APPARATUS
METHOD OF BLOCKING AND INSULATING CONTACTS

1. GENERAL

1.01 This section covers the methods of insulating contacts and blocking apparatus.

1.02 This section is reissued to add blocking and insulating information for U-, UA-, Y-, AF-, AG-, AJ-, 271-, and 282-type relays, plunger-type primary line switches, and 300-, 324-, and similar-type switches. Detailed reasons for reissue will be found at the end of the section. Since this is a general revision, the arrows ordinarily used to indicate changes have been omitted.

1.03 Whenever a BSP section, an X specification, or circuit requirement table specifies that apparatus be blocked or contacts insulated, the work shall be done in accordance with this section unless the BSP section, X specification, or circuit requirement table specifically states how the apparatus should be blocked or the contacts insulated.

1.04 Blocking tools, orange sticks, toothpicks and paper used in blocking apparatus and insulating contacts should be removed when the apparatus is to again be placed in service. The apparatus should be checked to insure that no parts of toothpicks, orange sticks, or paper remain in the apparatus.

1.05 In blocking a relay equipped with an armature stop or separator, take care not to dislodge or damage the stop or separator when inserting or removing the blocking tool.

2. LIST OF TOOLS AND MATERIALS

Code or Spec No.	Description
Tools	
136B	Relay Blocking Tool
324	Relay Blocking Tool
508A	Armature Blocking Tool
558A	Armature Blocking Tool
627A	Armature Blocking Tool
KS-6320	Orange Stick
KS-8511	Tweezers
Materials	
KS-7187	Bell Seal Bond Paper, Substance No. 20
KS-14737, List 1	Paper Insulator
—	Toothpicks, Hardwood, flat at one end and pointed at the other

3. BLOCKING APPARATUS

3.01 **A-, AB-, E-, EA-, F-, H-, M-, R-, T-, and Similar-type Relays:** Fig. 1—Block relays nonoperated by inserting the No. 136B relay blocking tool between the core and the armature. Block relays operated by inserting the No. 136B tool between the armature and the armature adjusting nut for all relays except EA-type relays coded EA25 and up. Toothpicks may be used instead of the No. 136B tool. Block EA-type relays coded EA25 and up operated with the No. 508A armature blocking tool, applying the offset legs of the tool to the core with the two long legs approximately centered on the armature.

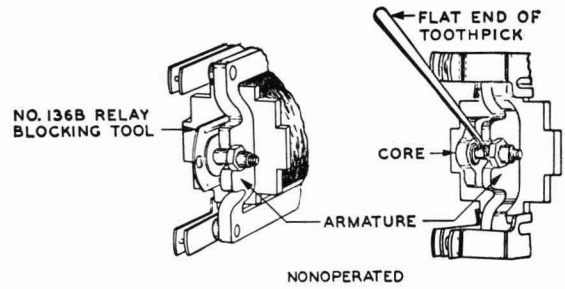

FIG. IA (SEE NOTE)

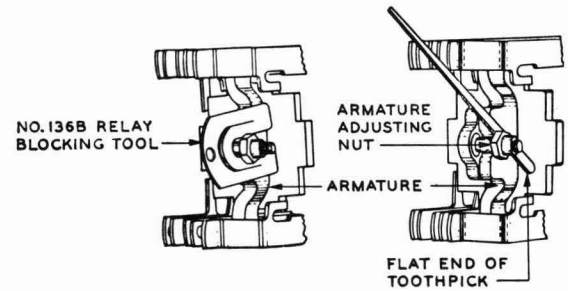

FIG. IB (SEE NOTE)

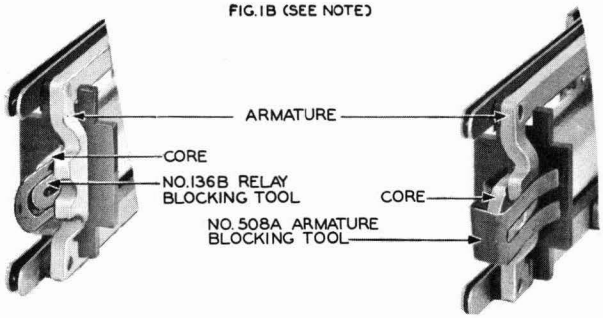

FIG. IC (SEE NOTE)

NOTE: FIGS. IA AND IB APPLY TO A-, AB-, E-, F-, H-, R-, T-, 236- AND 266-TYPE AND EAI TO I3 RELAYS, FIG. IC APPLIES TO EA TYPE RELAYS CODED EA 25 AND UP

Fig. 1—Blocking A-, AB-, E-, EA-, F-, H-, R-, and T-type Relays

3.02 **B-, G-, and J-type Relays:** Fig. 2—Block relays nonoperated by inserting a toothpick between the core and the armature. Block relays operated by inserting the flat end of a toothpick between the back contact spring or backstop and the upper part of the armature. Take care not to insert the toothpick between the contacts.

Caution: In blocking these relays nonoperated, do not force the toothpick between the armature and core as the armature may become bent, thereby changing its adjustment.

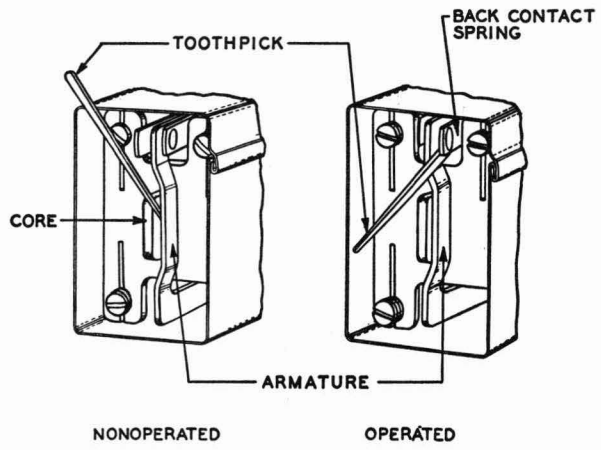

Fig. 2—Blocking B-, G-, and J-type Relays

3.03 **L-, N-, and S-type Relays:** Fig. 3—Block relays nonoperated by inserting the flat end of a toothpick between the core and the armature. Insert the toothpick from below the core. Block relays operated by using a part of a KS-6320 orange stick prepared as follows. Cut approximately 1-5/8 inches from one end of the orange stick and then cut approximately 5/8 inch from the smaller end of this cutoff portion. Use the remaining 1-inch length for blocking the relay operated by inserting it between the armature and contact screw bracket, as shown in Fig. 3.

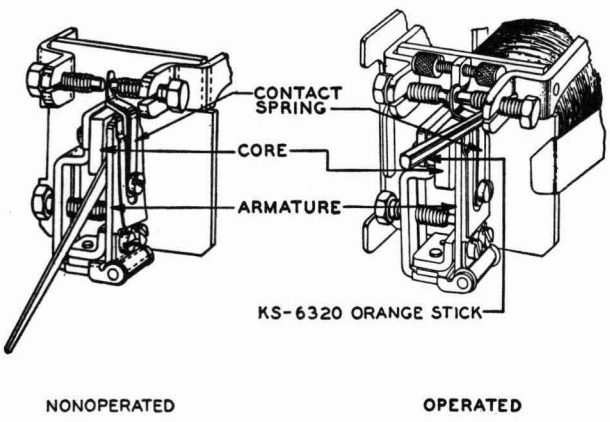

Fig. 3—Blocking L-, N-, and S-type Relays

3.04 **U-, Y-, UA-, 271- and 282-type Relays Not Equipped With Attachable Separators:** Fig. 4—Block relays nonoperated by inserting the No. 508A armature blocking tool on the front end of the core with the long legs of the tool between the core and the armature. Fully insert the tool, being careful not to push off the armature stop discs. Block relays operated by applying the offset legs of the blocking tool to the armature with the two long legs approximately centered on the core, as shown in Fig. 4.

3.05 **U-, UA-, 271-, and 282-type Relays Equipped With Attachable Separators:** Block relays nonoperated by inserting the No. 508A armature blocking tool on the front end of the core with the long legs of the tool between the flap of the attachable separator and the armature. Fully insert the tool. Take care when inserting or removing the tool not to crease or otherwise damage the separator. If the separator is creased or damaged, replace it. Block relays operated by applying the offset legs of the blocking tool to the armature with the two long legs approximately centered on the core over the metal clip of the insulator. Take care not to damage the separator.

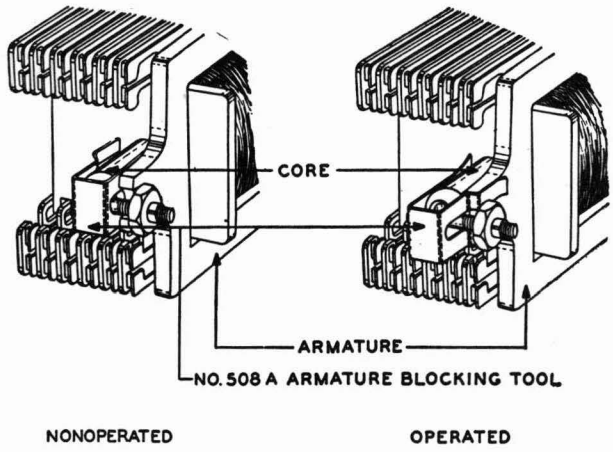

Fig. 4—Blocking U-, Y-, UA-, 271-, and 282-type Relays

3.06 **Y-type Relays Equipped With Magnetic Separators:** Block relays nonoperated by positioning the No. 508A armature blocking tool over the end of the core with the long leg of the tool between the armature and the separator on the core. Then carefully push the tool on the core, taking care that the legs of the tool do not snag on the separator. Block relays operated by applying the offset legs of the blocking tool to the armature with the two long legs approximately centered on the core to straddle the raised part of the separator. Take care not to twist or loosen the separator.

3.07 **AF-, AG-, and AJ-type Relays:** Fig. 5—Block relays nonoperated by inserting the No. 627A armature blocking tool between the armature and core. Block relays operated by inserting the armature blocking tool between the armature and the armature backstop. To use the tool, press on the loop portion to bring the prongs in line. Then insert the tool into position to the full length of the prongs.

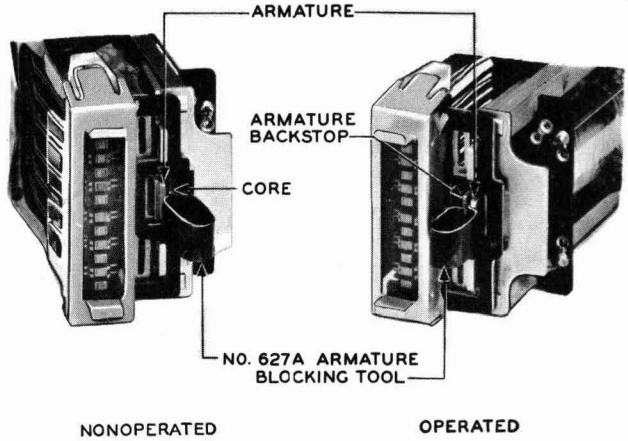

Fig. 5—Blocking AF-, AG-, and AJ-type Relays

3.08 **44-type Relays and 22-, 35-, and 56-type Drops:** Fig. 6—Block this apparatus nonoperated by inserting a toothpick between the armature and the frame or shell.

3.09 **105-, 108-, and Similar-type Relays:** Fig. 7—Block relays operated by inserting a toothpick between the armature and the adjusting nut.

3.10 **111-, 121-, 122-, 125-, 149-, 162-, 178-, and 179-type Relays:** Fig. 8—Block relays nonoperated by inserting the flat end of a toothpick between the armature and the pole piece. Block relays operated by inserting the flat end of a toothpick between the armature and the armature adjusting screw. Break the toothpick if necessary in order to insert it.

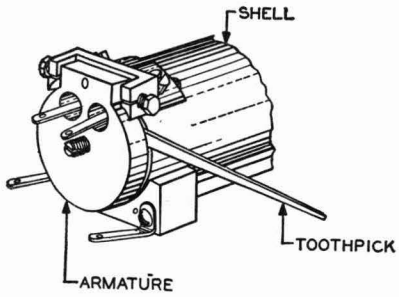

Fig. 6—Blocking 44-type Relays Nonoperated

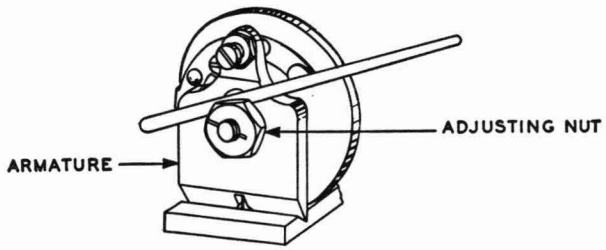

Fig. 7—Blocking 105-, 108-, and Similar-type Relays Operated

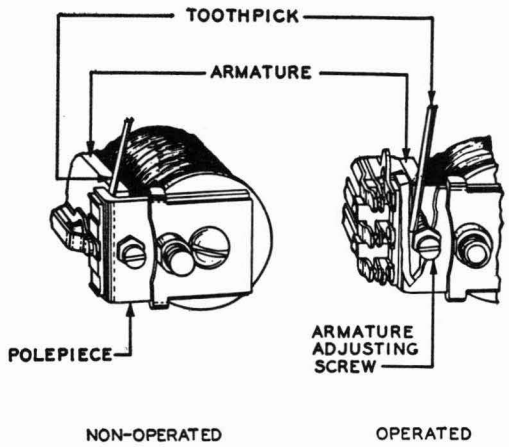

Fig. 8—Blocking 111-, 121-, 122-, 125-, 149-, 162-, 178-, and 179-type Relays

3.11 **114-, 124-, 126-, 174-, and 198-type Relays:** Fig. 9—Block relays nonoperated by inserting the flat end of a toothpick between the armature and the shell. Block relays operated by inserting a KS-6320 orange stick between the armature and the back contact screw support. Insert the orange stick between the support and the edge of the armature, being careful not to strain any of the parts.

3.12 **118-type Relays:** Fig. 10—Block relays nonoperated by inserting a toothpick between the armature and the core. Block relays operated by inserting a toothpick between the armature backstop bracket and the armature.

3.13 **186-type Relays:** Fig. 11—Block relays nonoperated by inserting the flat end of a toothpick between the armature and the frame. Take care to insert the toothpick at the corner of the armature, as shown in Fig. 11, and make sure that the toothpick is resting against the circular opening of the frame at a point above its center. Block relays operated by inserting the flat end of a toothpick above the counterweight pin and below the axis pin with the toothpick resting against the circular opening in the frame, as shown in Fig. 11.

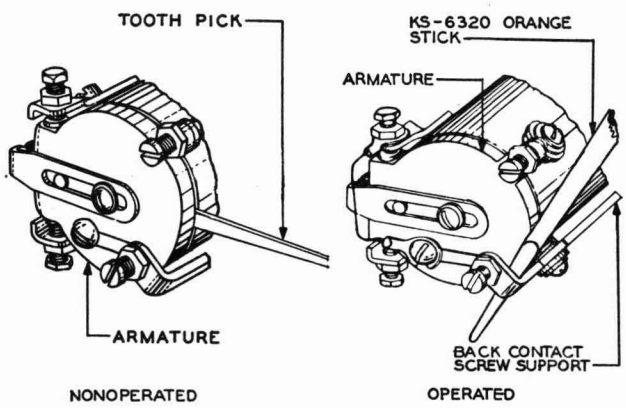

Fig. 9—Blocking 114-, 124-, 126-, 174-, and 198-type Relays

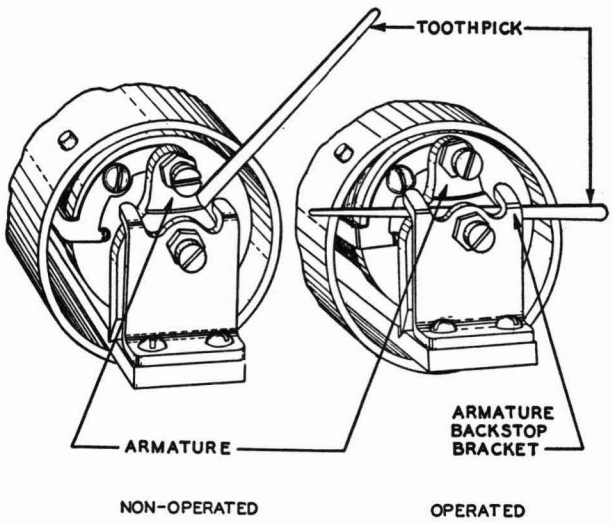

Fig. 10—Blocking 118-type Relays

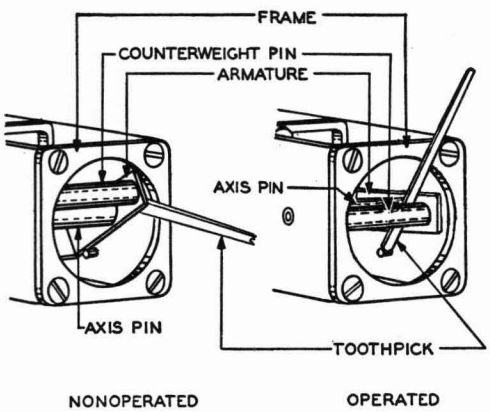

Fig. 11—Blocking 186-type Relays

3.14 **196-type Relays:** Fig. 12—Block relays nonoperated by inserting the pointed end of a toothpick between the armature and the core. Block relays operated by inserting the flat end of a toothpick between the armature and the back contact.

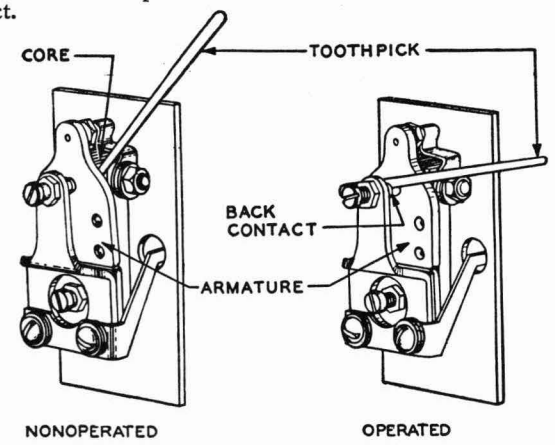

Fig. 12—Blocking 196-type Relays

3.15 **221-, 222-, 223-, 224-, 225-, 247-, and 248-type Relays:** Fig. 13—Block relays nonoperated, using a toothpick for relays where the armature travel is small and a KS-6320 orange stick where the armature travel is large. Insert the toothpick or orange stick between the armature and core. Block relays operated by manually operating the relays and then inserting the flat end of the toothpick or orange stick between the armature lever and the armature backstop.

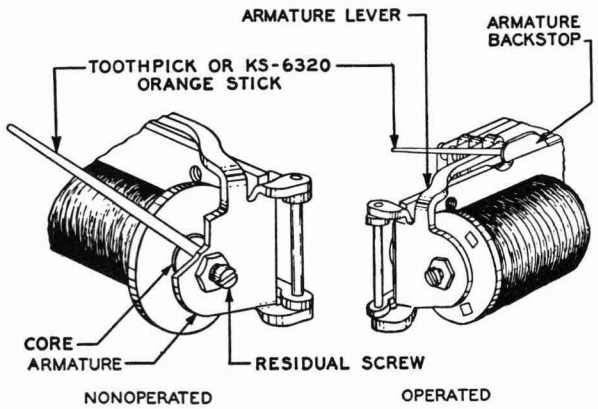

Fig. 13—Blocking 221-, 222-, 223-, 224-, 225-, 247-, and 248-type Relays

3.16 **Stromberg-Carlson 200-type Relays:** Fig. 14—Block relays nonoperated by inserting a toothpick between the armature and the core. Block relays operated by inserting a toothpick between the armature and the return pole piece.

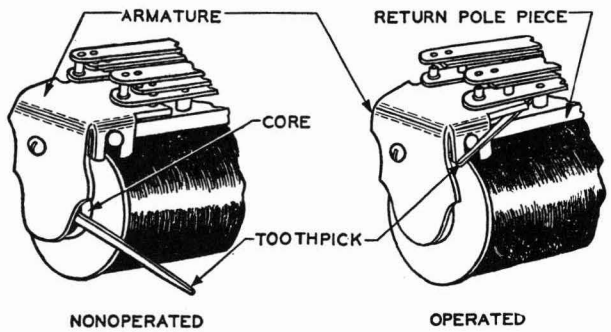

Fig. 14—Blocking Stromberg-Carlson 200-type Relays

Apparatus Other Than Relays and Drops

3.17 **Plunger-type Primary Line Switches (BCO Relay):** Fig. 15—To block the switch operated, block the BCO relay on the switch operated as follows. Place the pointed end of the No. 324 relay blocking tool behind the lever backstop adjacent to the end of the lever. Apply a sidewise pressure against the lever and pull the tool forward so that it is wedged between the lever backstop and lever. Do not manually operate the lever.

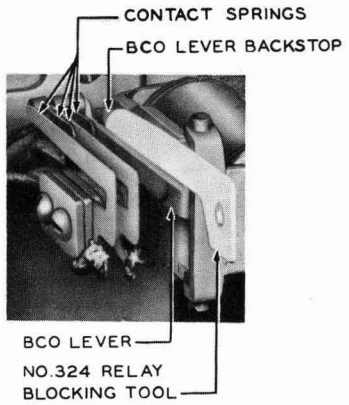

Fig. 15—Blocking Plunger-type Line Switch Operated

3.18 **300-, and Similar-type Switches:** Fig. 16—Block the holding magnet of switches nonoperated by applying the No. 558A armature blocking tool to the lower pole piece so that the blocking finger of the tool is between the end of the pole piece and the holding armature.

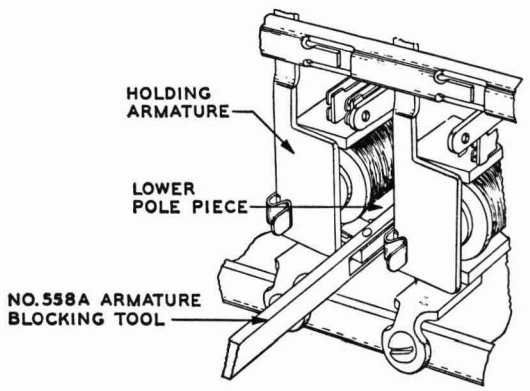

Fig. 16—Blocking 300- and Similar-type Switch Holding Magnets Nonoperated

3.19 **324-, and Similar-type Switches:** Fig. 17—Using a 1-1/2-inch length cut from the end of a KS-6320 orange stick, block the holding magnet nonoperated by inserting the flat end of the orange stick between the core and the holding armature with the other end of the stick resting on the retaining lug of the adjacent holding magnet stop bracket, as shown in Fig. 17. When blocking the holding magnet at the right-hand side of the switch nonoperated, place the flat part of the orange stick between the core and the holding armature at an angle of approximately 45 degrees above horizontal.

Caution: Insert the orange stick at an angle so that it does not snag on the outer edge of the stop plate.

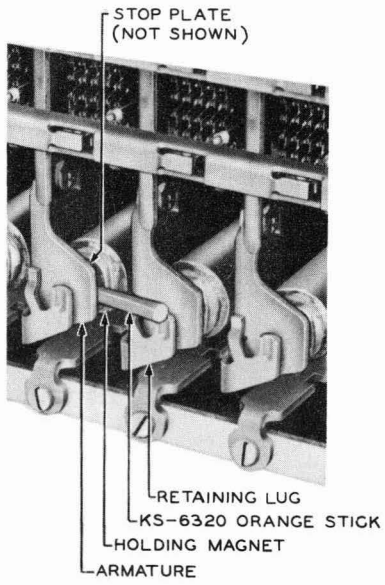

Fig. 17—Blocking 324- and Similar-type Switch Holding Magnets Nonoperated

4. INSULATING AND BLOCKING CONTACTS AND SPRINGS

Relay Contacts

4.01 **General:** When it is necessary to insulate contacts, a good grade of bond paper shall be used except when optional methods are specified for insulating by blocking individual contacts. KS-7187 Bell Seal bond paper provided in strips 1/2 inch wide and 2-1/2 inches long is generally suitable for use on relays except wire spring types for which a special shape of insulator is required. Procedures for insulating contacts and blocking springs on typical relays are given in the following paragraphs and illustrated in associated figures. Before removing a paper insulator from between contacts, relieve pressure of the contacts against the insulator. In preparing KS-7187 paper for insulating contacts, avoid lint by cutting instead of tearing the strips to the required size.

4.02 **Insulating Contacts of Relays Except Wire Spring Types:** Cut the strip of KS-7187 paper to the required size. Fold the paper and insert it between the contacts, as shown for typical relays in Figs. 18, 19, 20, and 21. When insulating normally closed contacts, manually operate the relay before inserting the paper.

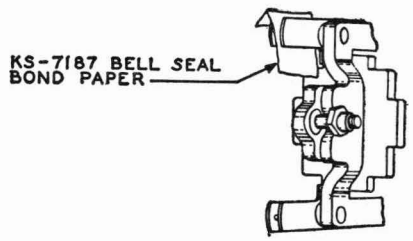

Fig. 18—Insulating Contacts of Relays in General (R-type Relay Illustrated)

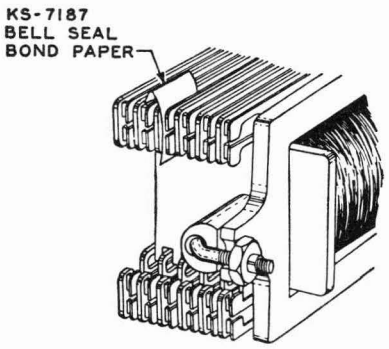

Fig. 19—Insulating Contacts of U-, UA-, and Y-type Relays

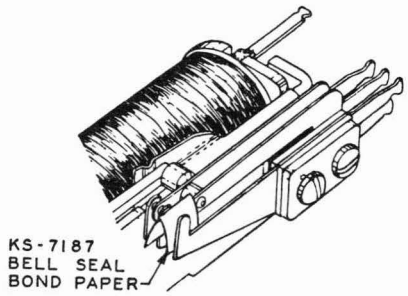

Fig. 20—Insulating Contacts of 221-, and Similar-type Relays

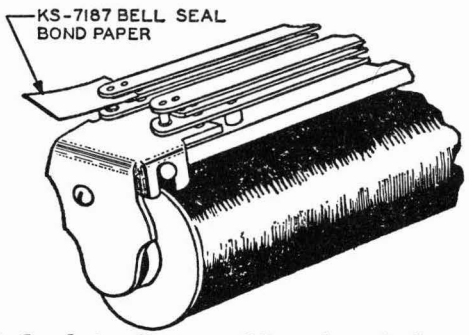

Fig. 21—Insulating Contacts of Stromberg-Carlson 200-type Relays

4.03 **Insulating Contacts of AF-, AG-, and AJ-type Relays (Wire Spring Types):** Fig. 22.

(1) Use the KS-14737, List 1 paper insulator, as covered in (3). The procedures for insulating normally open or normally closed contacts are the same, except in the case of normally closed contacts, block the relay operated as covered in 3.07. Remove the blocking tool after the insulator has been positioned between the contacts.

(2) The KS-14737, List 1 paper insulator is a small bond paper insulator folded down the middle with two ears folded out at one end. When the main folds are held together, the insulator assumes the shape of a Y. In order to avoid contaminating these insulators, they should be kept in their container until required for use.

(3) To insulate a contact, first remove the contact cover from the relay. Remove an insulator from the container with the KS-8511 tweezers, taking care not to damage or soil the insulator. Hold the insulator with the tweezers from the side opposite the center fold with the tip of the tweezers approximately at the center of the insulator. Check that the ears are in a position so that the insulator is in the form of a Y, and if necessary, bend the ears to this shape. Place the ears of the insulator against the fixed contact at an angle of approximately 45 degrees to the movable contacts, as shown in Fig. 22. Position the insulator so that the main folds are between the twin movable contacts with the ears against the fixed contact. After the insulator has been partially inserted in this way, push it back against the card with the side of the tweezers. Remount the contact cover.

(4) To remove an insulator, first remove the contact cover. Then remove the insulator with the tweezers, manually operating the relay if the insulator is between break contacts. Remount the cover.

Note: Do not use an insulator more than once.

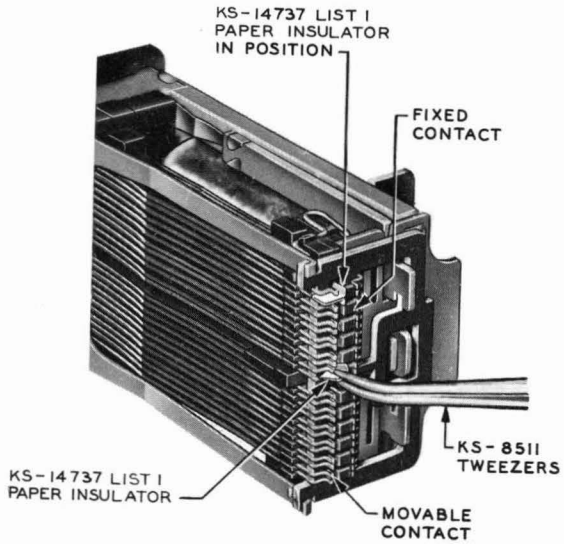

Fig. 22—Insulating Contacts of Wire-spring-type Relays (AJ Type Illustrated)

4.04 **Blocking Contacts of E-, and Similar-type Relays:** Fig. 23—Block normally closed contacts open or normally open contacts so they cannot close by inserting a toothpick between the springs or between the spring tang and the spoolhead.

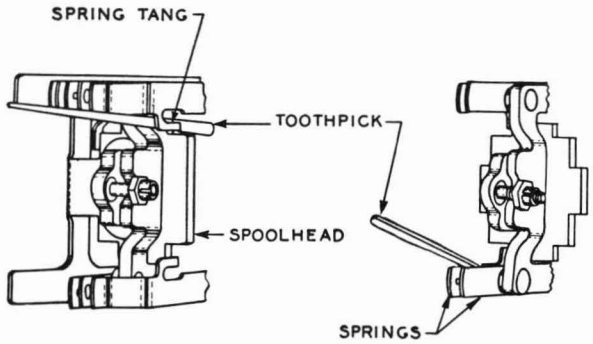

Fig. 23—Blocking Contacts of E- and Similar-type Relays

4.05 **Blocking Contacts of 125- and Similar-type Relays:** Fig. 24—Block individual contacts with a toothpick, as shown in Fig. 24.

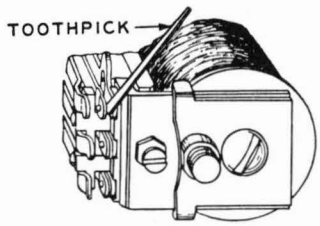

Fig. 24—Blocking Contacts of 125- and Similar-type Relays

4.06 **Insulating Rotor Brushes on 200-, 206-, 209-, and 211-type Selectors:** To insulate a rotor brush, cut a strip of KS-7187 Bell Seal bond paper crosswise into two pieces of approximately equal length. Fold one of the pieces at the center by bringing the two ends together. Rotate the selector manually until the rotor brushes are approximately horizontal. Place the folded strip of paper over the feeder brush associated with the rotor brush to be insulated and the first bank terminal so that the sides of the V formed by the paper lie one on each side of the row of bank terminals, and the apex of the V rests against the feeder brush. Use of the KS-8511 tweezers and the KS-6320 orange stick will facilitate placing the paper in position. Manually step the selector until the tips (trailing edges) of the rotor brush rest on the paper over the first bank terminal. To remove the paper, step the selector manually until the brush is clear of the paper. Remove the paper with the tweezers.

REASONS FOR REISSUE

1. To add a paragraph covering care to be taken on relays equipped with armature stops and separators (1.05).
2. To revise the List of Tools and Materials (Part 2).
3. To revise the paragraph covering blocking of A-, AB-, E-, EA-, F-, H-, M-, R-, T-, and similar-type relays to include M-, AB-, and EA-type relays (3.01).
4. To revise the blocking information for L-, N-, and S-type relays (3.03).
5. To add blocking information for U-, Y-, UA-, 271-, and 282-type relays (3.04).
6. To add blocking information for U- and UA-type relays when the relays are equipped with attachable separators (3.05).
7. To add blocking information for Y-type relays when the relays are equipped with magnetic separators (3.06).
8. To add blocking information for AF-, AG-, and AJ-type relays (3.07).
9. To revise the blocking information for 114-, 124-, 126-, 174-, and 198-type relays (3.11).
10. To revise blocking information for 186-type relays (3.13).
11. To revise blocking information for 221-, 223-, 224-, 225-, 247-, and 248-type relays (3.15).
12. To add blocking information for plunger-type primary line switches (3.17).
13. To add blocking information for 300- and similar-type switches (3.18).
14. To add blocking information for 324- and similar-type switches (3.19).
15. To revise the information covering insulating contacts with paper (4.01) and (4.02).
16. To add information covering insulating contacts of AF-, AG-, and AJ-type relays (4.03).
17. To revise the information for insulating rotor brushes of 206- and similar-type selectors (4.06).