60-TYPE SELECTOR

IDENTIFICATION AND MAINTENANCE

1.00 INTRODUCTION

This section covers the identification and maintenance of the 60-type selectors. It also contains information on the selector-wheel pin setting and operating features.

2.00 GENERAL

2.01 The 60-type selector, Fig. 1, 3, 4, and 5, is known as a step-by-step multiple contact selector. It is mounted on a bakelite base and is equipped with a glass cover. It has two polarized magnet coils located parallel to each other. An armature is arranged to pivot between the two poles on receipt of reverse current impulses through the windings. Motion of the armature in either direction is transmitted to a feed pawl in such a manner that the feed pawl steps a ratchet one tooth for each movement of the armature.

2.02 A code wheel is fastened to the ratchet shaft, and a coil spring tends to return both wheel and shaft to their stopped position. As long as the magnets are energized or are receiving reverse current impulses, the ratchet and code wheel are prevented from returning by either the feed pawl or a holding pawl. If pulses cease, the ratchet and code wheel will return to their normal stopped position unless restrained by the holding spring resting on a code pin.

2.03 The 66A and D-175279 selectors are the same as the selectors shown in Fig. 1, except that they have two ringing-position terminals and one designated for plug-in connection by means of a jack on the underside of the base as shown in Fig. 2.

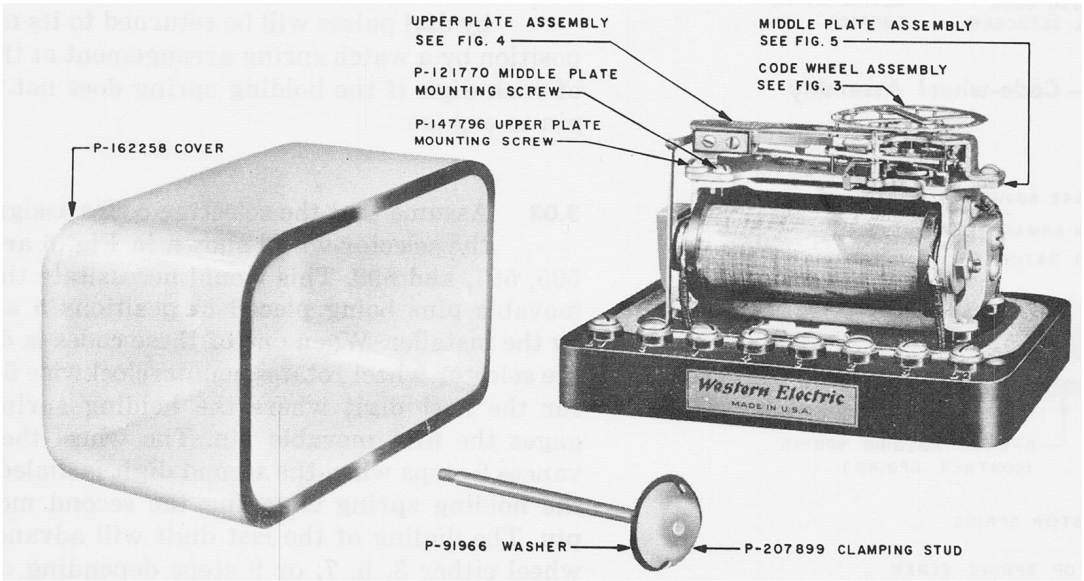


Fig. 1 — 60BA, BC, BP, BR, and D-151294 Selectors

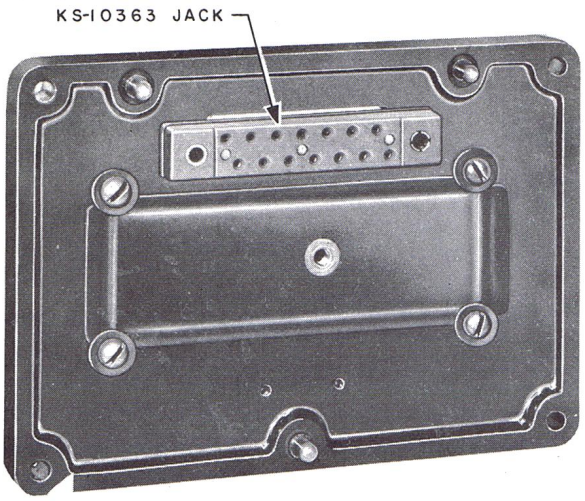


Fig. 2 — 66A and D-175279 Selectors, Base

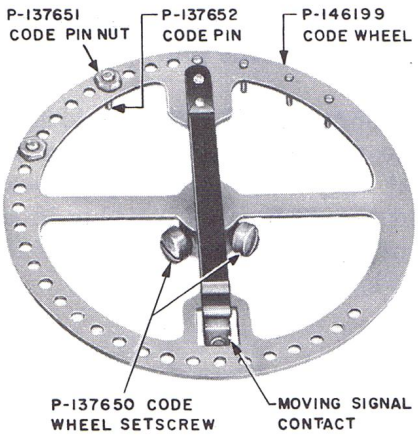


Fig. 3 — Code-wheel Assembly

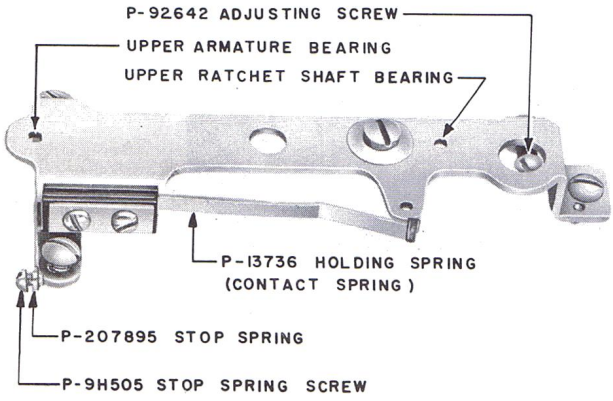


Fig. 4 — Upper-plate Assembly

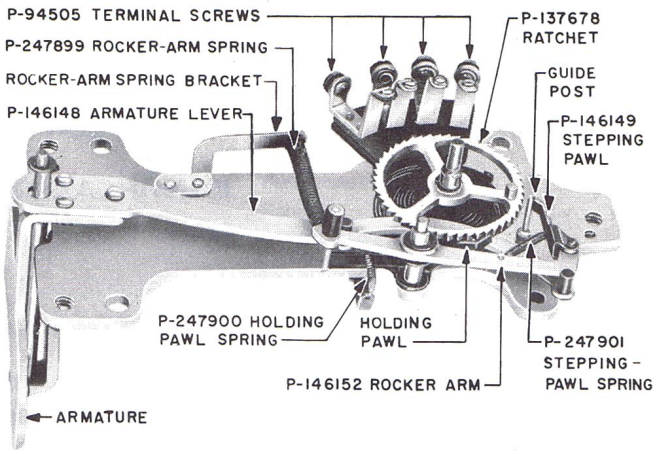


Fig. 5 — Middle-plate Assembly

3.00 SELECTOR-WHEEL PIN SETTING AND OPERATING FEATURES

3.01 As shown in Fig. 6, the selector wheel is equipped with four fixed pins assigned to Positions 17, 19, 21, and 23, and two movable pins assigned between Positions 2 and 15. The normal position of the selector wheel is defined as the position of the moving signal contact when it is 17 counterclockwise steps away from fixed contact C1.

3.02 The selector wheel when stepped off normal by dial pulses will be returned to its normal position by a watch spring arrangement at the end of each digit if the holding spring does not find a pin to engage.

3.03 Assume that the selecting codes assigned to the selector wheel shown in Fig. 6 are 593, 595, 597, and 599. This would necessitate the two movable pins being placed in positions 5 and 14 by the installer. When one of these codes is dialed, the selector wheel rotates counterclockwise 5 steps for the first digit where the holding spring engages the first movable pin. The wheel then advances 9 steps when the second digit is dialed with the holding spring engaging the second movable pin. The dialing of the last digit will advance the wheel either 3, 5, 7, or 9 steps depending on the code dialed with the holding spring engaging either the 17, 19, 21, or 23 pin. This places the

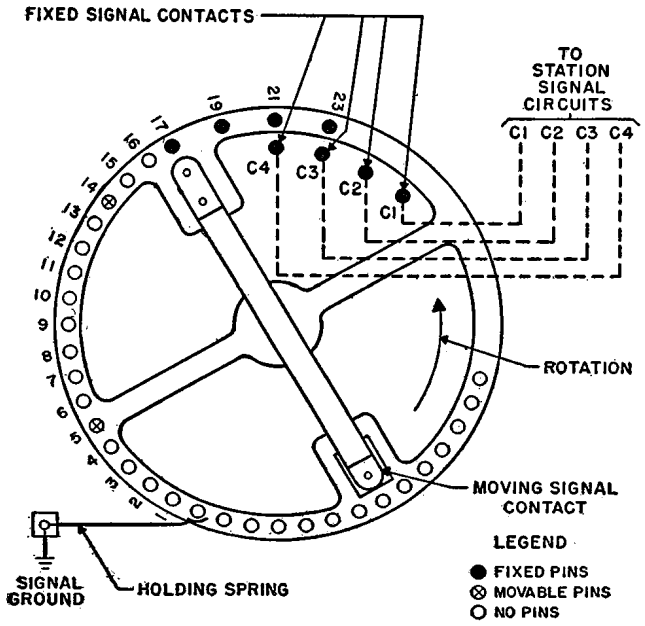


Fig. 6 — 60-type Selector Wheel

moving signal contact over either the C1, C2, C3, or C4 fixed contact, closing a circuit from the holding spring ground through the metal selector wheel and closed contact to the external signaling circuit via the *C1, C2, C3,* or *C4* leads. After all the digits have been dialed, the selector wheel returns to normal.

4.00 MAINTENANCE

4.01 Before checking or readjusting any part of the selector, the equipment should be taken out of service in accordance with established procedures.

4.02 CLEARANCE BETWEEN STEPPING PAWL AND RATCHET WHEEL, FIG. 7 (A)

1. Requirements: With the armature in standby position, the stepping pawl shall rest against the guide post. With the armature operated, the stepping pawl shall fully engage with the teeth on the ratchet wheel.

2. Adjustments: To adjust the clearance between the stepping pawl and the ratchet wheel, place the KS-6854 screw driver through the hole in the frame against the stepping-pawl guide post and adjust the guide post, slightly, in a direction to either increase or reduce the clearance as required. Do not bend the guide post more than is absolutely necessary.

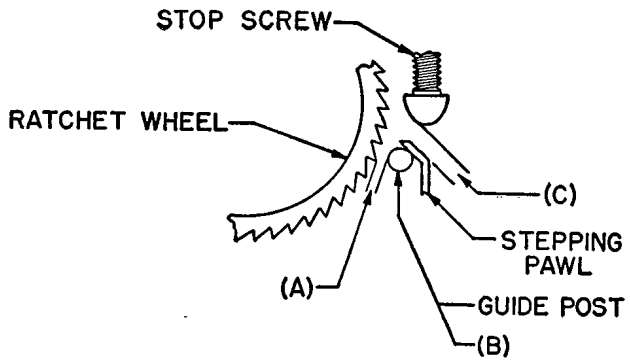


Fig. 7 — Stepping Pawl and Ratchet Wheel

4.03 STEPPING-PAWL POSITION, FIG. 7 (B)

1. Requirements: With the stepping pawl in the normal position, there shall be a clearance between the stepping pawl and the ratchet wheel of minimum 0.005 inch. Rotate the wheel manually and make certain that the requirement is met in all positions.

2. Adjustments: If the stepping pawl does not rest against the guide post, lubricate the stepping pawl bearing pin as outlined in 6.00. If the stepping pawl still does not rest against the guide post, replace the stepping-pawl retractile spring. To do this, remove the old spring with tweezers. Hook one end of the new spring (P-247901 spring) into the hole of the stepping pawl, and the other end into the hole of the rocker arm provided for this purpose. Avoid stretching the spring excessively, so its initial tension is not destroyed.

4.04 STEPPING-PAWL TRAVEL, FIG. 7 (C)

1. Requirements: The total travel of the stepping pawl (travel from the guide post to the stop screw) shall be

   - minimum, 1-3/4 teeth of the ratchet wheel
   - maximum, 2 teeth of the ratchet wheel.

   To check, operate the armature manually. With the stepping pawl resting against the

stop screw, hold the code wheel and release the armature. The stepping pawl will drop back against the guide post. Gauge the distance between the end of the stepping pawl and the position of the tooth on the code wheel which has been advanced by the pawl. Release the code wheel. Check the requirement with the armature operated against each pole piece in turn.

2. Adjustments: If the stepping-pawl travel requirement is not met, or if the holding pawl does not engage the ratchet wheel properly, it is an indication that the armature travel is incorrect or that the conical-head stop screw is not set properly. To correct this condition, loosen the locknut on the stop screw, using the No. 417A wrench. Then turn the stop screw in or out, as required, with the KS-6854 screw driver. Tighten the locknut securely. If the armature travel is not correct, adjust as instructed in 4.15, 2 and 4.16, 2.

4.05 ENGAGEMENT OF HOLDING PAWL AND RATCHET WHEEL, FIG. 8 (A)

1. Requirements: The holding pawl shall effectively engage each succeeding tooth of the ratchet wheel as the wheel is advanced by the operation of the stepping pawl. With the ratchet wheel normal, the holding pawl shall engage properly in the first tooth of the ratchet wheel with a clearance of maximum 0.005 inch as the armature operates. Partially operate the armature slowly by hand and note that the pawl falls in behind the tooth before the ratchet wheel starts to move.

2. Adjustments: If with the ratchet wheel in the normal position the holding pawl does not engage properly into the tooth of the ratchet wheel, adjust the position of the ratchet-wheel cam screw with the KS-6854 screw driver. Step the selector manually so that the number of steps corresponds to the sum of all the selecting digits in the code. Make certain that the selector stops on the proper contact terminal for the code used. If it does not, reset the cam screw so that the holding pawl will engage the proper tooth.

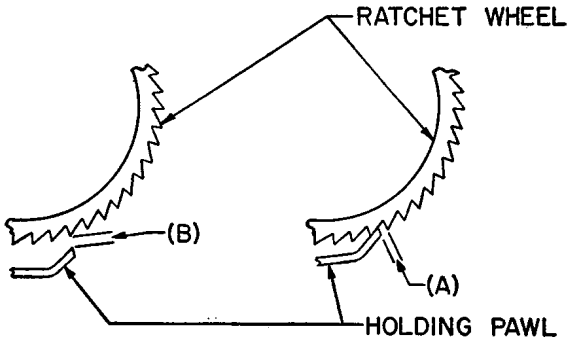


Fig. 8 — Ratchet Wheel and Holding Pawl

4.06 CLEARANCE BETWEEN HOLDING PAWL AND RATCHET WHEEL, FIG. 8 (B)

1. Requirement: With the holding pawl in the stand-by position, there shall be a clearance between the holding pawl and the ratchet wheel of minimum 0.005 inch. Rotate the ratchet wheel manually and make certain that the requirement is met in all positions.

2. Adjustments: If the requirement is not met, use the No. 485A pliers to adjust the post on the rocker arm against which the tail of the pawl rests. Exercise care not to adjust the post more than is necessary, and avoid damaging the holding-pawl retractile spring.

4.07 HOLDING-PAWL SPRING TENSION

1. Requirements: With the armature operated, the tension of the holding-pawl spring shall be sufficient to ensure that the holding pawl will rest against the face of each tooth of the ratchet wheel with a very light pressure (approximately 1-1/2-grams). Gauge by eye and feel; use the No. 70F gauge as a reference.

2. Adjustments: Correct the tension of the holding-pawl retractile spring by adjusting the offset portion of the holding-pawl spring bracket with the No. 485A pliers. This ensures that the holding pawl will rest against the face of each tooth as the ratchet wheel is advanced by the armature. In adjusting, take care to keep the tension of the spring as small as practicable and yet meet the tension requirement.

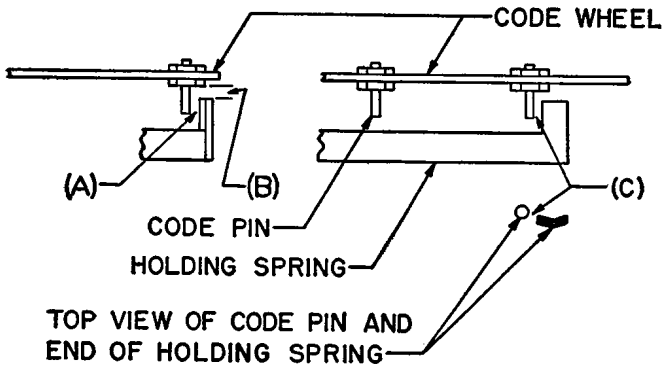


Fig. 9—Code Wheel and Holding Spring

4.08 CLEARANCE BETWEEN HOLDING SPRING AND CODE PINS, FIG. 9

1. Requirements:

a. When the code wheel is revolved by hand, there shall be a minimum clearance of 0.005 inch between the curved end of the holding spring and the inside of the code pins. See Fig. 9 (A).

b. When the code wheel is revolved by hand, there shall be a minimum clearance of 0.015 inch between the shoulder portion of the code pins and the holding spring. See Fig. 9 (B).

c. As the code wheel is advanced by the armature, the holding spring in its outward movement shall clear the code pins by a minimum of 0.005 inch. See Fig. 9 (C).

2. Adjustments:

a. The holding spring is adjusted to clear the code pins by applying the No. 485A pliers to the spring just in front of the roller on the rocker arm. If the cup-shaped portion of the holding spring does not clear the shoulder of the code pins, loosen the spring clamping screws with the 3-inch H cabinet screw driver and move the holding spring down. Make sure the holding spring rests against the stop spring and is not set so low that it fails to engage the code pins properly. Tighten the clamping screws securely.

b. If the holding spring does not clear the code pins in its outward movement, or if it does not engage the code pins as required in 4.09, 1, check the requirements on the code wheel position in 4.11, 1. If necessary, reposition the code wheel as outlined in 4.11, 2. If the code wheel is properly adjusted, loosen the holding spring clamping screws and move the spring until it is properly positioned to clear the shoulder of the code pins and to engage the code pins properly. Retighten the clamping screws securely.

4.09 ENGAGEMENT OF HOLDING SPRING WITH CODE PINS

1. Requirements: After the specified group or groups of pulses, the code wheel and code pins shall be so located that the holding spring will engage with the code pin on release of the armature and retain the code wheel in that position until it is advanced by the next group of pulses or released by a releasing pulse.

2. Adjustments: Proceed as described in 4.08, 2.

4.10 HOLDING SPRING POSITION

1. Requirements: In its normal position, the holding spring shall rest lightly (with approximately 1-1/2 grams pressure measured just back of the stud) against the rubber stud on the rocker arm. Use the No. 70F gauge.

2. Adjustments: If the holding spring does not rest against the rubber stud on the rocker arm, use the No. 485A pliers to adjust the spring near the point where it leaves the clamping plate and insulators. In making this adjustment, adjust the holding spring and the stop spring as a unit; after the adjustment has been completed, make sure the holding spring rests against the stop spring, especially at the free end of the stop spring. The holding spring should rest on the rubber stud on the rocker arm with a very light pressure.

4.11 CODE-WHEEL POSITION

1. Requirements:

   a. The code wheel shall be mounted on the shaft so that the heads of the setscrews clear the spring washer located under the ratchet cam screw.

   b. The contact spring on the code wheel should make contact with the specified contact terminal after the code wheel has been advanced by the operation of the armature the number of steps indicated by the sum of the selecting digits of the code.

2. Adjustments: With the KS-6854 screw driver, loosen the two setscrews holding the code wheel of the shaft. Lift the code wheel from the shaft. Advance the ratchet wheel by stepping the selector manually so that the number of steps corresponds to the sum of all the selecting digits in the code for the selector. Lock the selector operated in this position by inserting KS-6320 orange stick between the armature and the pole piece on the side opposite the operated armature. Place the code wheel on the shaft so that the contact spring is adjacent to the particular contact terminal to which the code is intended to step the selector. Adjust the wheel until the contact-spring position requirement is met. Securely tighten the setscrews in the hub of the code wheel. Remove the orange stick from the armature gap, allowing the code wheel to return to normal. Make certain the code-wheel position and contact-spring position requirements are met.

4.12 CONTACT-SPRING POSITION

1. Requirements:

   a. With the selector in the stand-by position, the flat portion of the contact spring shall rest against the code wheel with a very light pressure (approximately 1/2 gram). Use the No. 70F gauge.

   b. With the contact spring resting on the top of the first contact terminal, and the code wheel held in position by the holding spring engaging the code pin, the contact spring shall be lifted from the point on the code wheel on which it rests in its normal position to a minimum of 0.020 inch. Gauge by eye. The thickness of the contact spring is 0.010 inch.

   c. The contact spring shall not make contact with the contact terminals when advanced to one step before or one step beyond each contact terminal.

   d. The offset section on the contact spring, into which the contact is fitted, shall be approximately parallel to the code wheel.

2. Adjustments:

   a. If the flat portion of the contact spring does not rest properly against the code wheel, adjust the contact spring at the point adjacent to the rivets, using the slotted end of the No. 145 spring adjuster.

   b. If the contact spring is not lifted from its position on the code wheel as the spring passes over the contact terminal, adjust the contact end of the spring slightly, using the slotted end of the No. 145 spring adjuster. Check to see that, after this adjustment is made, the portion of the contact spring which carries the contact is approximately parallel to the surface of the code wheel. If it is necessary to adjust the contact spring so that it is not parallel with the code wheel in order to obtain the proper lift as the spring passes over the terminals, it is an indication that the code wheel is set too high or too low on the shaft. In this case loosen the setscrews in the code wheel hub and reset the code wheel position as covered in 4.11, 2.

   c. If the contact spring makes contact with the contact terminals when the code wheel is advanced to one step before or one step beyond the terminal, adjust the contact terminals, using the No. 485A pliers. Take care not to loosen the terminal rivets when making this adjustment.

4.13 SPIRAL-SPRING TENSION

1. Requirements:

   a. The tension of the spiral spring shall be sufficient to restore the code wheel to normal if the wheel is not held by the holding spring engaging the code pins, and if the rocker is in its normal position.

   b. To check this tension requirement, advance the code wheel by operating the armature manually, then slowly release the armature making sure that the code wheel restores properly from each of the following positions:

   - One step beyond the normal position
   - One step beyond each contact terminal

2. Adjustments:

   a. If the spiral-spring tension is not sufficient to restore the code wheel to normal when it is one step beyond the normal position, adjust the tension of the spiral spring by moving the supporting arm of the outer end of the spring in a clockwise direction, using the hooked end of the No. 145 spring adjuster. Moving the supporting arm in a counterclockwise direction decrease the tension. Do not increase the tension of the spiral spring sufficiently to cause it to be distorted when the code wheel is advanced to the last contact terminal.

   b. If the code wheel does not restore properly from one step beyond the contact terminals, it indicates that the tension of the contact spring is too great or that the code wheel is set so that the contact spring is lifted too high as it passes over the contact terminals. In this case reduce the tension of the contact spring, using the No. 145 spring adjuster as covered in 4.12, 2, or reposition the code wheel on the shaft as covered in 4.11, 2.

4.14 ROCKER-ARM RETRACTILE SPRING TENSION

1. Requirements: The tension of the rocker-arm retractile spring (including the tension of the holding spring) shall be sufficient to restore the rocker arm to normal when no current is flowing through the selector winding.

2. Adjustments: If the rocker arm does not restore to normal when no current is flowing through the selector, lubricate the rocker arm bearings as outlined in 6.01. If the rocker arm still does not restore to normal, correct the tension of the rocker-arm retractile spring by adjusting the bracket of the rocker-arm retractile spring, using the No. 485A pliers. The tension of the spring shall not be greatly in excess of the amount required to restore the rocker arm to its normal position, since a higher voltage would be needed to operate the selector if the tension were too excessive.

4.15 ARMATURE POSITION

1. Requirements: With the armature in the normal position, the faces of magnet cores shall lie in as near a parallel plane with the armature as possible. The airgaps between the armature and the cores shall be approximately equal.

2. Adjustments: Adjustment for meeting this requirement shall be made by loosening the core locknuts with the No. 417A wrench and by turning the core with the 3-inch H cabinet screw driver. Turn the core in a clockwise direction to decrease the armature gap and in a counterclockwise direction to increase the gap. Tighten the locknut securely and be sure the selector meets the over-all operating requirements in 5.01 to 5.04.

4.16 ARMATURE-LEVER CLEARANCE

1. Requirements: Throughout its stroke, the armature level shall clear all parts except the rocker arm. The vertical or horizontal play in the armature bearings shall not be sufficient to permit the lever to touch adjacent parts.

2. Adjustments: Adjust the armature arm slightly by using the No. 485A pliers. Avoid adjusting the armature lever more than is necessary, and be careful not to place excessive strain on the armature pivots.

5.00 OVER-ALL OPERATION REQUIREMENTS

5.01 Before checking to see that the operating requirements are met, the selector key, or dial, and associated equipment must be checked to ensure proper adjustment. Also, be sure the circuit is in condition to transmit the series of impulses which will advance the selector to the specified terminal.

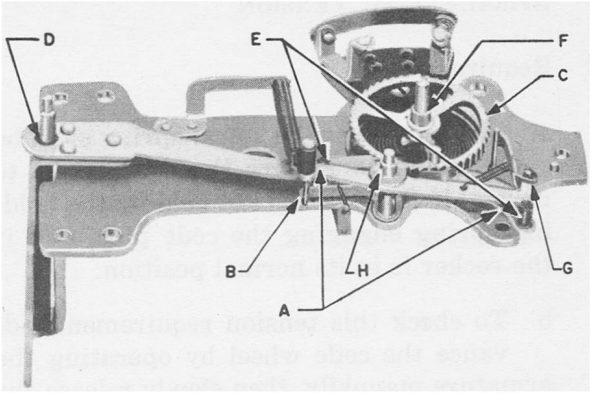
5.02 When the proper series of impulses is transmitted to the selector under normal operating conditions, the selector shall step to the proper terminal as determined by the code setting of the selector.

5.03 If the selector fails to operate properly, there may be excessive tension of the rocker arm spring, of the spiral spring, or of the contact spring as it passes over the terminals or incorrect armature gaps. Reduce the tensions of the springs toward the specified minimums as covered in the preceding paragraphs. If the over-all operating requirements still are not met after making these adjustments, make sure the armature airgaps are not excessive. Failure to operate indicates too great an airgap, and failure to release indicates either too small an airgap or unequal airgaps. Adjust the armature airgaps until the selector operates properly in the circuit.

5.04 Test the selector for false operation by sending a group of pulses that should step the selector one step beyond a contact position. This should make the code wheel release and return to its stop position.

6.00 LUBRICATION

6.01 Lubricate the various points listed below by applying KS-6232 oil very sparingly with artist's show card brush (one dip distributed over four or five points). The points to be lubricated are illustrated in Fig. 10. To lubricate the ratchet wheel shaft bearing, apply the brush under the code wheel bearing and lubricate the shaft with the end of the brush. After applying the oil, operate the selector manually a few times to work the oil into the bearings. Take care to keep the oil away from the contacts and the selector windings. Wipe off excess oil with a clean dry KS-14666 cloth.



A — Surfaces of the rocker arm which come in contact with the phosphor bronze pins.
B — Side of the rounded end of the holding pawl which makes contact with the stud.
C — Teeth of the ratchet wheel.
D — Armature bearings.
E — Rocker arm bearings.
F — Ratchet wheel shaft bearings.
G — Stepping pawl bearing pin.
H — Holding pawl bearing.

Fig. 10 — Lubrication Points

Wrapping the cloth around one end of the KS-6320 orange stick will facilitate removal of excess oil from points which may not be accessible otherwise.

6.02 One dip of KS-6232 oil means the amount of oil retained on a KS-14164 artist's show card brush after being dipped 3/8 inch into the oil and then scraped twice on the side of the container to remove surplus oil. There shall not be sufficient oil adhering to the brush to form a drop on the end of the bristles.

7.00 CLEANING

7.01 The parts of the selector should be cleaned, when necessary, by applying KS-7860 petroleum spirits to the parts with the KS-14164 brush and allowing these parts to dry thoroughly. Avoid injury to the delicate mechanism and springs associated with the armature arm, the rocker arm, and the code wheel. After cleaning, relubricate as covered herein.