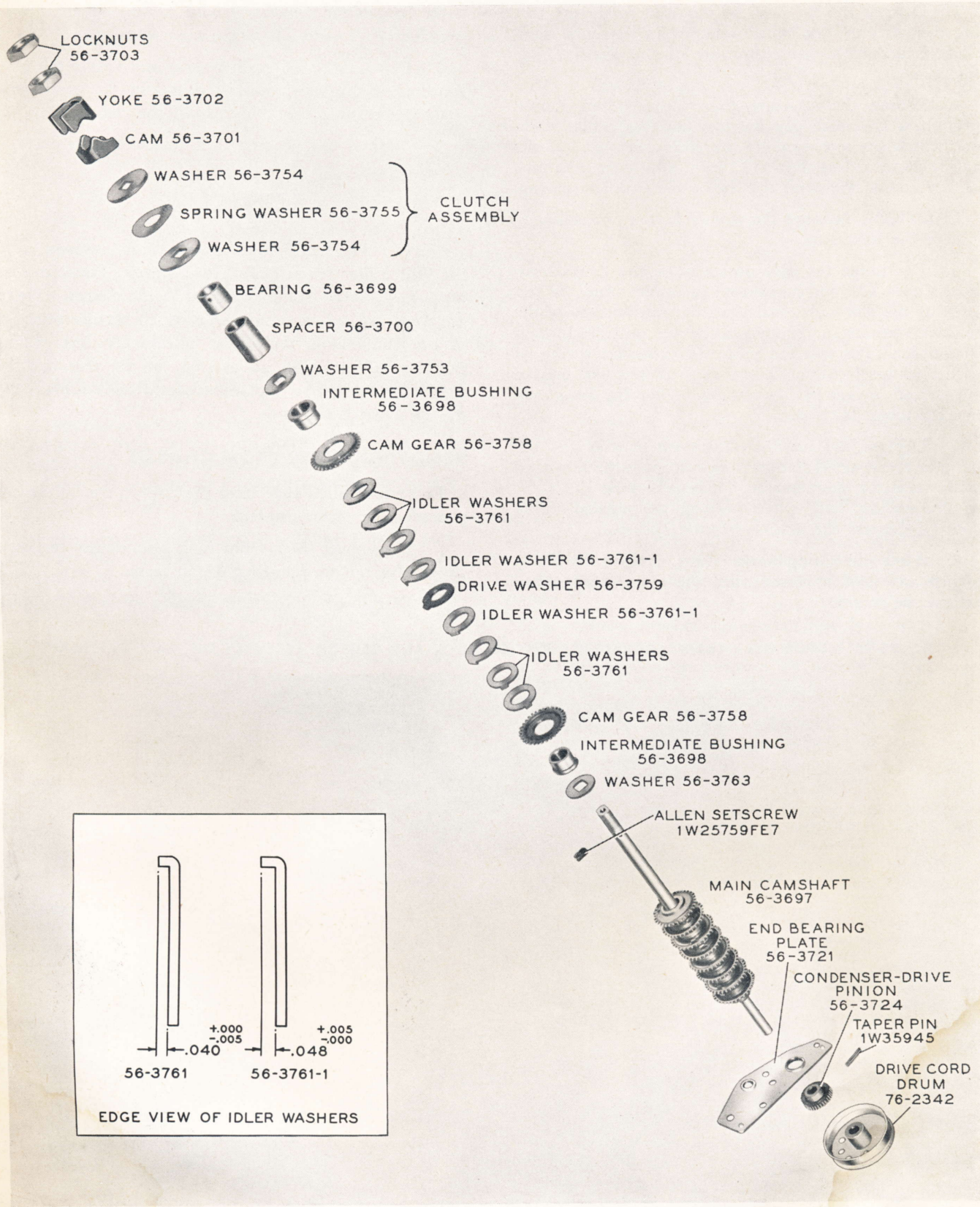


FIGURE 5. EXPLODED VIEW OF MAIN CAMSHAFT

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3. Remove cover from a-c switch, and disconnect leads.

4. Disconnect leads from terminal strip adjacent to band-change-switch motor condenser, which are connected to slide switch and motor-and-muting switch on Tuner.

5. Remove dial-pointer drive pulley.

6. Remove the four nuts and washers holding unit to subbase.

7. Tilt rear of unit upward and remove, sliding unit away from panel which mounts operating controls.

### HINTS FOR DIAGNOSING TROUBLE

Unit runs slowly.

- Excessive friction in moving parts.
- Excessive brush pressure on motor commutator.
- Low voltage.
- Insufficient brush pressure (excessive arcing).

Motor switch opens before station is tuned in.

- Excessive friction causing idler gear to climb drive gear before cam washers lock.

Motor and gear train run, but cam-gear assembly does not move.

- Pinion gear on armature missing or loose to extent that it fails to engage gear on drive shaft.
- Armature spring missing, weak, or broken.
- Stripped gear or gears.

Push rod latches, but motor does not run.

- Pawl on push rod missing or broken.
- Switch contacts dirty.
- No 24-volt supply.
- Spring on pawl missing, weak, or broken.
- Insufficient brush pressure.

Push rod fails to latch.

- Latch spring missing, weak, or broken.
- Kickout idler not returned to normal operating position because of excessive friction, weak return spring, or excessive brush pressure.
- Release-bar return spring missing, weak or broken.

Unit operates, but fails to select proper band.

- Push-rod extension spring reversed.
- Dirty rocker-bar spring contact or front plate contact.
- Broken rocker-bar-spring contact.
- Trouble in band-switch-motor circuit.

Unit does not tune to stations accurately.

- Setscrews on tuning-condenser split gear loose.
- Split gear loose on hub.
- Allen screw in main camshaft loose.
- Lock nuts on main camshaft loose.
- Springs missing from split gear.
- Excessive spacing between clutch washers.
- Spring washer in clutch assembly too weak.
- Spring washer in clutch assembly too strong. (This condition is characterized by too much drag on manual-tuning control during setting up of stations.)

Slippage in manual tuning.

- Excessive friction of main-camshaft assembly.
- Weak drive-cord spring.
- Setscrews in drive drum loose.

### REPLACING COMPONENTS IN MAIN-CAMSHAFT ASSEMBLY

**CAUTION:** It is unlikely that the main-camshaft assembly will require either partial or complete disassembly. In the event that it is necessary, the following precaution must be observed to insure correct operation. The two idler washers (Part No. 56-3761-1) which are separated by the center drive washer (Part No. 56-3759) are slightly different from the remaining six washers of each gear-and-idler washer section, in that the ears of the two washers are approximately 1/64 inch longer.

When disassembling the unit, it is strongly recommended that the two types of idler washers be kept separated for identification. If the washers should become mixed, they can be identified by the dimensions given in figure 5.

1. Remove pointer-drive-cord drum. Remove tuning-condenser drive cord.

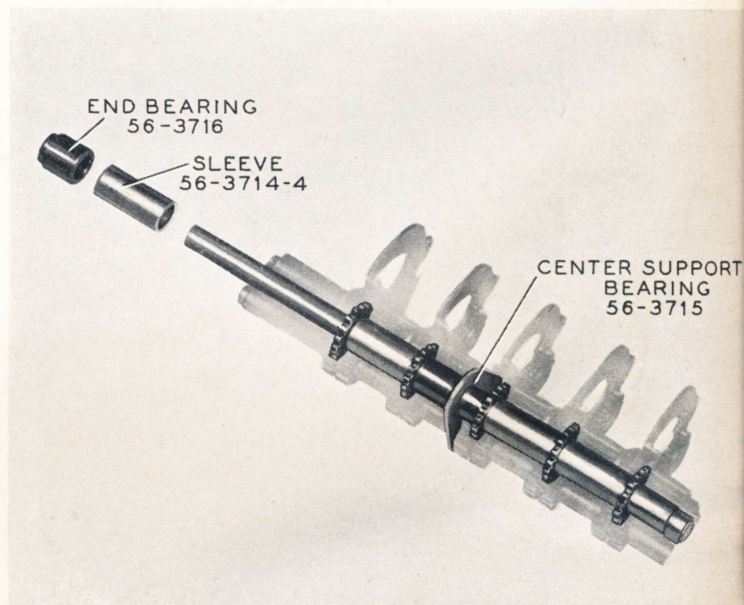
2. Remove manual-tuning drive-bracket assembly (Part No. 76-2414) by removing the two screws which hold bracket to main frame. See figure 2.

3. Loosen the two Allen screws and remove manual-tuning drive drum (Part No. 76-2342). See figure 2.

4. Loosen the two Allen screws and remove tuning-condenser split gear (Part No. 76-3589). See figure 2.

5. Drive out taper pin in condenser-drive pinion gear (Part No. 56-3724), and remove gear. See figure 24.

**FIGURE 6. PUSH-BUTTON GEAR TRAIN IN POSITION TO REMOVE MAIN-PINION SHAFT**







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**FIGURE 7. REMOVING MAIN-PINION SHAFT**

6. Loosen Allen screw in main camshaft so that top of setscrew is approximately one thread below surface of shaft. See figure 4.

7. Remove the two lock nuts, cam, cam yoke, two washers, and spring washer. See figure 4.

8. Remove remaining screw and lock washer in end bearing plate (Part No. 56-3721), and remove plate. See figure 3.

9. Remove main-camshaft assembly by sliding assembly away from motor-end bearing plate.

10. Remove components from shaft by sliding them toward threaded end.

11. Replace defective part and reassemble components on main camshaft in the order shown in figure 5.

**NOTE:** Correct assembly is important to insure proper operation of unit. See **CAUTION** above.

12. Reinstall main-camshaft assembly by reversing procedure of steps 1 through 9.

**REMOVING MAIN-PINION-SHAFT, ARMATURE-PINION-SHAFT, AND SLOTTED-PINION-SHAFT ASSEMBLY**

1. Perform steps 1 through 9 of **REPLACING COMPONENTS IN MAIN-CAMSHAFT ASSEMBLY**.

2. Remove setscrew, torque spring, and gear assembly from main-pinion shaft. See figure 4.

3. Disconnect the five armature springs (Part No. 56-3710).

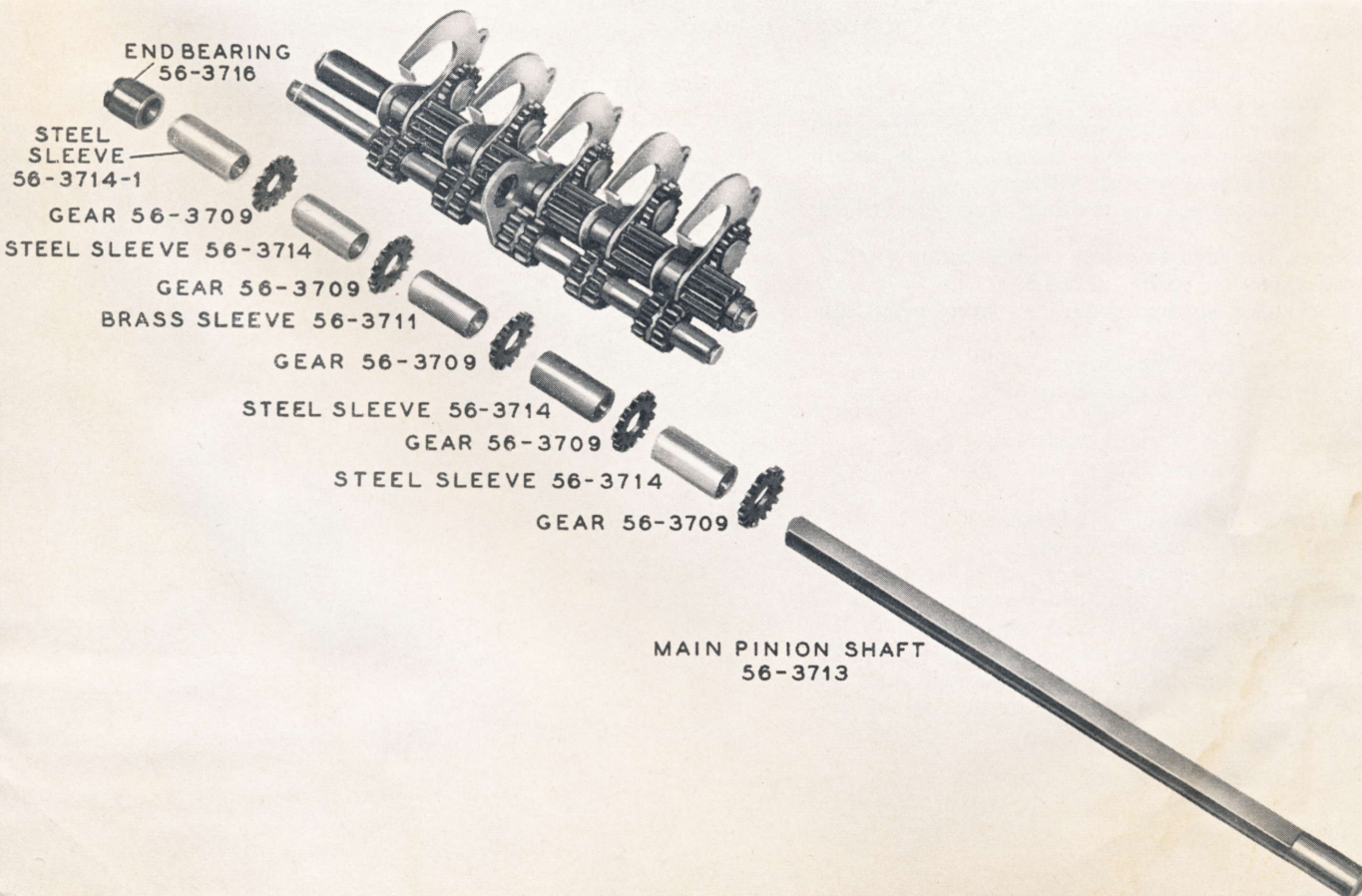
4. Remove main-pinion-shaft, armature-pinion-shaft, and slotted-pinion-shaft assemblies as a unit by sliding them away from motor-end bearing plate.

**REPLACING COMPONENTS IN MAIN-PINION-SHAFT ASSEMBLY**

1. Place assembly in the position shown in figure 6, and remove sleeve and end bearing. Hold extreme right-hand gear and pull shaft to the right. See figure 7. **NOTE:** If the defective part is to the left of the center-support bearing (figure 6), the shaft need be removed only as far as this bearing.

**FIGURE 8. ASSEMBLY OF COMPONENTS ON MAIN-PINION SHAFT**

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2. Replace defective part and reassemble components on shaft in order shown in figure 8. **NOTE:** There is a slight crown on one side of each pinion gear. When reassembled, this crown should be on the same side as the pinion gear mounted on the armature.

3. Start assembly by placing the first three gears, spaced with two steel sleeves and one brass sleeve, on shaft. Insert partly assembled shaft through center-support bearing, and replace remaining two steel sleeves, two gears, and one brass end bearing.

### REPLACING COMPONENTS IN ARMATURE-PINION-SHAFT ASSEMBLY

1. Place assembly in position as shown in figure 9.
2. Remove sleeve from either end of shaft.
3. Grasp center-support bearing with one hand and pull shaft to the right or left, depending upon location of defective part with respect to center-support bearing. See figure 10. Removal of shaft is made easier if it is rotated slightly while being removed.
4. Replace defective part and reassemble components on shaft. See figure 11. Be sure that rear portion of armature on which pinion gear is mounted is centered in slot of pinion on adjacent shaft. See figure 9.

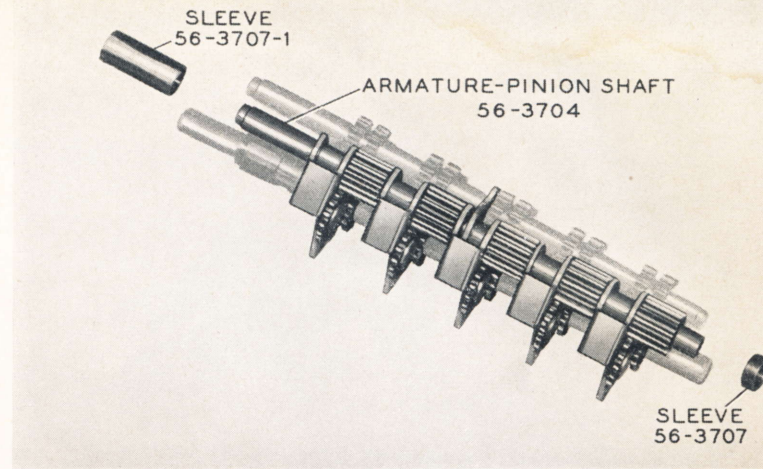


FIGURE 9. PUSH-BUTTON GEAR TRAIN IN POSITION TO REMOVE ARMATURE-PINION SHAFT

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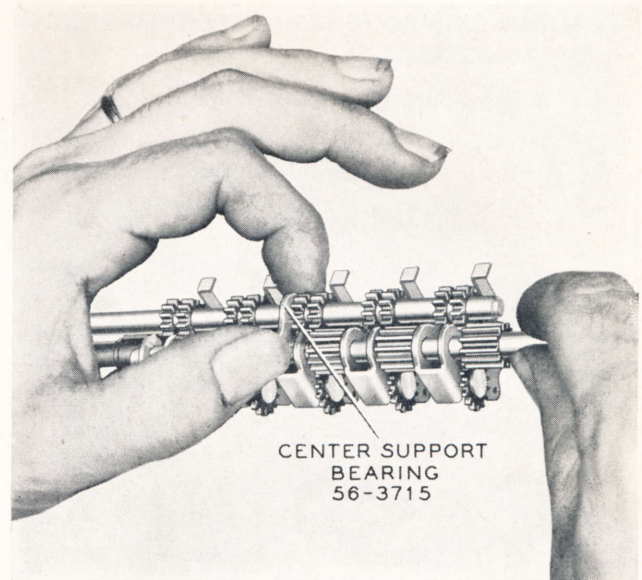
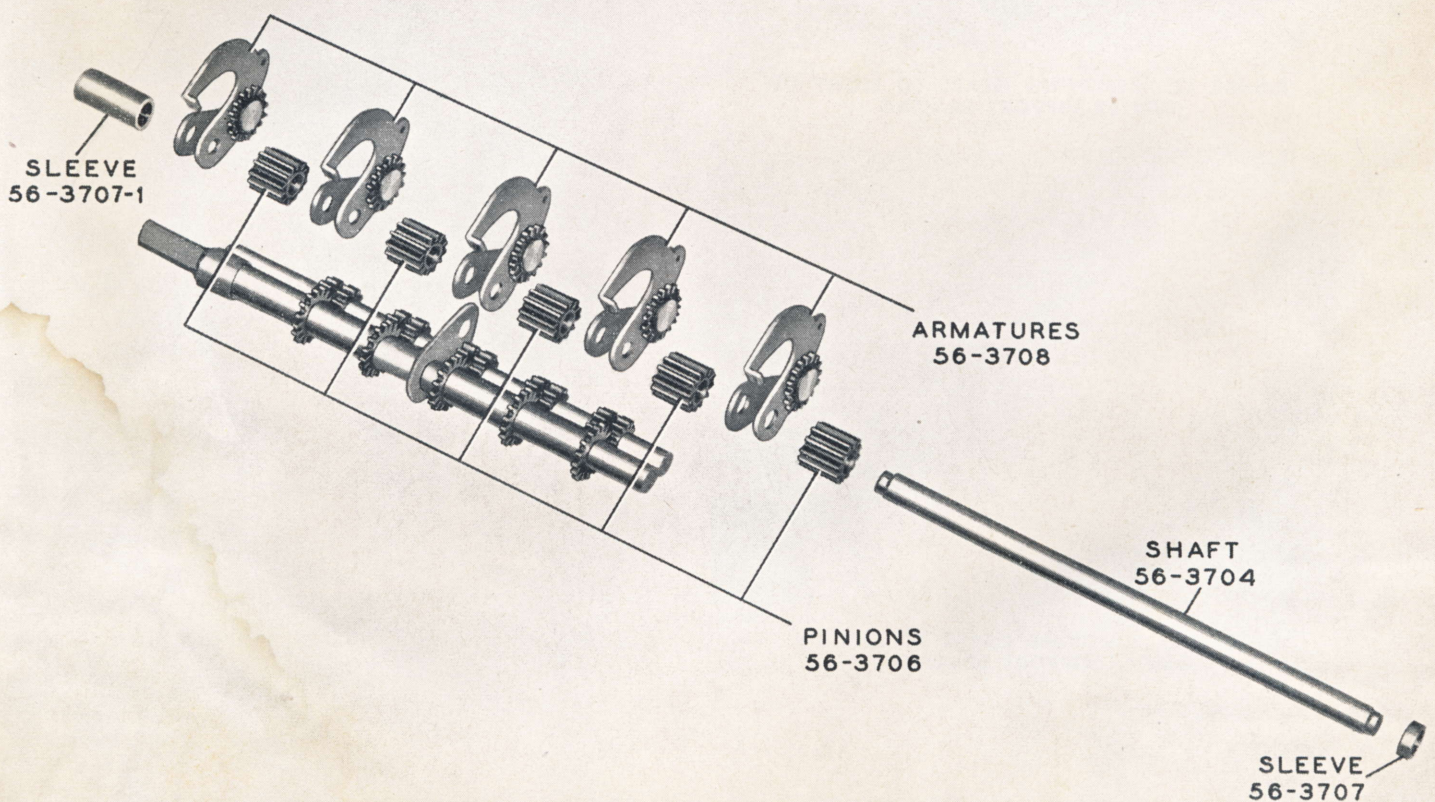


FIGURE 10. REMOVING ARMATURE-PINION SHAFT

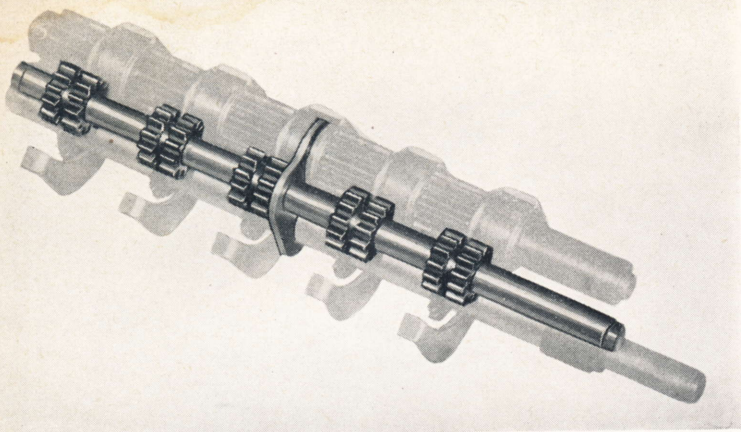
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FIGURE 11. EXPLODED VIEW OF ARMATURE-PINION SHAFT

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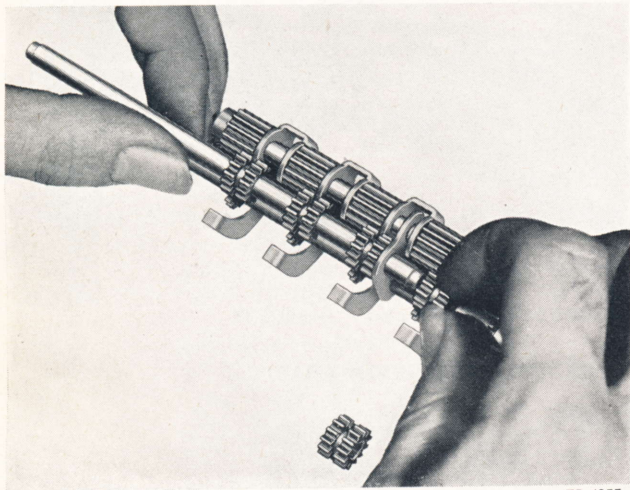


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**FIGURE 12. PUSH-BUTTON GEAR TRAIN IN POSITION TO REMOVE SLOTTED-PINION SHAFT**

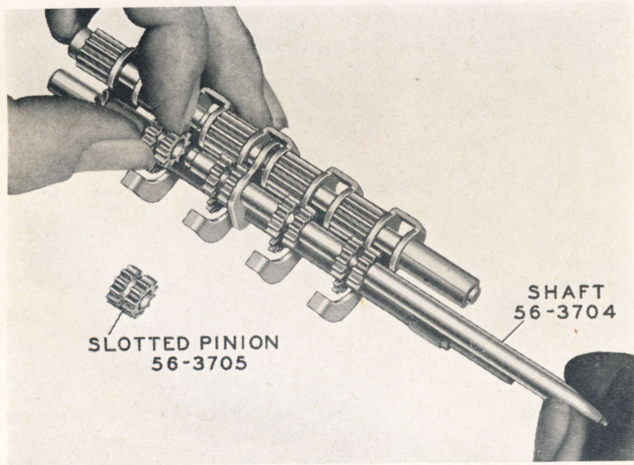
**REPLACING COMPONENTS IN SLOTTED-PINION-SHAFT ASSEMBLY**

1. Place assembly in position shown in figure 12.
2. Remove pinion gears from shaft by pulling shaft to the right or left, depending upon location of defective pinion gear with respect to center-support bearing. See figures 13 and 14.



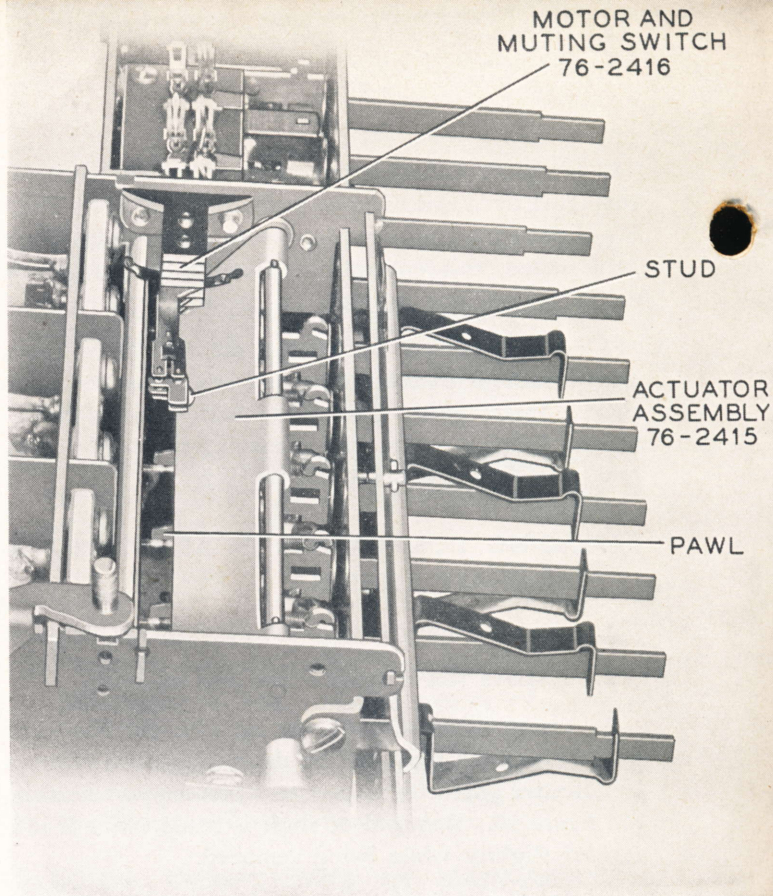
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**FIGURE 13. REMOVING GEARS TO RIGHT OF CENTER-SUPPORT BEARING**



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**FIGURE 14. REMOVING GEARS TO LEFT OF CENTER-SUPPORT BEARING**

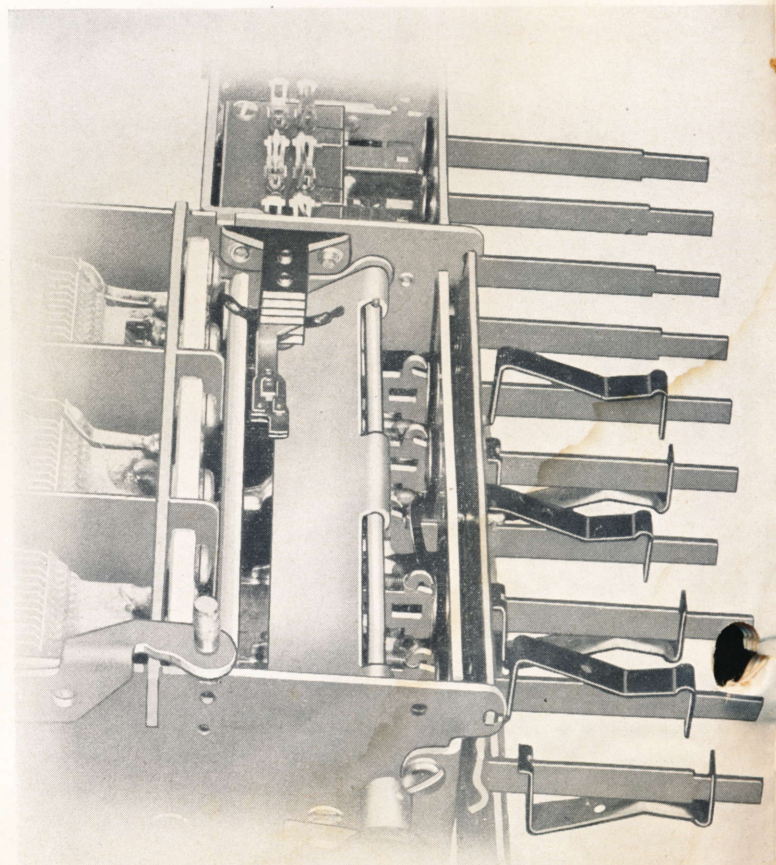


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**FIGURE 15. POSITION OF ACTUATOR, MOTOR-AND-MUTING SWITCH, AND PAWL, FOR MANUAL OPERATION**

**FIGURE 16. STATION-SELECTOR PUSH-BUTTON DEPRESSED, SHOWING PAWL AND MOTOR-AND-MUTING-SWITCH POSITIONS**

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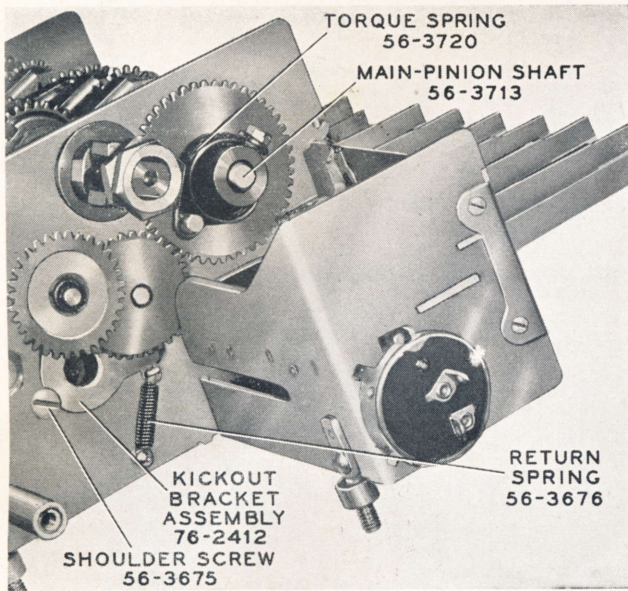
3. Replace defective part and reassemble as shown in figure 14. NOTE: Be sure that the slot in the pinion engages the left portion of the armature.

**REPLACING PUSH RODS AND RELATED COMPONENTS**

1. Perform steps 1 through 9 of REPLACING COMPONENTS IN MAIN-CAMSHAFT ASSEMBLY.

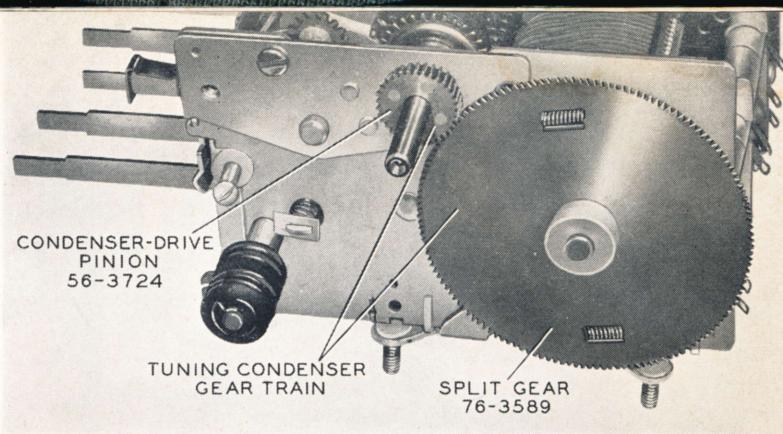
2. Perform steps 2 through 4 of REMOVING MAIN-PINION-SHAFT, ARMATURE - PINION-SHAFT, AND SLOTTED-PINION-SHAFT ASSEMBLY.

3. Remove the six push-rod extension springs.



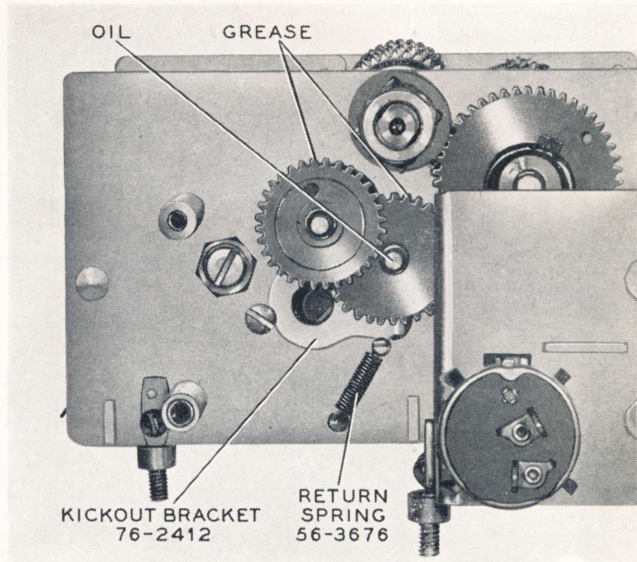
**FIGURE 17. MOTOR GEAR TRAIN AND KICKOUT BRACKET**

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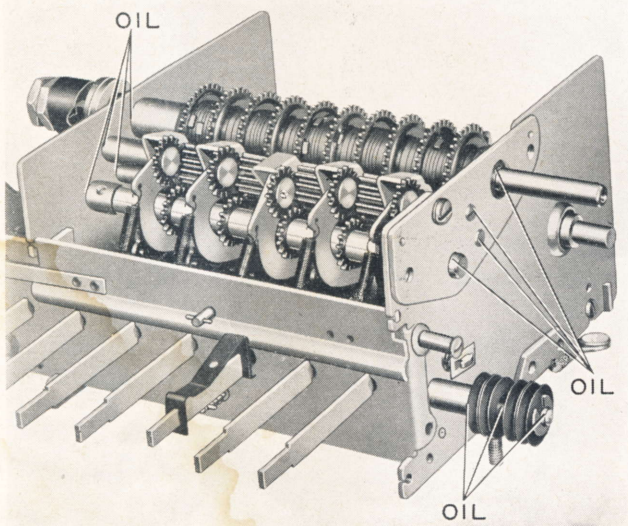
**FIGURE 19. TUNING-CONDENSER GEAR TRAIN**

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**FIGURE 20. KICKOUT BRACKET IN NORMAL POSITION**

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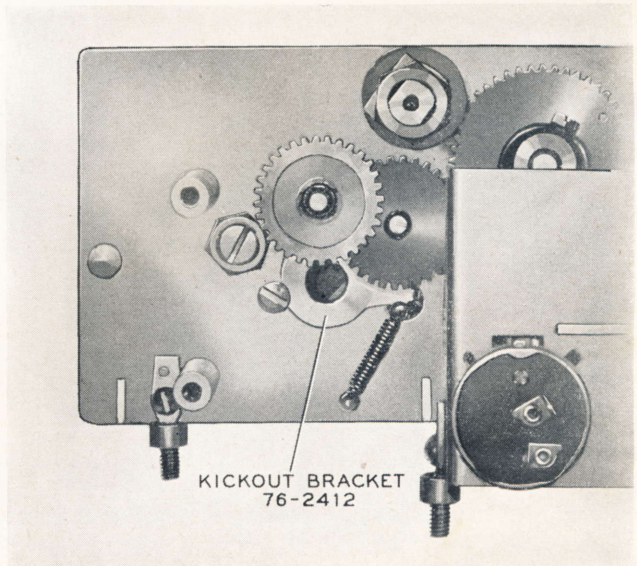


**FIGURE 18. PUSH-BUTTON GEAR TRAIN, SHOWING ARMATURE ENGAGED WITH MAIN PINION**

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**FIGURE 21. KICKOUT BRACKET IN TRIPPED POSITION**

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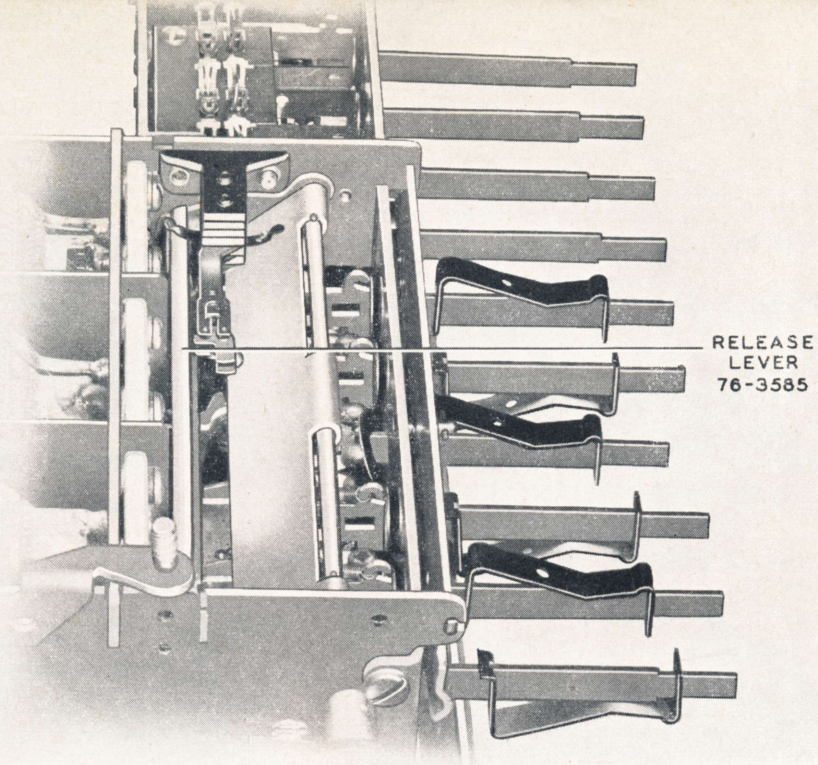
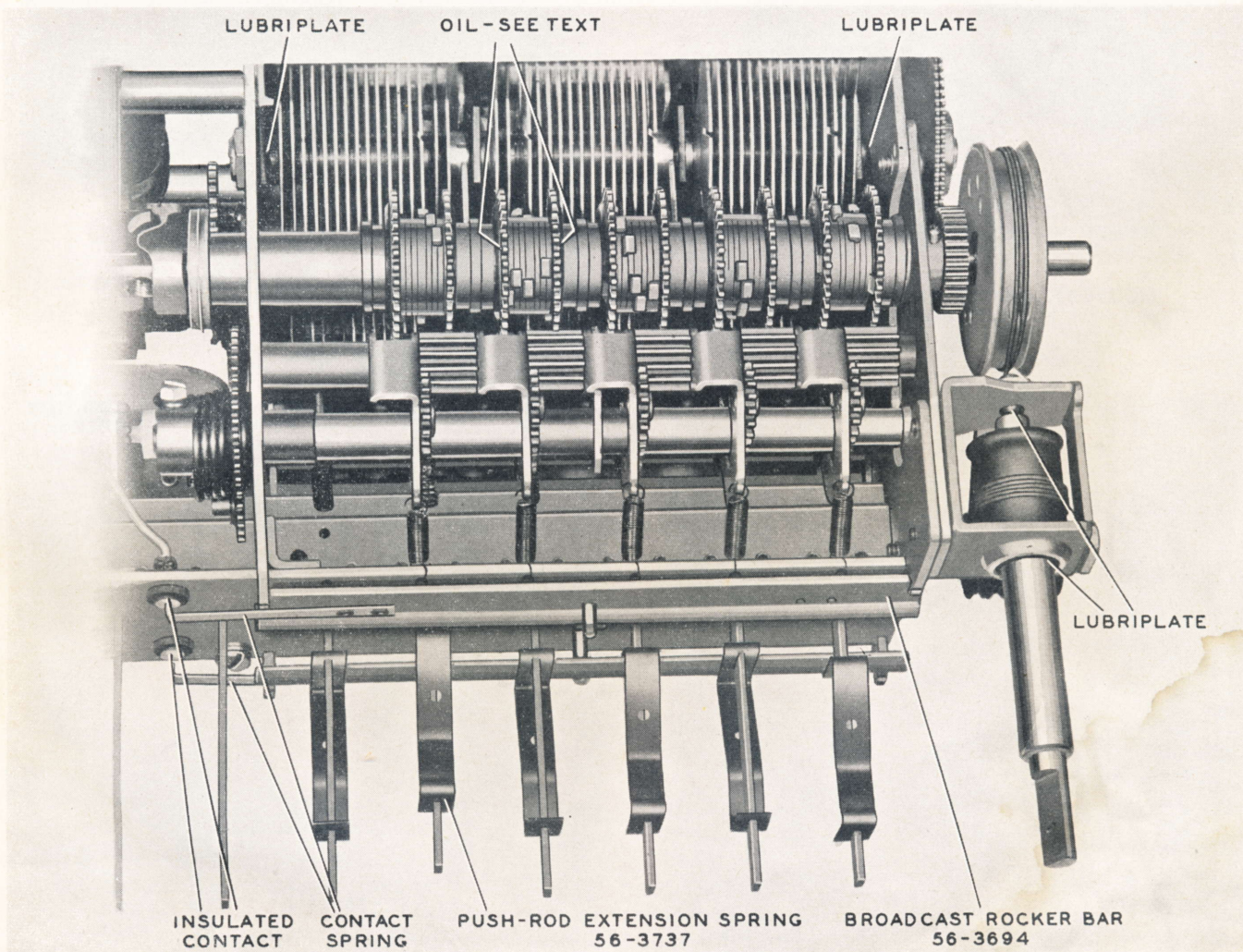


FIGURE 22. ACTUATOR RELEASED BY PAWL, MOTOR SWITCH OPEN

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FIGURE 23. PUSH-ROD EXTENSION SPRING IN BROADCAST POSITION

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4. Remove groove pins from rocker-bar studs. Remove rocker bar and rocker-bar return springs. See figure 24.

5. Remove spring retainer, spring, and latch bar. See figure 25.

6. Remove the six screws and lock washers which hold front-plate assembly to frame. See figure 25.

7. Unhook the six push-rod springs from cam bar. See figure 25.

8. Place unit with motor-switch side up, and remove front-plate assembly, gently pulling it forward.

9. Remove defective station-selector push rod or FM band-selector push rod by pulling forward and rotating approximately 90 degrees. See figure 26. Remove PHONO, BC, or SW push rod by carefully raising switch slide (figure 26) slightly to release slide from projection on push rod.

10. To remove cam bar (figure 27), slide it toward front of unit after all push rods have been removed.

11. When reassembling, be certain that projections on push rods are between the two cams, and rest on the bar proper. Replace push rods and insert front plate on rods, starting with a-c switch rod and threading each successive rod through slots in plate. See figure 27.

### REPLACING ACTUATOR ASSEMBLY

1. Remove the two screws (figure 26) which hold motor-and-muting switch to frame, and remove switch.

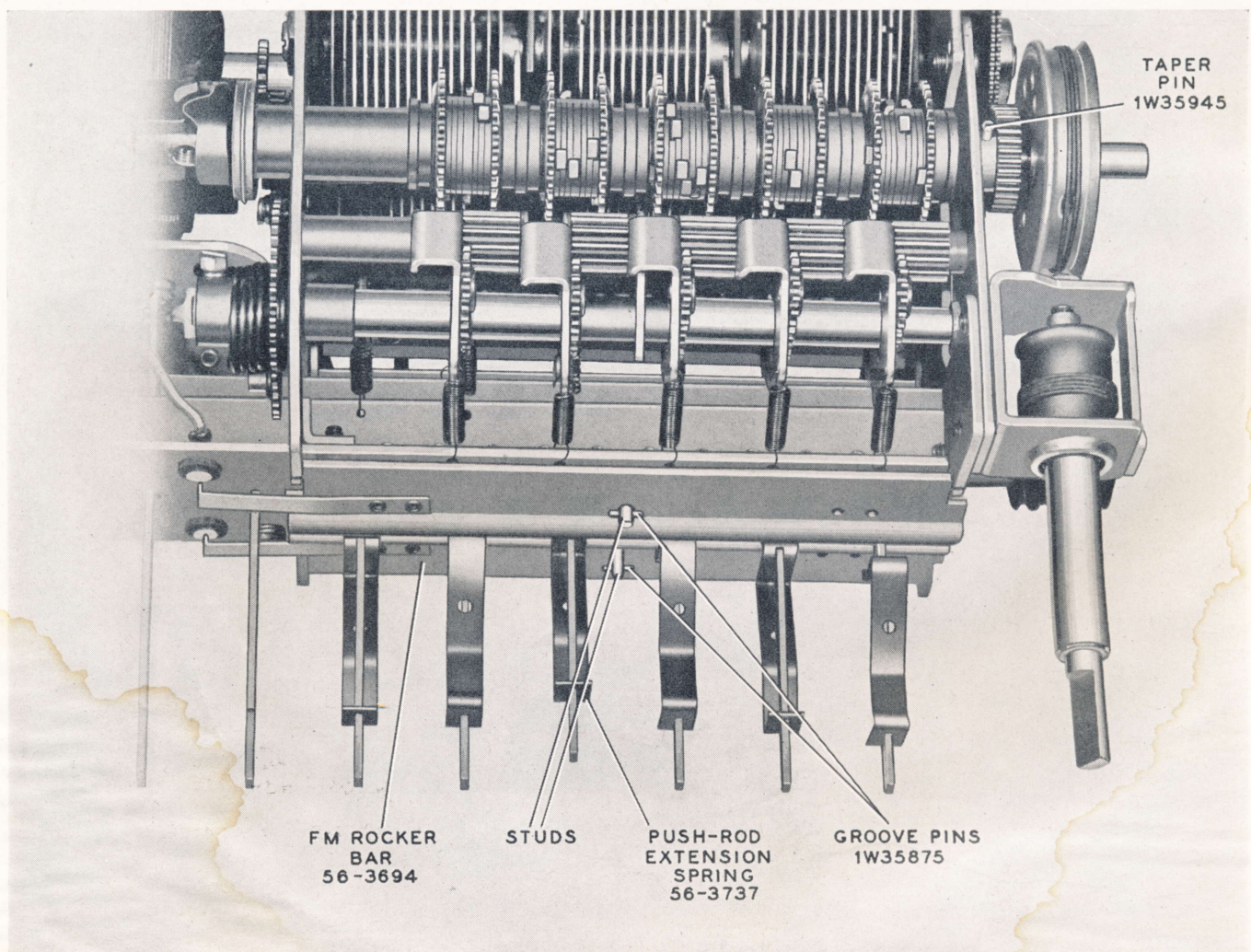
2. Unhook release-lever return spring. See figure 26.

3. Grasp pivot pin (figure 27) with pliers and pull pin toward center of assembly. After pin is released from end frame plate, pull upward slightly. Repeat this procedure with remaining pin. The assembly may now be removed by pulling upward.

4. The release lever may be removed from the actuator assembly by grasping the pivot pins with pliers and pulling toward the center of the actuator until the release lever is free.

FIGURE 24. PUSH-ROD EXTENSION SPRING IN FM POSITION

TP-4344





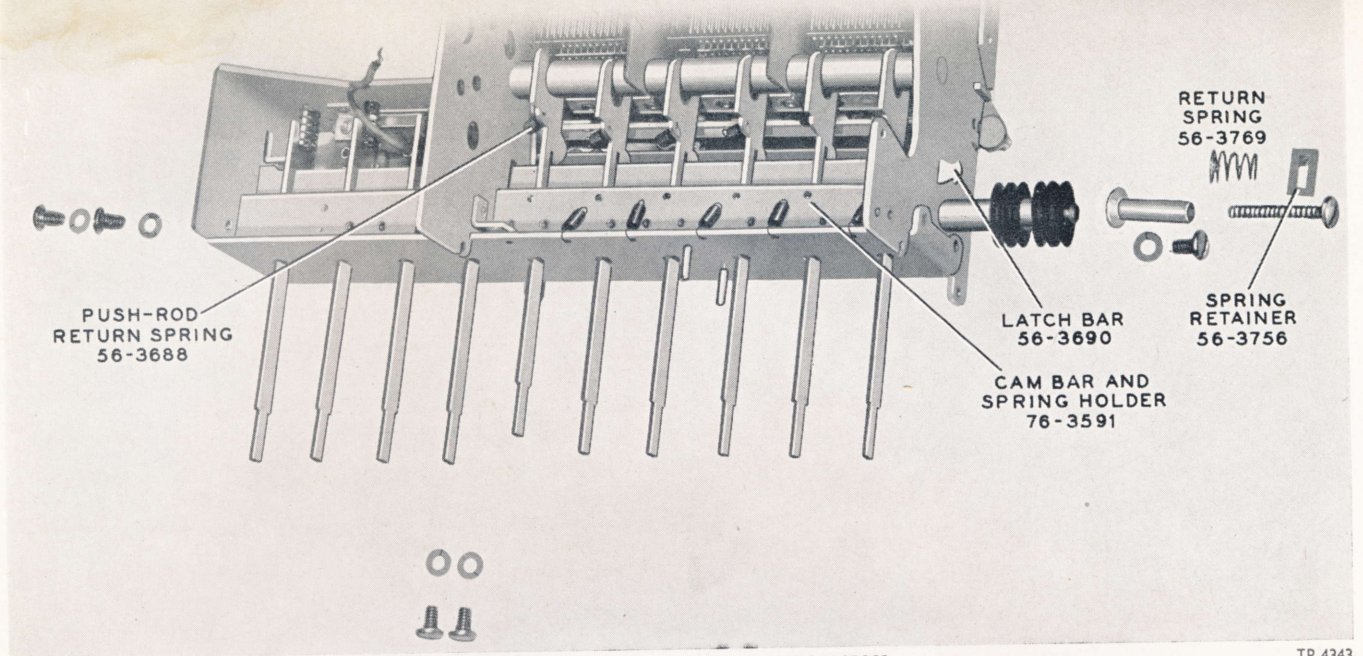


FIGURE 25. FRONT-PLATE ASSEMBLY

TP-4343

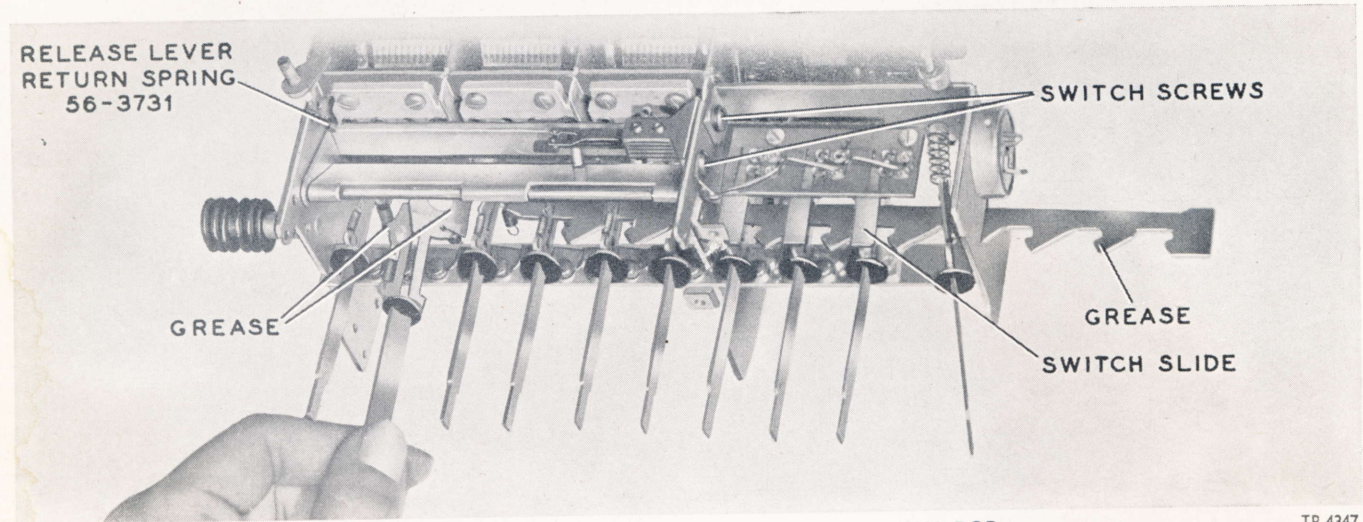
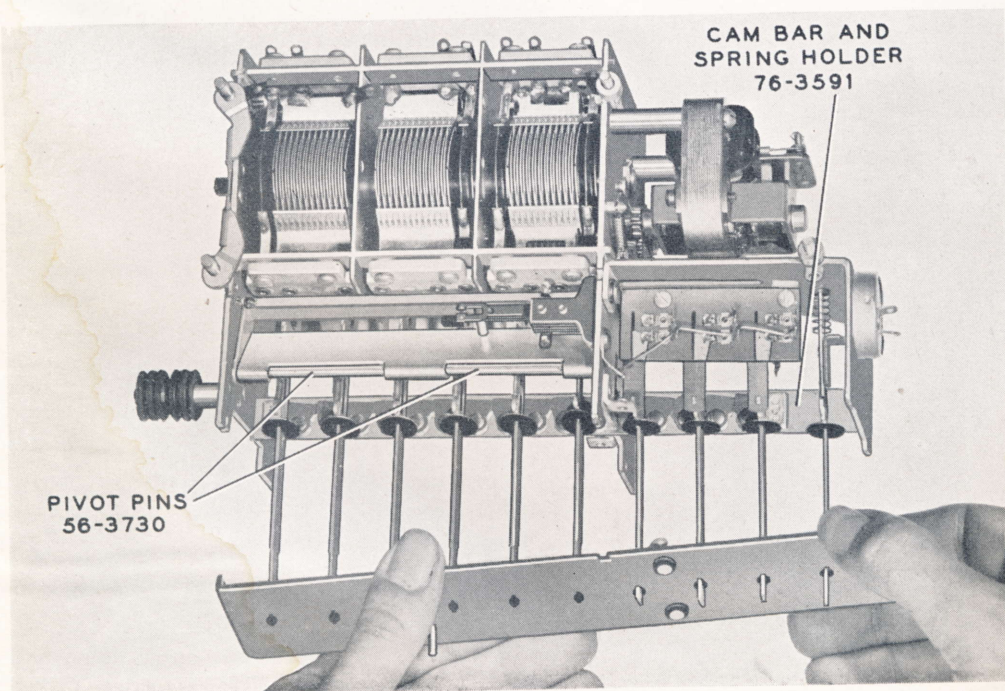


FIGURE 26. REMOVING STATION-SELECTOR PUSH ROD

TP-4347



TP-4346

FIGURE 27. REPLACING FRONT-PLATE ASSEMBLY



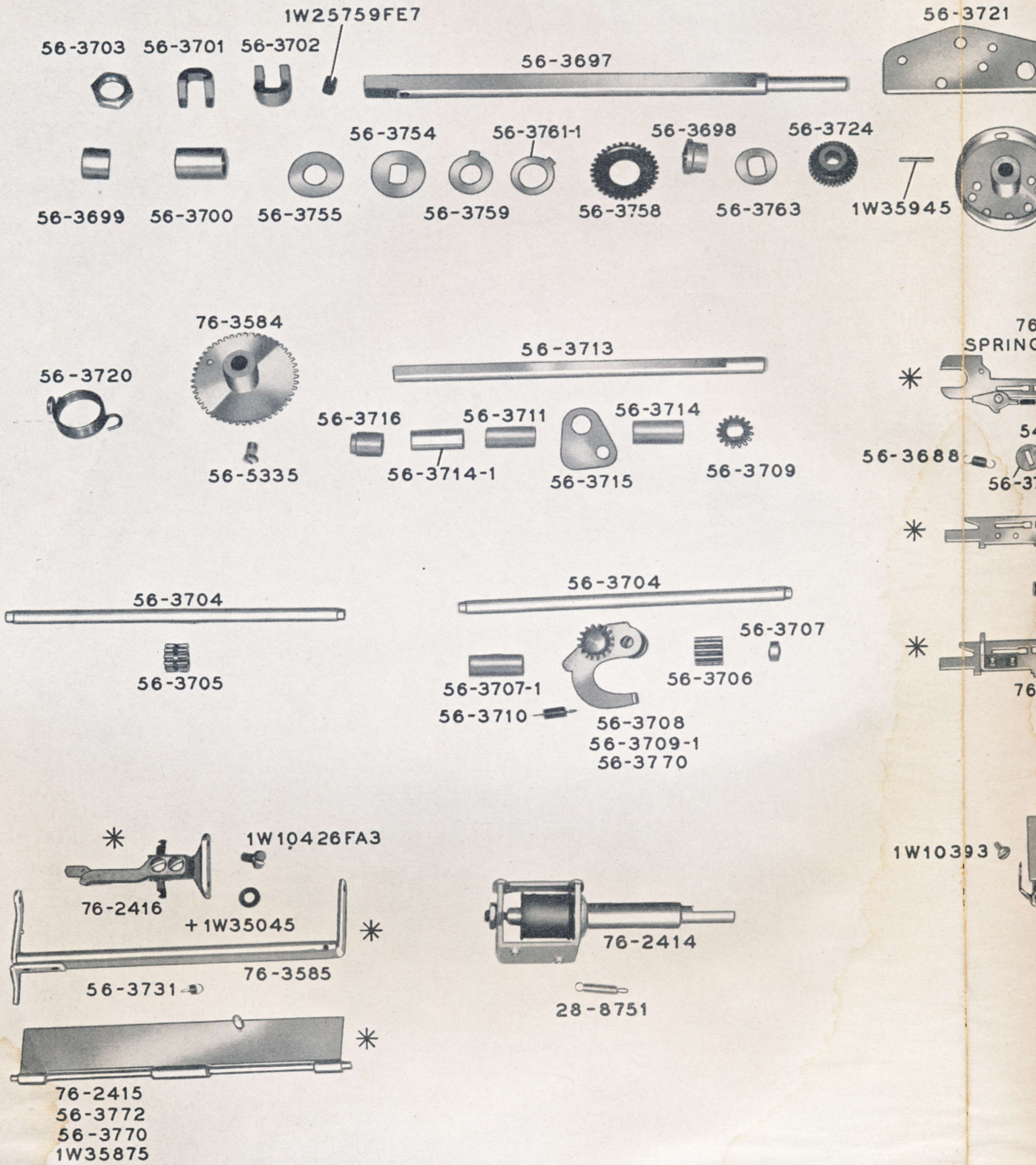
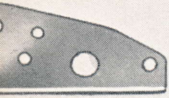


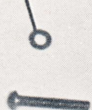
FIGURE 28. PARTS AND



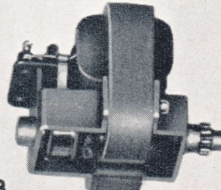
3721



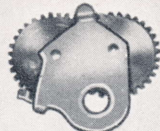
+ 1W35045



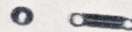
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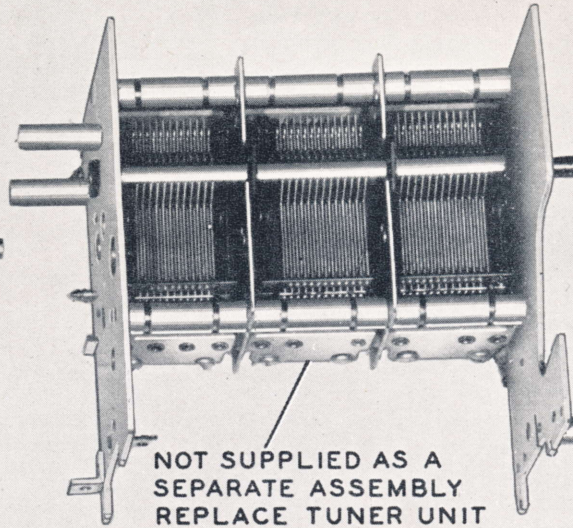
76-2428



76-2412

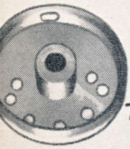


56-3675 56-3676



NOT SUPPLIED AS A SEPARATE ASSEMBLY  
REPLACE TUNER UNIT

11W29743



76-2342

76-3587

SPRING 56-3687

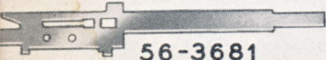


54-4362



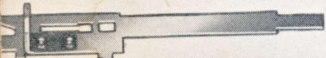
56-3757

56-3737



56-3681

56-3683  
56-3683-1



76-3586

76-3591



+ 2W35686

56-3695

56-3694

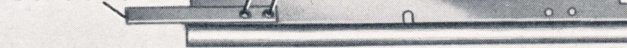


76-2413

+ 2W35686

56-3695

56-3694



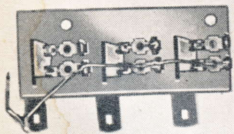
1W35875

56-3696

56-3769

56-3756

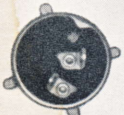
93



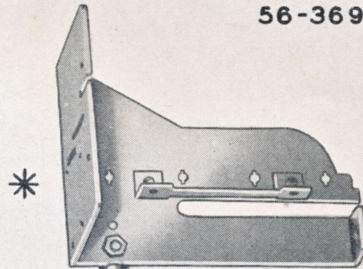
76-3588



56-3690

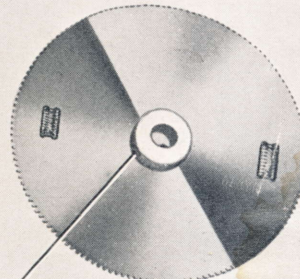


42-1789



W-2531

76-3590



76-3589

1W25849FA3



## REPLACING KICKOUT IDLER-BRACKET ASSEMBLY

1. Remove motor screws and motor. See figure 3.
2. Unhook idler-bracket return spring from projection on bracket. See figure 17.
3. Remove shoulder screw holding bracket in place. See figure 17.
4. Bracket may now be removed from frame assembly.

NOTE: It is not advisable to replace the two gears on the assembly, as these are matched gears. If replacement is necessary, replace the assembly, Part No. 76-2412.

## LUBRICATION

Proper lubrication of the Philco Electromechanical Push-Button Tuner is an important part of servicing the unit. Remember that *too much* lubrication can be as detrimental as too little. *It is very important that only the points indicated in figures 18, 20, 23, and 26 be lubricated.*

Use very light oil, such as Philco Part No. 45-2954, and apply only one or two drops to the points indicated. Where grease is specified, use a good grade of light grease and apply sparingly. On the latch bar and pawls, wipe a thin film over the bearing surfaces.

When lubricating the main-camshaft assembly, apply a single drop of oil on a toothpick to the point of contact between each cam gear and intermediate bushing. See figure 23.

## REPLACEMENT PARTS LIST

Part No.	Description	Part No.	Description
28-8751	Spring, drive-cord, manual tuning	56-3755	Washer, spring, main camshaft, clutch
†31-2695-7	Cord, drive, manual tuning (25-foot spool, Service Aid Part No. 45-8750)	56-3756	Spring, retaining, latch bar
42-1789	Switch, a.c.	56-3757	Washer, steel, push rod
54-4362	Washer, felt, push rod	56-3758	Gear, cam, main camshaft
56-3675	Screw, shoulder, kickout bracket	56-3759	Washer, drive, main camshaft
56-3676	Spring, return, kickout bracket	56-3761	Washer, idler, main camshaft
56-3681	Push rod, PHONO, BC, SW	56-3761-1	Washer, idler, main camshaft
56-3683	Spring, a-c switch, push rod	56-3763	Washer, flat, main camshaft
56-3683-1	Spring, PHONO, BC, SW, push rod	56-3769	Spring, return, latch bar
56-3684	Push rod, FM	56-3770	Rivet, shoulder, armature assembly
56-3687	Spring, pawl, station-selector push rod	56-3771	Spring, split gear
56-3688	Spring, push-rod return	56-3772	Spring, actuator assembly
56-3690	Latch bar	56-5332	Sleeve, drive cord
56-3694	Rocker bar	56-5333	"C" washer, manual tuning
56-3695	Spring, contact, rocker bar	56-5334	Sleeve, manual tuning
56-3696	Spring, return, rocker bar	56-5335	Setscrew, drive gear
56-3697	Camshaft	76-2150	Tuner assembly, complete
56-3698	Bushing, intermediate, main camshaft	76-2342	Pulley, manual-tuning drive
56-3699	Bearing, end, main camshaft	76-2412	Bracket assembly, kickout
56-3700	Spacer, brass, main camshaft	76-2413	Plate, front
56-3701	Cam	76-2414	Drive assembly, manual tuning
56-3702	Yoke	76-2415	Actuator and stud
56-3703	Nut, 3/8—40, main camshaft	76-2416	Switch, motor and muting
56-3704	Shaft, armature and slotted pinion	76-2428	Motor, 24 volts
56-3705	Gear, slotted pinion	76-3584	Drive-gear assembly
56-3706	Gear, pinion, armature-pinion shaft	76-3585	Release-lever assembly
56-3707	Spacer, brass, .121 inch, armature-pinion shaft	76-3586	Push-rod assembly, a.c.
56-3707-1	Spacer, brass, .746 inch, armature-pinion shaft	76-3587	Push-rod assembly, station selector
56-3708	Armature	76-3588	Slide-switch assembly
56-3709	Gear, pinion, main-pinion shaft	76-3589	Split-gear assembly, tuning-condenser drive
56-3709-1	Gear, pinion, armature assembly	76-3590	Bracket assembly, end
56-3710	Spring, return, armature	76-3591	Cam-bar and spring-holder assembly
56-3711	Spacer, brass, .686 inch, main-pinion shaft	76-3592	Bracket assembly, trunnion
56-3713	Shaft, main pinion	†W-1958	Staple, drive cord (Service Aid Part No. 45-9117)
56-3714	Spacer, steel, .686 inch, main-pinion shaft	W-2531	Spacer nuts, mounting
56-3714-1	Spacer, steel, .750 inch, main-pinion shaft	1W10393	Screw, 4—40 x 3/16", binding head, machine
56-3715	Bearing, center support	1W10426FA3	Screw, 6—32 x 1/4", binding head, machine
56-3716	Bearing, end, main-pinion shaft	1W10621FA3	Screw, 6—32 x 1-1/8", round head, machine, drive cord
56-3720	Spring, torque, main-pinion shaft	1W25759FE7	Allen setscrew, main camshaft
56-3721	Plate, end bearing	1W25848FE7	Setscrew, pulley
56-3724	Gear, pinion, condenser drive	†1W25849FA3	Setscrew, split gear (Service Aid Part No. 45-8942)
56-3730	Pin, pivot, actuator assembly	†1W35045	Lock washer, No. 6 (Service Aid Part No. 45-9030)
56-3731	Spring, release-lever return	1W35875	Pin, groove, 3/64" x 1/4"
56-3737	Spring, extension, push rod	1W35945	Pin, tapered, condenser-drive pinion
56-3753	Washer, flat, idler and reduction gear retaining	†1W42535	"C" washer, retaining, idler and reduction gear (Service Aid Part No. 45-9040)
56-3754	Washer, flat, main camshaft, clutch	†2W35686	Eylet, rocker-bar contact spring (Service Aid Part No. 45-9220)
		11W29743	Pulley, idler, drive cord

† This part number used for reference only. Use "Service Aid" part number when ordering replacements. "Service Aid" is quantity package.



