RELAYS

AF, AG, AND AJ TYPE

PIECE-PART DATA AND REPLACEMENT PROCEDURES

1. GENERAL

1.01 This section covers the information necessary for ordering parts to be used in the maintenance of AF-, AG-, and AJ-type relays. It also covers approved procedures for replacing these parts.

1.02 This section is reissued to:

- Cover the use of the 1017A and 1018A tool kits.
- Cover the use of the 4B clip.
- Delete Tables C and D.
- Revise Fig. 1.

Since this is a general revision, marginal arrows normally used to show changes have been omitted.

1.03 The 1018A tool kit, which is used only for replacing cards, is a part of the 1017A tool kit but may be ordered separately.

1.04 The older method of repairing wire spring relays using the 1014B Tool Kit is being retained in the section. It may be used where appropriate.

1.05 Part 2 of this section covers the piece-part numbers and the corresponding names of the parts which it is practicable to replace in the field in the maintenance of these relays. No attempt should be made to replace parts not designated. Part 2 also contains explanatory figures showing the different parts. This information is called Piece-Part Data.

1.06 Part 3 of this section covers the approved procedures for the replacement of the parts listed in Part 2. This information is called Replacement Procedures.

1.07 Before making any replacements on the apparatus covered herein, remove the circuit from service in accordance with approved procedures.

1.08 The material of the plastic cover, P-19A162, is replaced by a flame retardant transparent material. The replace date is governed by the depletion date of the formerly used material, with no change in the part number.

1.09 Before replacing an open coil, attempt to repair it by resoldering the leads at the eyelets, after removing the enamel with fine sandpaper. The eyelet hole, which is normally free of solder, may be filled with solder to restore continuity.

1.10 Complete relays of the same code should be purchased and disassembled in order to obtain the replacement parts for relays to be repaired.

1.11 All replacement coils should have the letter "R" stamped in a 1/4-inch high character on the front of the front spool head at the time of repair.

1.12 Some relays of types covered by this section have been purchased from companies other than Western Electric. These may be identified by corporate trade marks molded into the covers and stamped on the relays. Since part designation numbers stamped on individual piece parts in these relays may not always correspond to numbers referenced in this section, when piece part replacements are necessary, an equivalent Western Electric-made relay should be examined for the part numbers of the proper parts.

2. PIECE-PART DATA

2.01 The figures included in this part show the various piece parts in their proper relation to other parts of the relay. The piece-part numbers of the various parts are given together with the names of the parts as listed by the Western Electric Company Merchandise Department. When these names differ from those in general use in the field, the latter names in some cases are shown in parentheses.

2.02 When ordering parts for replacement purposes, give both the piece-part number and the name of the part, for example, "P-19A132 Card." Do not refer to the BSP number or to any information shown in parentheses following the piece-part number.

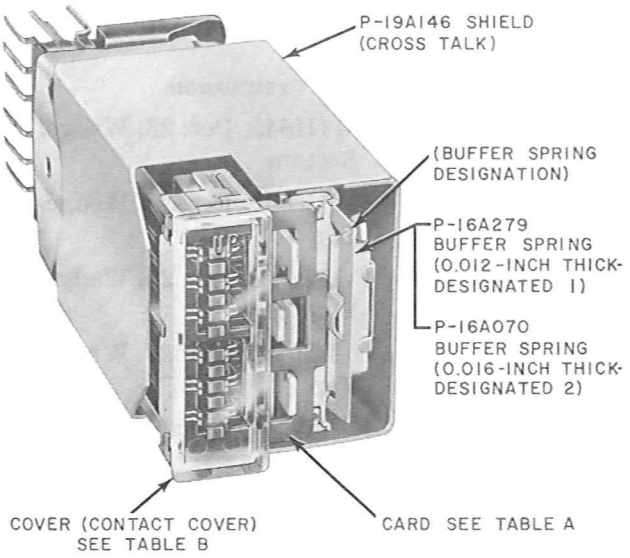

Fig. 1—12-Position Relay—General View

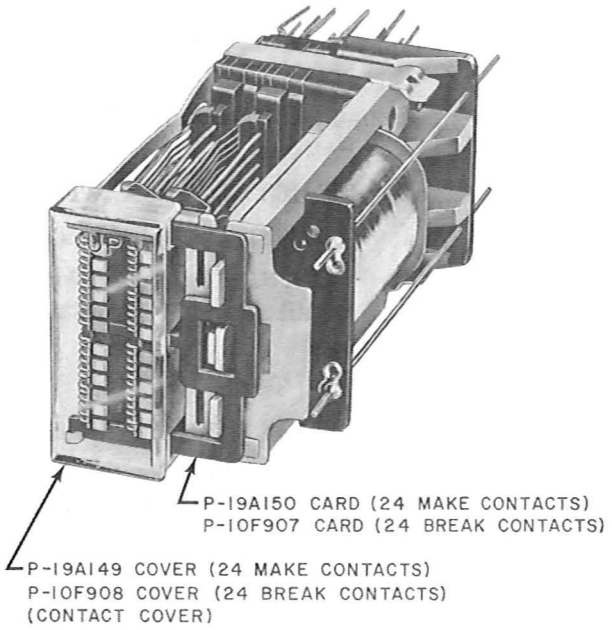

Fig. 2—24-Position Relay—General View

TABLE A

*CARD IDENTIFICATION NUMBER (12-POSITION RELAY)	CARD PIECE-PART NUMBER
0	P-19A130 Card
1	P-19A131 Card
2	P-19A132 Card
3	P-19A133 Card
4	P-19A134 Card
5	P-19A135 Card
6	P-19A136 Card
7	P-19A137 Card

* The identification number is stamped on each card and is located in the lower right-hand corner with the card properly mounted on the relay. Order the replacement card by the piece-part number corresponding to the identification number on the card to be replaced.

TABLE B

**P-16A144 Cover	Without metal frame — used on 12-position relays having a contact cover spring
**P-10F098 Cover	With metal frame — used on 12-position relays not having a contact cover spring.

**These covers are not interchangeable.

3. REPLACEMENT PROCEDURES USING 1017A and 1018A TOOL KITS

3.01 List of Tools

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
1017A	Tool Kit (Includes 1018A Tool Kit) (Consists of the following)

AMT	DESCRIPTION
1	Case, Carrying, KS-20499 L1
1	P-11H619, Det. 1, Retainer, Wedge Support Assembly
2	P-11H620, Det. 2, Spacer Nut
1	P-11H621, Det. 3, Post, Anchoring
2	P-11H622, Det. 4, Stud, Spacing
1	P-11H623, Det. 5, Wedge Inserter Assembly
4	P-12B536, Det. 6, Tubes with plastic container, P-12B537
1	P-11H624, Det. 7, Yoke Assembly
4	P-11H625, Det. 8, Insulator
2	P-11H627, Det. 10, Retainer Assembly
2	P-11H628, Det. 11, Retainer, Stud Spacer
1	P-11H629, Det. 12, Support, Top Wedge
1	P-11H634, Det. 17, Support, Bottom Wedge
1	P-11H635, Det. 18, Bracket Assembly
1	P-11H613, Det. 15, Bracket
1	P-11H636, Det. 19, Clip
1	P-11H637, Det. 20, Wedge, Top
1	P-11H644, Det. 21, Wedge, Bottom
1	P-11H638, Det. 22, Wedge, Top
1	P-11H645, Det. 23, Wedge, Bottom
1	P-11H639, Det. 24, Wedge, Top
1	P-11H646, Det. 25, Wedge, Bottom
1	P-11H640, Det. 26, Wedge, Top
1	P-11H647, Det. 27, Wedge, Bottom
1	P-11H641, Det. 28, Wedge, Top
1	P-11H648, Det. 29, Wedge, Bottom
1	P-11H642, Det. 30, Wedge, Top
1	P-11H649, Det. 31, Wedge Bottom
1	P-11H643, Det. 32, Wedge, Top
1	P-11H650, Det. 33, Wedge, Bottom
1	P-11H632, Det. 34A, Wedge
1	P-11H651, Det. 34B, Wedge
1	P-12B564, Plastic Box for Details 7 and 19, and 630A tool
1	628A, Tool
1	Tool Kit, 1018A consisting of:
	1 P-11H630, Detail 13, Comb
	1 P-11H631, Detail 14, Comb
	1 P-11H633, Detail 16, Lifter
	1 840440168, Detail 35, Lifter
	1 840286199, Detail 36, Lifter
	1 840286207, Detail 37, Comb
	1 840286215, Detail 38, Comb Lifter

CODE OR SPEC NO.	DESCRIPTION
KS-6320	Orange Stick
KS-8511	Tweezers
—	P Long-nose Pliers
—	6-inch C Screwdriver

3.02 Figure 3 shows the tools comprising the 1017A and 1018A Tool Kits.

3.03 No replacement procedures are specified for screws or other parts where the replacement consists of a simple operation.

3.04 After making any replacement of parts of an AF-, AG-, or AJ-type relay, the part or parts replaced shall meet the readjust requirements involved as specified in Section 040-502-701. Other parts whose adjustments may have been directly disturbed by the replacing operations shall be checked to the readjust requirements and an overall operation check shall be made of the relay before restoring the circuit to service.

3.05 ***Crosstalk Shield:*** To replace a crosstalk shield, remove the contact cover. Grasp the upper or lower right side of the shield with the P long-nose pliers and pull the shield straight out from the relay. To mount the new shield, hold it with the shield spring to the right. Tilt the shield slightly to the left, keeping the spring against the spoolhead in order to avoid shorting the make contacts. Push the shield in until the left edge of the shield clears the front edge of the cover guide. Then swing the front of the shield to the right so that the shield is approximately in line with the relay and push the shield on the relay until the crimped end of the spring engages the core plate. Remount the contact cover.

3.06 ***Buffer Spring***

(a) ***Removing Buffer Spring:*** If the relay is equipped with a crosstalk shield, remove it as covered in 3.05. If the buffer spring is positioned by the core plate, disengage the lugs on the upper positioning arm from the core plate using a KS-6320 orange stick and pull the upper part of the spring slightly forward. Similarly disengage the lower lugs and pull the spring straight out. If the buffer spring is positioned by the spoolhead, disengage the upper leg of the buffer spring from the spoolhead by pressing the leg gently toward the core with the KS-6230 orange stick and pull the upper

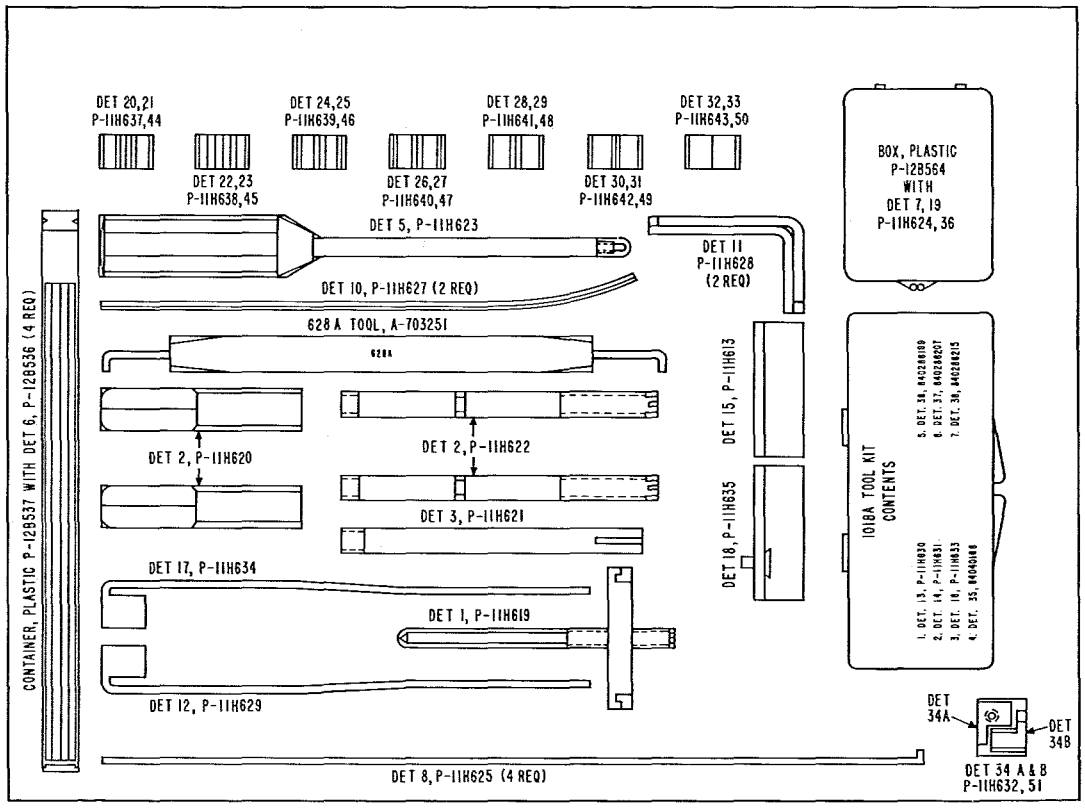

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Fig. 3—1017A Tool Kit Including 1018A Tool Kit

part of the spring slightly forward. Similarly disengage the lower leg and pull the spring straight out.

(b) ***Mounting Buffer Spring:*** Holding the buffer spring with the operating lug toward the relay card, insert the positioning arms between the spoolhead and the outer legs of the core. Carefully push the buffer spring inward, deflecting it slightly to the right to engage the positioning lugs on the core plate. Check the requirements for buffer spring position and tension covered in Section 040-502-701.

3.07 ***4B Cover Clip,*** Fig. 4 is used to minimize displacement of operating cards, contacts covers, and contact springs of wire spring relays during shipping and handling.

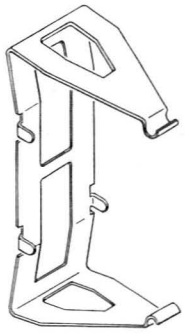

Fig. 4—4B Clip

(a) ***Removing Clip:*** Insert the tip of a KS-6854 screwdriver between the upper end of the 4B clip and relay cover. A slight twist will disengage the tang. Slide the clip out and down to disengage bottom tang.

(b) ***Mounting clip:*** Slide clip over the lower end of the contact cover enough to engage the tang. Press the upper end over the contact cover until the top tang engages with a snap.

CARD REPLACEMENT—12 POSITION RELAYS

Removing Contact Cover, Crosstalk Shield, and Buffer Spring and 4B Clip.

3.08 Remove the 4B clip as covered in 3.07. Remove the contact cover. If the relay is equipped with a crosstalk shield, remove it as covered in 3.05. Remove the buffer spring, if provided, as covered in 3.06.

Stamping Relay Code on New Card

3.09 Note the code number and date of manufacture stamped on the card to be replaced. Before mounting the new card, stamp the code number and date on the card in the same location using the R-2315 lettering and numbering set. Make sure that this information is stamped on the same side (black side) of the new card as the single digit (0 to 6) located in the lower right-hand corner with the card in its proper position on the relay.

Disengaging Balancing Spring Legs

3.10 Disengage the blancing springs legs from the card as follows. Block the relay operated using the 768A tool. Holding the 628A balancing spring lifter in the left hand, insert the spring lifter next to the upper leg of the balancing spring with the end of the lifter just behind the comb. Roll the end of the lifter under this leg of the spring so that the spring rests in the groove of the lifter. Then draw the lifter forward to the position shown in Fig. 5. With the right hand, place the end of a KS-6320 orange stick on the top edge of the card in line with fixed contacts. Lift the spring upward with the tool and, at the same time, press the card downward with the orange stick. When the spring clears the top of the card, move it toward the left so that it is free of the card. Withdraw the spring lifter. When removing the lower leg of the spring, the procedure is the same except that the opposite end of the spring lifter is rolled over the top edge of the leg and pushed downward while the orange stick is pressed upward against the bottom edge of the card. Remove the wedge.

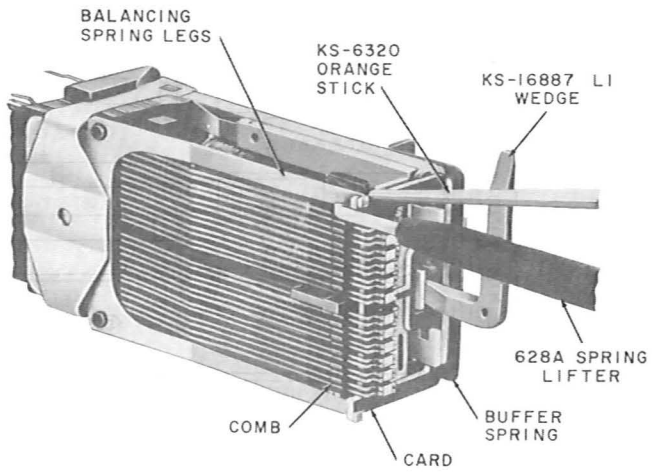

Fig. 5—Disengaging Balancing Spring From Card

3.11 On the top left side of the relay, with the taper of Detail 36 lifter facing to the left, place the lifter behind the card inserting it between the left movable twin contact springs and the fixed single contact springs as shown in Fig. 6. Push the lifter down until all the movable contacts are lifted away from the fixed contacts.

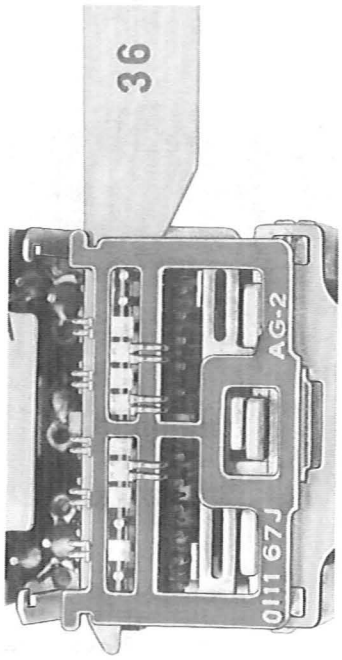

Fig. 6—Detail 36 Lifter in Place

3.12 Insert Detail 37 comb behind the card and in front of Detail 36 lifter, with the teeth facing the lifted movable contacts as shown in Fig. 7. The comb automatically will come to rest on the stop, and the movable contact springs will align in pairs between the teeth of the comb.

3.13 Remove Detail 36 lifter.

3.14 With the taper of Detail 38 comb lifter facing to the right, place the groove (on left side of Detail 38) over the right side of the protruding Detail 37 comb. Holding the comb with the left hand, slowly push the Detail 38 comb lifter down until all movable contacts springs are lifted in pairs as shown in Fig. 8.

3.15 On the top right side of the relay, insert Detail 13 comb behind the card with the teeth of the comb facing to the left and the slot

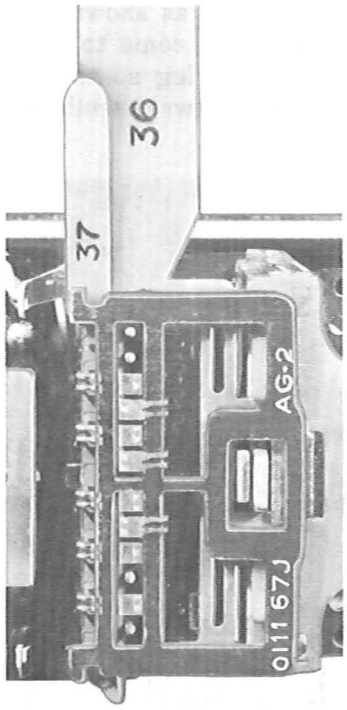

Fig. 7—Detail 37 Comb in Place With Detail 36 Lifter

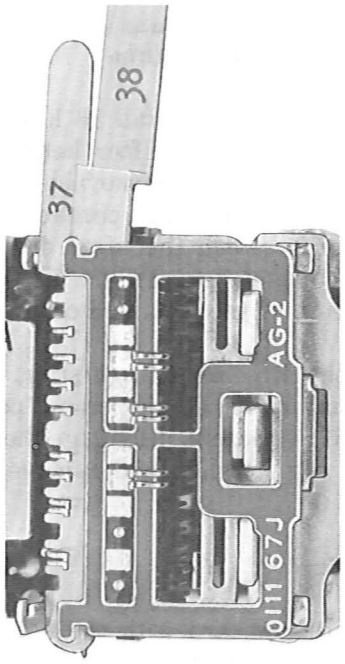

Fig. 8—Detail 38 Comb Lifter in Place with Detail 37 Comb

straddling the armature as shown in Fig. 9. The stop on the comb shall come to rest on the top edge of the armature leg so that the movable springs align in pairs between teeth of the comb.

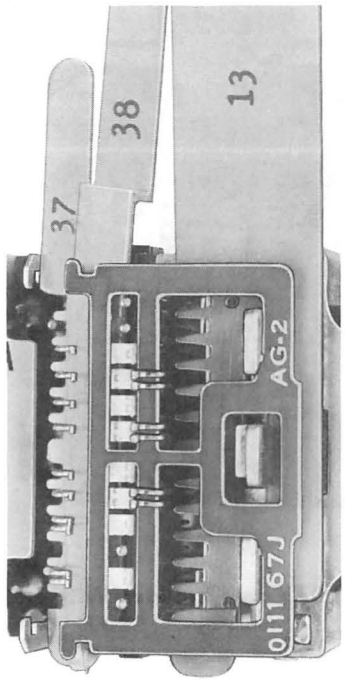

Fig. 9—Detail 13 Comb in Place with Detail 37 Comb and Detail 38 Comb Lifter

3.16 With the taper of Detail 16 lifter facing to the right, place the lifter behind the card inserting it between the right movable twin contact springs and the fixed single contact springs as shown in Fig. 10. Push the lifter down until all the movable contact springs are lifted in pairs between the teeth of the Detail 13 comb.

3.17 Using the KS-6320 orange stick, hold down the armature in the unoperated position and with the KS-8511 tweezers, disengage the card from the armature leg notches and remove the card. See Fig. 11.

Replacing the Card

3.18 Hold the new card with the notches to the left and the stamped information on the card visible. Insert the left vertical section of the card between the movable and fixed contacts. Hold the armature against the armature backstop with the KS-6320 orange stick and with the other hand position the card on the legs of the armature.

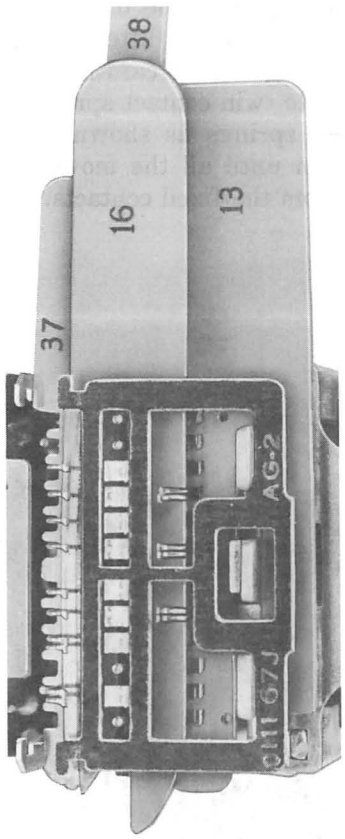

Fig. 10—Detail 16 Lifter in Place with Detail 13 Comb, Detail 37 Comb and Detail 38 Comb Lifter

Release the armature and move the card up and down until the projections on the card engage the notches in the outer legs of the armature.

3.19 Remove Detail 16 lifter carefully so that all contacts fall back into their respective positions. Remove Detail 13 comb.

3.20 Hold Detail 37 comb with the left hand and carefully remove Detail 38 comb lifter. Replace Detail 36 lifter as outlined in 3.11. Remove Detail 37 comb and then remove Detail 36 lifter carefully so that all contacts fall back into the respective positions.

3.21 Reattach balancing springs to card and replace cover.

CARD REPLACEMENT—24-POSITION BREAK CONTACT RELAYS

3.22 Release balancing springs as covered in 3.10.

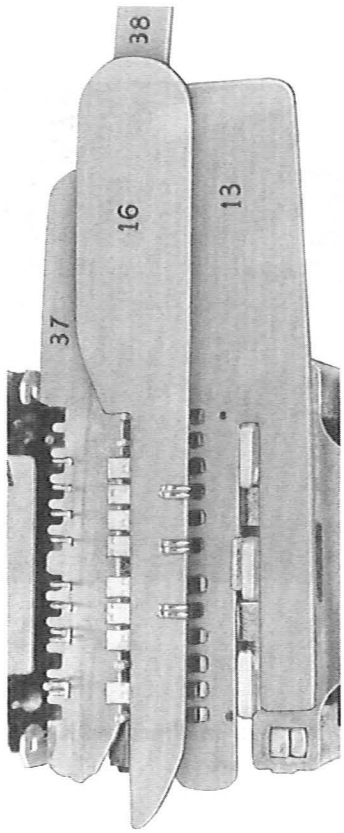

Fig. 11—Card Removed

3.23 On the top left side of the relay with the taper of Detail 35 lifter facing to the right, place the lifter behind the card inserting it between the movable twin contact springs and the fixed single contact springs. Push the lifter down until all the movable contacts are lifted from the fixed contacts.

3.24 Follow the procedures outlined in 3.15, 3.16, 3.17, 3.18, and 3.19.

3.25 Remove Detail 35 lifter carefully so that all contacts fall back into their respective positions.

3.26 Reattach balancing springs and replace cover.

CARD REPLACEMENT—24-POSITION MAKE CONTACT RELAYS

3.27 Release balancing springs as covered in 3.10.

3.28 Follow the procedures outlined in 3.11, 3.12, 3.13, and 3.14.

3.29 With the taper of Detail 35 lifter facing to the left, place the lifter behind the card inserting it in the right hand row of contacts between the movable twin contact springs and the fixed single contact springs. Push the lifter down until it comes to rest and all movable contacts are lifted.

3.30 With the KS-6320 orange stick, hold down the armature in the unoperated position and with the KS-8511 tweezers disengage the card from the armature leg notches and remove the card.

3.31 To insert a new card, follow the procedures outlined in 3.18.

3.32 Remove Detail 35 lifter carefully so that all contacts fall back into their respective positions.

3.33 Follow procedure outlined in 3.20.

3.34 Replace balancing springs and replace cover.

REPLACEMENT OF COIL AND ARMATURE ASSEMBLY—12-POSITION AND 24-POSITION RELAYS

3.35 To obtain replacement parts for each relay to be repaired, a complete relay of the same code should be purchased and disassembled.

3.36 All replacement coils should have the letter "R" stamped in a 1/4-inch high character on the front of the front spool head at the time of replacement.

3.37 Remove 4B clip as covered in 3.07. Remove contact cover and, if provided, crosstalk shield and buffer springs as covered in 3.05 and 3.06.

3.38 Disengage the balancing spring legs from the card as covered in 3.10.

3.39 Remove the card as covered in 3.11 through 3.30.

Removing the Core or Armature Assembly and Coil of Relays Mounted on 2-Inch Wide Plates and on Wide Plates

3.40 ***Relays Mounted on 2-Inch Wide Plates:***

(a) Nominal 7/32-inch horizontal separation between relays

(b) Blank position to left of relay

(c) Other apparatus to left of relay

(d) Relay in extreme left mounting position

(e) Relay to be repaired with empty holes of wire spring relay to the left.

3.41 ***Relays Mounted on Wide Plates:***

(a) Nominal 7/32-inch horizontal separation between relays

(b) Relay in extreme left mounting position

(c) Relay to be repaired with empty holes of a wire spring relay to the left.

3.42 ***Preparation of Wiring and Cabling:*** Remove components and wiring connected to the winding terminals of the relay to be repaired. Remove excess solder from terminals or cut off terminals flush with mounting plate to permit terminals to be drawn through holes in the relay mounting bracket in subsequent operations.

3.43 If the wiring to relays mounted on 2-inch wide plates does not permit moving the mounting plate forward at least 1 inch, cut the cable stitching and reposition the cable. It is not necessary to disturb the wiring or cabling for relays mounted on wide plates.

3.44 If the relay to the left of the relay being repaired has more than one winding, the secondary and tertiary terminals will interfere with the subsequent wedging operation.

Caution: Unsolder and remove these terminals using care to avoid damage to the coil lead wires and connections.

3.45 ***Positioning of Mounting Plate:***

(a) Remove the upper mounting plate screws and loosen the lower screws several turns. Insert the short thread end of the Detail 4 studs through the upper mounting holes at both ends and screw into frame as shown in Fig. 12.

(b) Place an 0.020-inch by 4-inch by 18-inch acetate strip on top of the row of relays on the mounting plate below the relay being repaired.

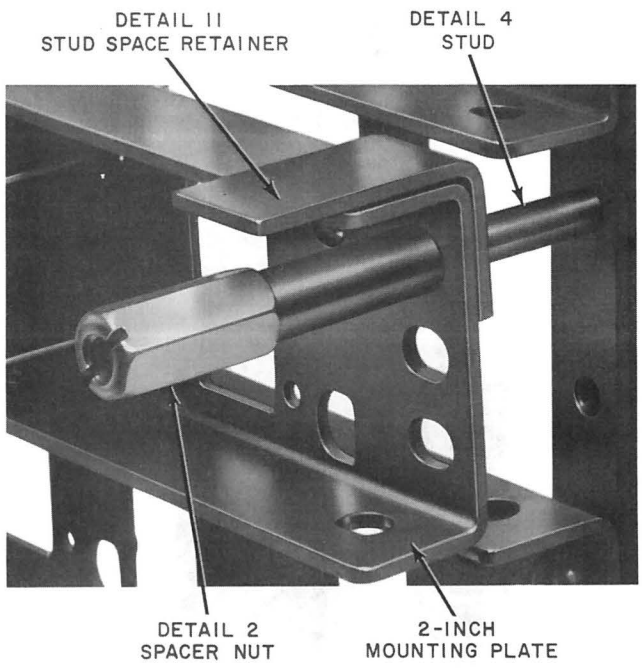

Fig. 12—Detail 4 Stud in Place with Detail 11 Stud Space Retainers

This will avoid short circuiting of damaging the relays.

(c) Remove lower mounting plate screws.

(d) Move the mounting plate forward approximately 1 inch until the edge is beyond the grooves in the upper Detail 4 studs.

(e) Insert the Detail 11 stud spacer retainers behind the mounting plate into the grooves of the Detail 4 studs as shown in Fig. 12.

(f) If the relay being repaired is at the left end of the mounting plate, place the Detail 18 wedging bracket over the left Detail Stud as shown in Fig. 13. The wedging bracket is not required for relays in other mounting positions.

(g) Screw the Detail 2 spacer nuts onto the Detail 4 studs at both ends of the mounting plate and tighten. See Fig. 14.

(h) Insert the Detail 3 anchoring post into the left Detail 2 spacer nut and hand tighten. See Fig. 15.

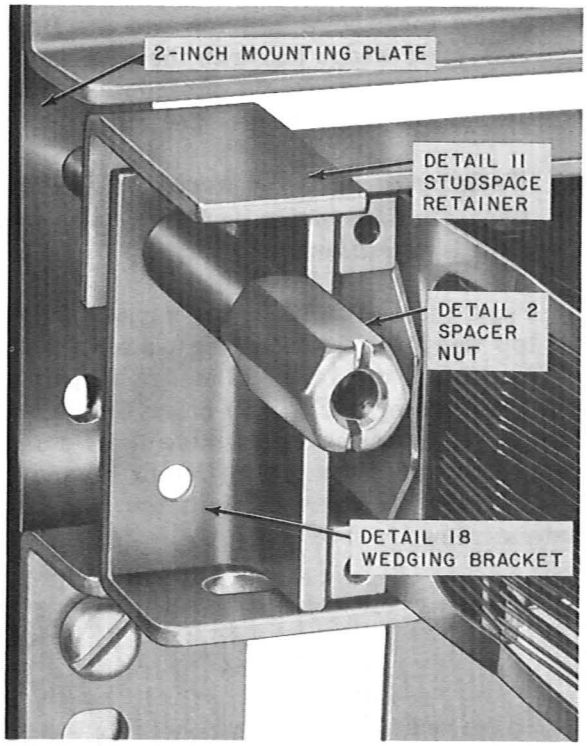

Fig. 13—Detail 18 Wedging Bracket in Place Over Left Detail 4 Stud

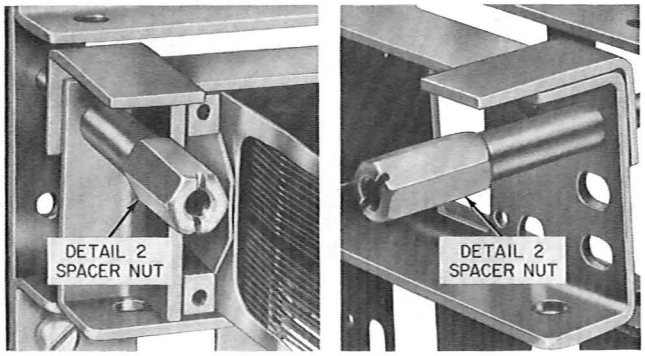

Fig. 14—Detail 2 Spacer Nuts in Place

(i) To make the relay being repaired more accessible, loosen the mounting screws 1-1/2 turns on the plates above and below the relay; also loosen the mounting screws of the relay to its right.

Wedging

3.46 Procedures for wedging a relay to be repaired depend upon the position in which the relay is mounted on the mounting plates. These different positions are outlined in 3.40 and 3.41.

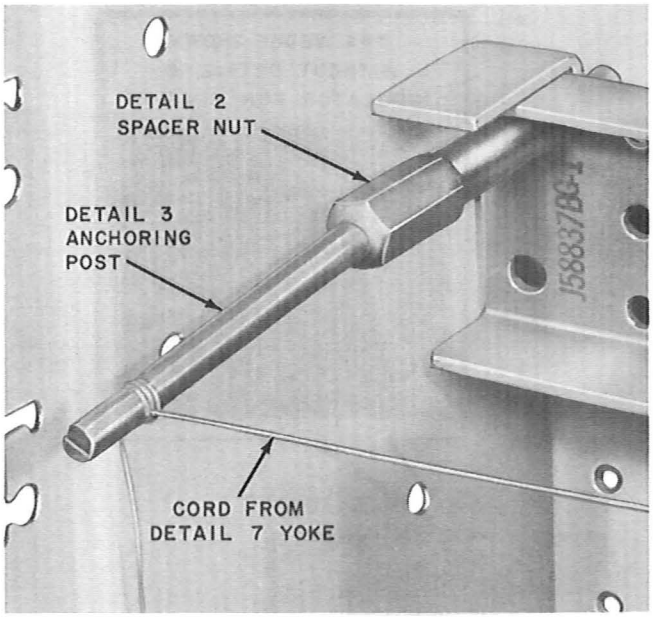

Fig. 15—Detail 3 Anchoring Post Inserted in Left Detail 2 Spacer Nut

3.47 Wedging of relay mounted on a a 2-inch wide plate with nominal 7/32-inch separation between relays is as follows:

(a) Place Detail 8 insulator over the winding terminals of the relay to the left of the relay be repaired. Place with the 1/8-inch long leg in an up-position on the upper terminal and in a down-position on the lower terminal. See Fig. 16.

(b) Screw the Detail 5 wedge inserter into the Detail 34A upper wedge. With its wide end down, force the wedge between the clamping spring of the relay being repaired and the core of the relay to its left. See Fig. 16. After the wedge is firmly in place, unscrew the wedge inserter.

Note: If the relays are too closely spaced to permit normal insertion of the wedges, loosen the mounting screws of both relays and reposition the relays to increase the separation. Follow the same procedure to decrease the separation if the wedges do not sufficiently compress the clamping spring to permit its tabs to be readily disengaged from the core grooves on the right side of the relay.

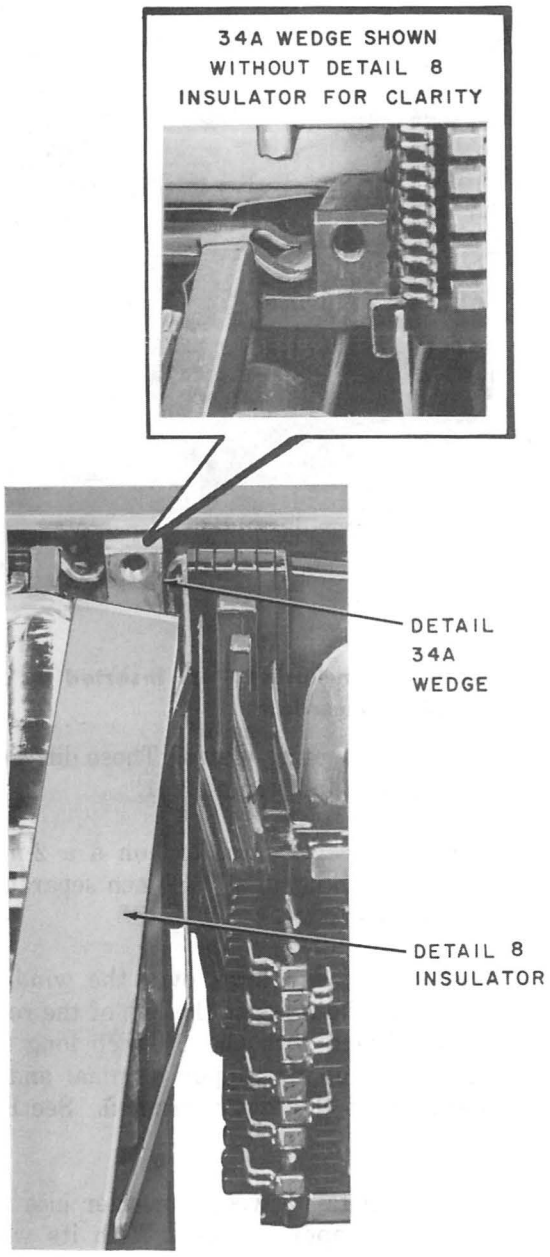

Fig. 16—Details 34A and 34B Wedges in Place With Detail 8 Insulators (34B not shown)

Note: In the event that the relay to the left of the relay being repaired has four terminals wires, it will be necessary to remove temporarily the upper and lower terminal rods during the repair operation. This removal of the terminal rods is necessary for proper wedging of the relay being repaired. After repair is made, make sure terminals rods are replaced.

(c) Screw the wedge inserter into the Detail 34B lower wedge and with the wide end up, insert the wedge using the procedure followed in inserting the upper wedge. See Fig. 16.

3.48 ***Wedging of Relay on 2-inch Wide Plates With Blank Position or Other Apparatus to the Left is as Follows:***

(a) Place the Detail 12 wedge support on the top flange of the mounting plate as shown in Fig. 17 and the Detail 17 wedge support on the lower flange (Fig. 17) close to the left corners of the relay. Assemble the Detail 1 wedge support assembly to Details 12 and 17 and tighten the screw against the mounting plate as shown.

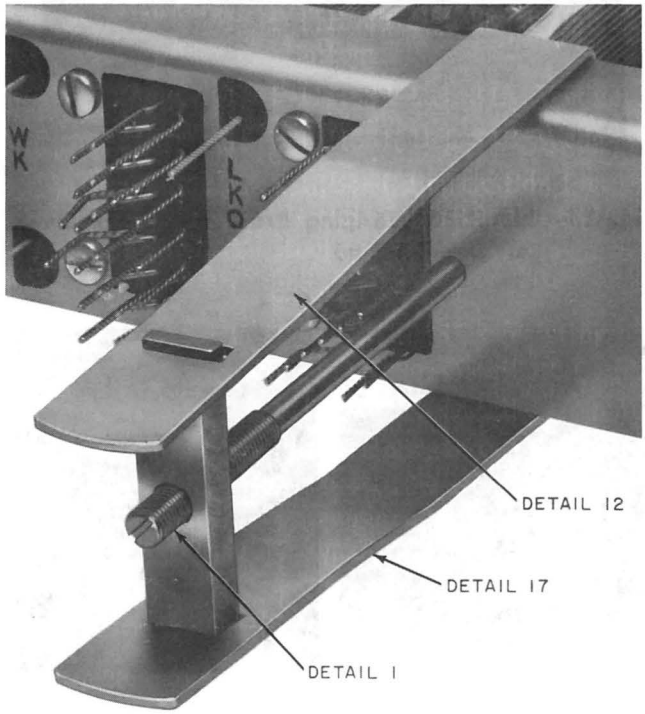

Fig. 17—Detail 12 Wedge Support, Detail 17 Wedge Support, and Detail 1 Wedge Support Assembly

(b) Use the Detail wedge inserter to force Details 20 to 33 wedges of sufficient thickness to compress the relay clamping spring between the spring and the wedge supports as shown in Fig. 18.

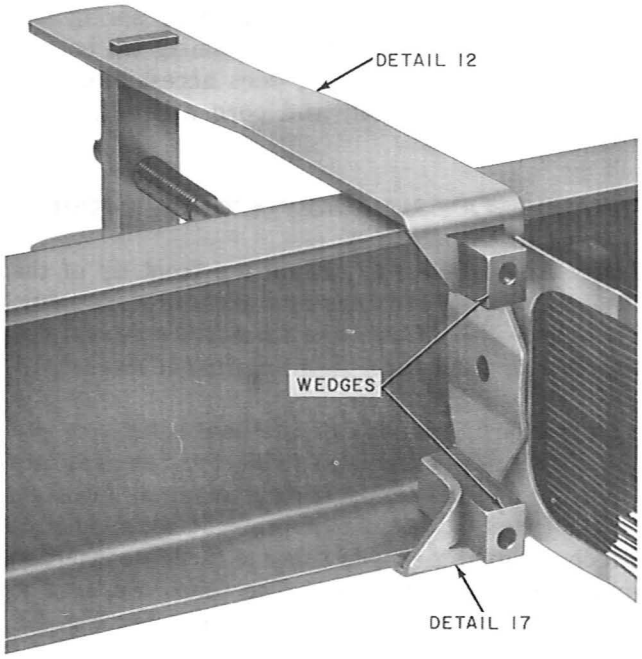

Fig. 18—Wedges in Place W/Details 12 and 17

3.49 ***Wedging of Relay on 2-Inch Wide Plate With Relay in Extreme Left Position is as follows:***

(a) Place Detail 18 wedging bracket on Detail 4 stud and then fasten Detail 2 spacer nut as shown in Fig. 19.

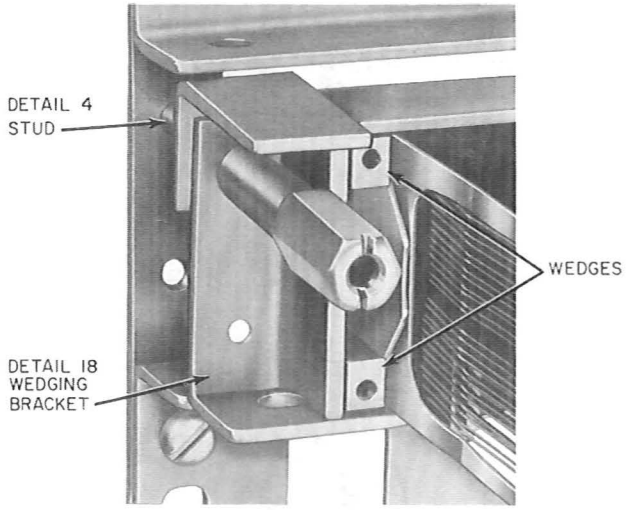

Fig. 19—Detail 18 Wedging Support on Detail 4 Stud

(b) Use the Detail 5 wedge inserter to force Details 20 to 33 wedges of sufficient thickness to compress the relay clamping spring between the spring and the Detail 18 wedging bracket on the top and bottom. See Fig. 19.

3.50 ***Wedging of Relay on 2-Inch Wide Plate With Empty Mounting Holes of a Wire Spring Relay to the Left is as Follows:***

(a) Place Detail 15 wedging bracket to the left of the defective relay (Fig. 20) so that the flat upright of the angle shall provide a backing for the details 20 to 33 wedges against the clamping spring of the defective relay.

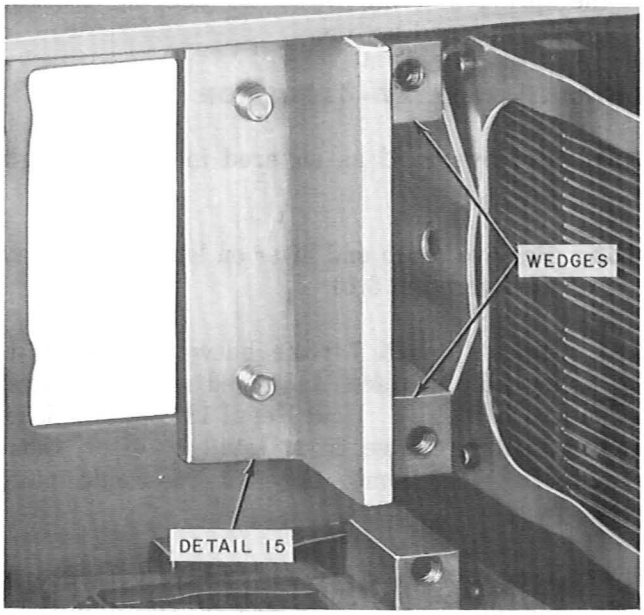

Fig. 20—Detail 15 Wedging Bracket in Place

The 2-threaded holes of the wedging bracket shall align with the empty mounting holes on the left next to the defective relay. Insert the mounting screws from the rear and tighten.

(b) Use the Detail 5 wedge inserter to force details 20 to 33 wedges of sufficient thickness to compress the relay clamping spring between the spring and the Detail 18A wedging bracket on the top and bottom.

3.51 ***Wedging a Relay Mounted in the Extreme Left Position on Greater Than 2-Inch Mounting Plates Provided the Mounting Plate is Mounted in the Front of the Bay.***

(a) Remove the mounting plate screws on the extreme left and place Detail 18 wedging bracket so that the dowel pin will fit into the lower mounting screw hole. Then place 12 12-24 by 3/8-inch long mounting screw in the upper hole and tighten the Detail 18 wedging bracket and mounting panel to the frame of the bay.

(b) Use the Detail 5 wedge inserter and force Details 20 to 33 wedges of sufficient thickness to compress the relay clamping spring between the spring and the Detail 18 wedging bracket both on top and bottom.

DISMANTLING RELAY—12 POSITION

3.52 Remove card as covered in 3.11 through 3.17.

3.53 Remove comb and lifter on left side of relay as covered in 3.20.

3.54 Insert Detail 7 yoke between the right movable contacts and fixed single contacts as shown in Fig. 21. Hold Detail 13 comb in place and carefully remove first Detail 16 lifter, then remove Detail 13 comb. All contacts should mate properly.

3.55 Tie Detail 7 yoke assembly to Detail 3 anchoring post using lock stitch. Pull only tight enough to release the pressure of the spring assembly against the core plate of the relay and tie. Clamp spring can now be released.

3.56 Using 6-inch C screwdriver, release clamp springs from coil, core and armature assembly.

3.57 Lift clamp springs, and remove defective coil, and core and armature assembly with a shaking motion.

3.58 Apply long-nose pliers to the clamping springs as close to the relay mounting bracket as possible and squeeze ends of clamping spring to the flange of the mounting plate. Then insert Detail 10 retainer between clamp spring end and mounting bracket as shown in Fig. 22. Use one retainer for retaining the top clamping spring and a second Detail 10 retainer for retaining the bottom clamping spring. This provides accessibility for new replacement coil, and core and armature assembly.

REPLACEMENT AND REASSEMBLY OR RELAY—12-POSITION

3.59 Apply Detail 19 clip on the front tip of the new coil, and core and armature assembly. This clip will hold both the armature core and coil together until all parts fit into terminal bracket.

3.60 Insert terminals of the new relay coil into Detail 6 tubes and guide the terminal into their respective holes in the terminal bracket. Upper Detail 6 tubes should protrude approximately 1 inch ahead of the lower tubes to facilitate insertion into the terminal bracket. The tubes are used to prevent shorting of the coil terminals. See Fig. 23.

3.61 Insert the new coil, and core and armature assembly.

3.62 Remove Detail 10 retainers, both top and bottom.

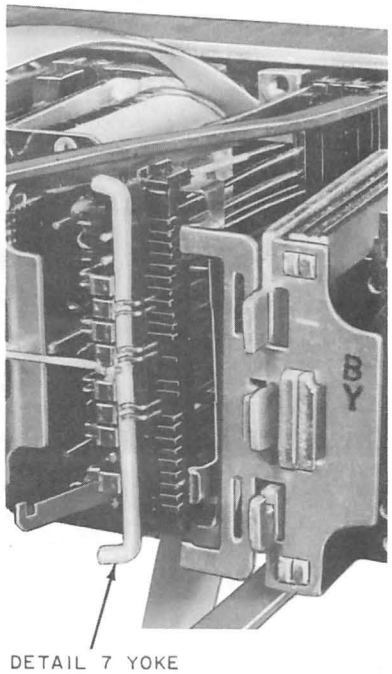

Fig. 21—Detail 7 Yoke in Place Between Contacts

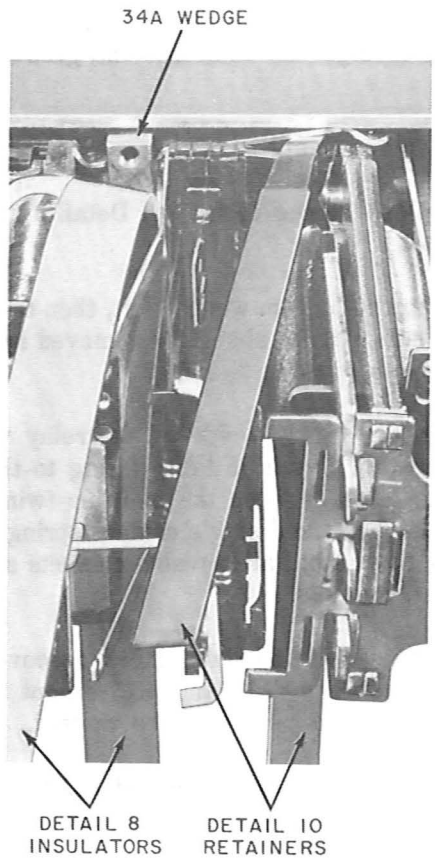

Fig. 22—Detail 10 Retainers in Place

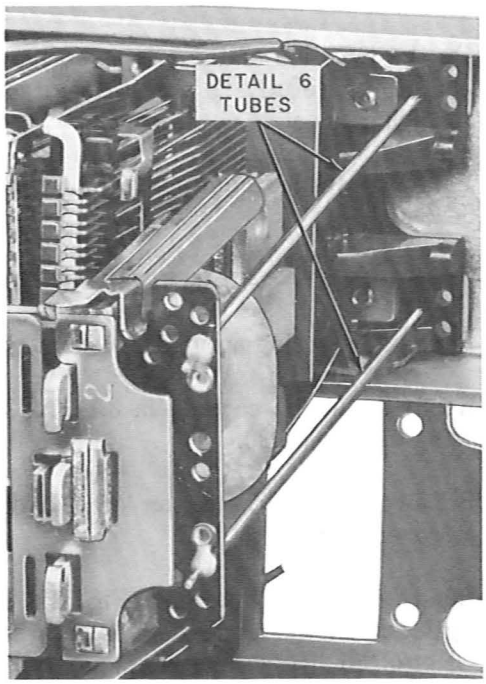

Fig. 23—Detail 6 Tubes on Terminal Rods

3.63 Using the C screwdriver, apply a force to both rear ends of the relay core close to the terminal bracket so that the tab ends of the clamping springs will snap into the grooves in the core.

3.64 Remove Detail 19 clip from armature.

3.65 Release lacing cord from Detail 3 anchoring post.

3.66 Remove bottom wedge first, then the top wedge. These wedges should be removed by pulling out cautiously without twisting.

3.67 Replace combs and lifters as covered in 3.11 through 3.16 except that the words "behind the card" should be omitted.

3.68 Remove Detail 7 yoke and proceed as covered in 3.18 through 3.21.

3.69 Remove Detail 6 guides.

3.70 Remove Detail 3 post, loosen Detail 2 spacer nut on both sides and remove Detail 11 clamps.

3.71 Replace mounting plate to its original position, replace bottom mounting screws, remove Detail 4 studs and replace with mounting screws.

3.72 Rewire relay coil terminals, check for mechanical and electrical adjustments. Put circuit designation on relay, and position and relace cabling.

DISMANTLING RELAY—24-POSITION BREAK RELAY

3.73 Remove balancing springs as covered in 3.10.

3.74 On the top left side of relay with the tape of Detail 35 lifter facing to the right, place the lifter behind the card inserting it between the movable contact springs and the fixed single contact springs. Push the lifter down until all movable contacts are lifted from the fixed contacts.

3.75 Remove the card as covered in 3.15, 3.16, and 3.17.

3.76 Remove comb and lifter as covered in 3.20.

3.77 Insert Detail 7 yoke on right side of fixed contacts. See Fig. 21. Holding Detail 13 comb in place, carefully remove Detail 16 lifter and then remove Detail 13 comb. All contacts should mate properly.

3.78 Tie Detail 7 yoke assembly to Detail 3 anchoring post using lock stitch. Pull only tight enough to release the pressure of the spring assembly against the core plate of the relay and tie. Clamp spring now can be released.

3.79 Using C screwdriver, release clamp springs from coil, and core and armature assembly.

3.80 Lift clamp springs, remove defective coil, and core and armature assembly.

3.81 Apply long-nose pliers to the clamping springs as close to the relay mounting bracket as possible and squeeze ends of clamping spring to the flange of the mounting plate. Then insert Detail 10 retainer between clamp spring and mounting bracket. See Fig. 22. Use one retainer for retaining the top clamping spring and a second retainer for retaining the bottom clamping spring. This provides accessibility for the new replacement coil, and core and armature assembly.

REPLACEMENT AND REASSEMBLY OF RELAY—24-POSITION BREAK CONTACT RELAY

3.82 Apply Detail 19 clip on the front tip of the new coil, and core and armature assembly. This clip will hold the armature core and coil together until all parts will fit into terminal bracket.

3.83 Insert terminals of new relay coil into Detail 6 tubes and guide the terminals into their respective holes in the terminal bracket. Upper Detail 6 tube shall protrude approximately 1 inch ahead of the lower tube to facilitate insertion into the terminal bracket. The tubes are used to prevent shorting of the coil terminals.

3.84 Insert the new coil, and core and armature assembly.

3.85 Remove Detail 10 retainers, both top and bottom.

3.86 Using the C screwdriver, apply a force to both rear ends of the relay core close to terminal bracket so that the tab ends of the clamping springs will snap into the grooves in the core.

3.87 Remove Detail 19 clip from armature.

3.88 Release lacing cord from Detail 3 anchoring post.

3.89 Remove bottom wedge first, then top wedge. These wedges should be removed by pulling out cautiously without twisting.

3.90 On the top left side of the relay with the taper of Detail 35 lifter facing to the right, insert the lifter between the movable twin contact springs and the fixed single contact springs. Push the lifter down until all movable contacts are lifted from fixed contacts.

3.91 Replace combs and lifters as covered by procedure in 3.15 and 3.16 except that the words "behind the card" shall be omitted.

3.92 Remove Detail 7 yoke and insert new card as covered in procedure in 3.18.

3.93 On the right side of the relay, remove Detail 16 lifter carefully so that all contacts fall back into their respective positions. Remove Detail 13 comb.

3.94 On the left side of the relay, remove Detail 35 lifter carefully so that all contacts fall back into their respective positions.

3.95 Follow procedure outlined in 3.69 through 3.72.

DISMANTLING RELAY—24-POSITION MAKE RELAY

3.96 Remove balancing springs as covered in 3.10.

3.97 Remove card as covered in 3.11, 3.12, 3.13, 3.14, 3.29, and 3.30.

3.98 Remove comb and lifter on left side of relay as covered in 3.20.

3.99 Insert Detail 7 yoke (see Fig. 21) on the right side of the fixed contacts and carefully remove Detail 35 lifter. All contacts shall mate properly.

3.100 Tie Detail 7 yoke assembly to Detail 3 anchoring post using lock stitch. Pull only tight enough to release the pressure of the spring assembly against the core plate of the relay and tie. Clamp spring can now be released.

3.101 Using the C screwdriver, release the clamp springs from the coil, and core and armature assembly.

3.102 Lift clamp springs, and remove defective coil, and core and armature assembly with a shaking motion.

3.103 Apply long-nose pliers to the clamping springs as close to the relay mounting bracket as possible and squeeze ends of clamping springs to the flange of the mounting plate. Then insert Detail 10 retainer between clamp spring and mounting bracket. See Fig. 22. Use one retainer for retaining the top clamping spring and a second retainer for retaining the bottom clamping spring. This provides accessibility for the new replacement coil, and core and armature assembly.

REPLACEMENT AND REASSEMBLY OR RELAY—24-POSITION MAKE CONTACT RELAY

3.104 Apply Detail 19 clip on the front of the new coil, and core and armature assembly. This clip will hold both the armature and coil together until all parts will fit into the terminal bracket.

3.105 Insert terminals of the new relay into Detail 6 tubes and guide the terminals into their respective holes in the terminal bracket. Upper Detail 6 tube shall protrude approximately 1 inch ahead of the lower tube to facilitate insertion into the terminal bracket. The tubes are used to prevent shortage of coil terminals.

3.106 Insert the new coil, and core and armature assembly.

3.107 Remove Detail 10 retainers both top and bottom.

3.108 Using the C screwdriver, apply a force to both rear ends of the relay core close to the terminal bracket so that the tab ends of the clamping springs will snap into the grooves in the core.

3.109 Remove Detail 19 clip from armature.

3.110 Release lacing cord from Detail 3 anchoring post.

3.111 Remove bottom wedge first, then the top wedge. These wedges shall be removed by pulling out cautiously without twisting.

3.112 Replace combs and lifter as covered by procedure in 3.11, 3.12, 3.13, 3.14, and 3.29 except that the words "behind the card" shall be omitted.

3.113 Remove Detail 7 yoke and then replace card as covered in 3.18.

3.114 On left side of relay, hold Detail 37 comb with the left hand and carefully remove Detail 38 comb lifter. Replace Detail 36 lifter as outlined in 3.11. Remove Detail 37 comb, then remove Detail 36 lifter carefully so that all contacts shall fall back into their respective positions.

3.115 On the right side of the relay, remove Detail 35 lifter carefully so that all contacts fall back into their respective positions.

3.116 Reattach the balancing springs.

3.117 Follow procedure outlined in 3.69 through 3.72.

4. REPLACEMENT PROCEDURES USING THE 1014B TOOL KIT

4.01 List of Tools and Materials

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
628A	Balancing Spring Lifter
629A	Spring Holder (positions 7 to 12 on 12-position relays)
629B	Spring Holder (positions 1 to 6 on 12-position relays)
630A	Spring Holder and Removable Clamp (positions 1 to 12 on 12- and 24-position relays)
652A	Spring Holder (positions 19 to 24 on 24-position relays)

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
652B	Spring Holder (positions 13 to 18 on 24-position relays)
656A (2 reqd)	Insulator
1014B	Tool Kit (see 3.02) (includes the following)

AMT	DESCRIPTION
1	20B Carrying Case Containing:
1	666B Core Plate Replacer
1	674A Spring Lifter
2	669A Contact Separators
1	715A Ratchet Handle
1	716A Ratchet Head
1	716B Ratchet Head
1	717B Coil Setter
1	P-12B564 Plastic Box (for wedges)
4	718A Wedges
1	P-12B537 Container (for terminal guide tubes)
8	P-12B536 Tubing (terminal guide tubes)
1	P-16A068 Container (for contact separators)

KS-6320	Orange Stick
KS-8511	Tweezers
KS-16887 L1	Wedge
R-1640	Center Punch
R-2315	Lettering and Numbering Set
—	P Long-nose Pliers
—	4-Inch E Screwdriver
—	4-Ounce Riveting Hammer
—	5-Inch Diagonal Pliers
MATERIALS	
KS-2423	Cloth
KS-7187	Bell Seal Bond Paper

4. REPLACEMENT PROCEDURES USING THE 1014B TOOL KIT

4.01 *List of Tools and Materials*

4.02 ***1014B Tool Kit:*** Fig. 24 shows the tools comprising the 1014B tool kit used for replacing coils on wire-spring type relays. The 666B core plate replacer, 669A separators, 674A spring lifter, and 716B ratchet head furnished with the tool kit are not required for AF-, AG-, and AJ-type relays. The 716B ratchet head is used for AK-type relays. The 666B core plate replacer, 669A separators, and the 674A spring lifter are used on 286-, 287-, and 288-type relays. To prepare the ratchet head and handle for use, proceed as follows.

(a) The 716A ratchet head is mounted on the 715A ratchet handle for removing the core plate and coil from the relay. To mount the head on the handle, rotate the ratchet rod so that its teeth face away from the trigger and move the rod back through the handle until it engages its stop. Insert the head mounting rail in the handle slot so that the hole in the rail lines up with the rod. Push the rod through the rail hole sufficiently to hold the head in position and rotate the rod 180 degrees so that the teeth face the trigger. In this position the rod may be advanced by pulling the trigger.

(b) To remove the ratchet head from the ratchet handle, rotate the rod so that the teeth face away from the trigger. Then move the rod back through the handle until it engages its stop and slide the head off the handle.

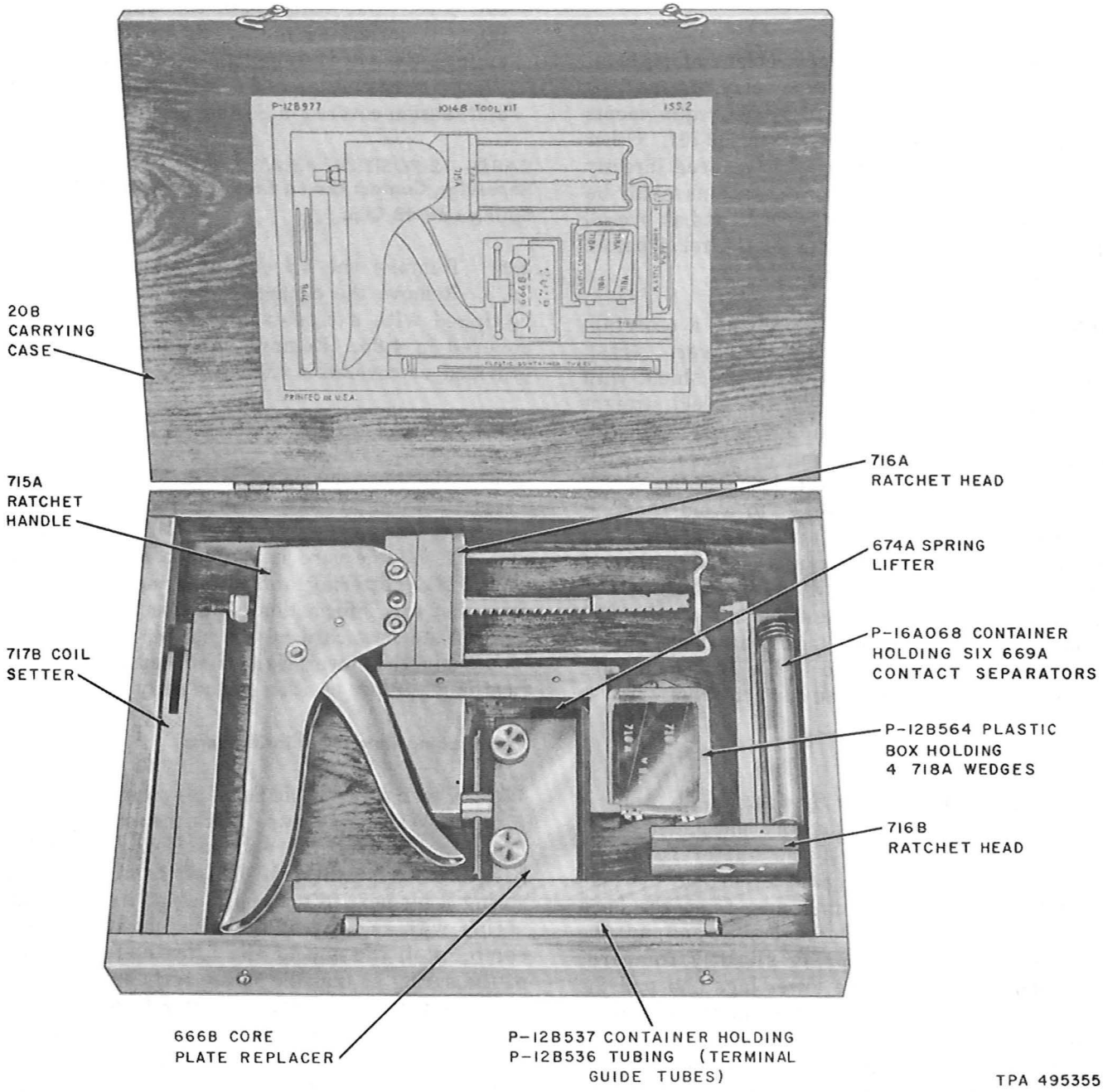

Fig. 24—1014B Tool Kit

4.03 No replacement procedures are specified for screws or other parts where the replacement consists of simple operation.

4.04 After making any replacement of parts of an AF-, AG-, or AJ-type relay, the part or parts replaced shall meet the readjust requirements involved as specified in Section 040-502-701. Other parts whose adjustments may have been directly disturbed by the replacing operations shall be checked to the readjust requirements and an overall operation check shall be made of the relay before restoring the circuit to service.

4.05 ***Crosstalk Shield:*** To replace a crosstalk shield, remove the contact cover. Grasp the upper or lower right side of the shield with the P long-nose pliers and pull the shield straight out from the relay. To mount the new shield, hold it with the shield spring to the right. Tilt the shield slightly to the left, keeping the spring against the spoolhead in order to avoid shorting the make contacts. Push the shield in until the left edge of the shield clears the front edge of the cover guide. Then swing the front of the shield to the right so that the shield is approximately in line with the relay and push the shield on the relay until the crimped end of the spring engages the core plate. Remount the contact cover.

4.06 ***Buffer Spring***

(a) ***Removing Buffer Spring:*** If the relay is equipped with a crosstalk shield, remove it as covered in 4.05. If the buffer spring is positioned by the core plate, disengage the lugs on the upper positioning arm from the core plate using a KS-6320 orange stick and pull the upper part of the spring slightly forward. Similarly disengage the lower lugs and pull the spring straight out. If the buffer spring is positioned by the spoolhead, disengage the upper leg of the buffer spring from the spoolhead by pressing the leg gently toward the core with the KS-6320 orange stick and pull the upper part of the spring slightly forward. Similarly disengage the lower leg and pull the spring straight out.

(b) ***Mounting Buffer Spring:*** Holding the buffer spring with the operating lug toward the relay card, insert the positioning arms between the spoolhead and the outer legs of the core. Carefully push the buffer spring inward, deflecting it slightly to the right to engage the positioning lugs on the core plate. Check the requirements for buffer spring position and tension covered in Section 040-502-701.

CARD—12-POSITION RELAY

Removing Contact Cover, Crosstalk Shield, and Buffer Spring and 4B Clip.

4.07 Remove the 4B clip as covered in 3.07. Remove the contact cover. If the relay is equipped with a crosstalk shield, remove it as covered in 4.05. Remove the buffer spring, if provided, as covered in 4.06.

Stamping Relay Code on New Card

4.08 Note the code number and date of manufacture stamped on the card to be replaced. Before mounting the new card, stamp the code number and date on the card in the same location using the R-2315 lettering and numbering set. Make sure that this information is stamped on the same side of the new card as the single digit (0 to 6) located in the lower right-hand corner with the card in its proper position on the relay.

Disengaging Balancing Spring Legs

4.09 Disengage the balancing spring legs from the card as follows. Block the relay operated using the KS-16887 L1 wedge. Holding the 628A balancing spring lifter in the left hand, insert the spring lifter next to the upper leg of the balancing spring with the end of the lifter just behind the comb. Roll the end of the lifter under this leg of the spring so that the spring rests in the groove of the lifter. Then draw the lifter forward to the position shown in Fig. 5. With the right hand, place the end of a KS-6320 orange stick on the top edge of the card in line with fixed contacts. Lift the spring upward with the tool and, at the same time, press the card downward with the orange stick. When the spring clears the top of the card, move it toward the left so that it is free of the card. Withdraw the spring lifter. When removing the lower leg of the spring, the procedure is the same except that the opposite end of the spring lifter is rolled over the top edge of the leg

and pushed downward while the orange stick is pressed upward against the bottom edge of the card. Remove the wedge.

Insulating Contact Cover Spring

4.10 ***Relays Having Break Contacts and Contact Cover Spring:*** On these relays it is necessary to prevent shorting of the movable break contact springs with the contact cover spring during replacement of the card. For this purpose, one or two 656A insulators are required. When the relay has break contacts in both the 1- to 6- and 7- to 12-position groups, two insulators are required. If only one of these groups has break contacts, only one insulator is required. To insert a 656A insulator, proceed as follows. Hold the tab of the insulator with the offset portion toward the contact cover spring. Insert the insulator between the contact cover spring and the break contact spring combination until the insulator touches the spoolhead. (See Fig. 25.)

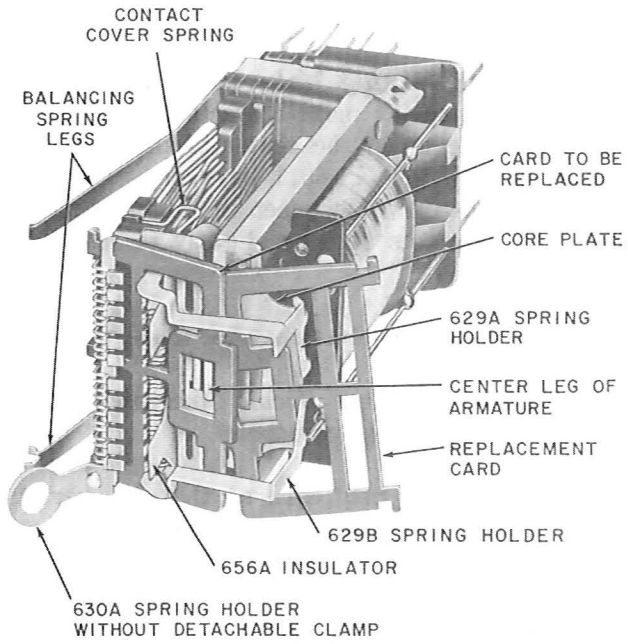

Fig. 25—12-Position Relay—Card Removal Tools Mounted in Place Except Detachable Clamp of 630A Spring Holder

Applying Spring Holders to Break Contact Springs

4.11 The 629A spring holder is used to hold the break contact springs in positions 7 to 12 and the 629B holder in positions 1 to 6 during replacement of the card. Each of the tools has six notches to engage the six pairs of two springs with which it may be used. It is important that the pairs of springs are engaged by the proper notches in the tools. Special care is required to engage the break springs in the proper notches where all positions on the relay are not equipped with these springs. These springs holders are shown mounted on the relay in Fig. 25.

4.12 If there are any break contacts in positions 7 to 12, insert the 629A spring holder between the fixed and break contact springs in these positions as follows. Holding the new card with the notched ends at the left and the code and date information visible, insert the notched leg of the holder through the opening in the card adjacent to the upper right-hand corner. The shank of the holder should be adjacent to the top of the card. Hold the spring holder and new card in one hand and, with the other hand, push the card to be replaced to the right to open the gap between the fixed and break contacts sufficiently to insert the holder. Insert the notched leg of the holder into the gap with the six notches in line with the six positions (7 to 12) on the relay. Swing the outer end of the holder to the right and clip it on the core plate as shown in Fig. 25. Release the card and make sure that each pair of twin springs is engaged by the proper notch in the tool.

4.13 If there are any break contacts in positions 1 to 6, insert the notched leg of the 629B spring holder through the lower right opening in the new card suspended on the 629A spring holder. If the 629A spring holder was not required, place the new card on the 629B spring holder with the shank of the holder adjacent to the bottom of the card. Then push the card to be replaced to the right to open the gap between the fixed and break contacts sufficiently to insert the holder. Insert the notched leg of the holder between the fixed and break contacts with the six notches in the holder in line with the six positions (1 to 6) on the relay. Swing the outer end of the holder to the right and clip it on the core plate as shown in Fig. 25. Release the card and make sure that each pair of twin springs is engaged by the proper notch in the holder. Swing the new card suspended on the holders as far to the right as possible.

Applying Spring Holder and Clamp to Make-Contact Springs

4.14 Referring to Fig. 25, insert the 630A spring holder without the clamp between the fixed and make-contact springs as follows. Pry the card to be replaced from its position on the armature with the KS-6320 orange stick, placing one end of the orange stick over the end of the center leg of the armature and under the adjacent edge of the card. Tilt the card outward so that it can be moved over the ends of the armature legs. With the right hand, push the card to the left to open the gap between the fixed and make contacts sufficiently to permit insertion of the spring holder. With the left hand, insert the spring holder through this gap and turn the handle to the left. Release the card. Position the spring holder so that its larger projection is centered between positions 6 and 7 on the relay and the pairs of twin make springs are engaged by the proper notches in the holder.

4.15 Hold the clamp associated with the spring holder by the handle with the notch at the bottom. Place the metal loop at the top of the clamp on the end of the spring holder that extends out above the make-contact springs. Move the clamp downward so that the notch in the bottom of the clamp engages the pin located adjacent to the handle on the spring holder. The clamp will hold the make-contact springs in their proper notches on the spring holder. (See Fig. 26.)

4.16 Using the 628A balancing spring lifter in the right hand, place the outer end of the top leg of the balancing spring in the notch at the top of the spring holder as shown in Fig. 6. Similarly, place the outer end of the bottom leg of the balancing spring in the notch at the bottom of the spring holder.

Removing Card

4.17 ***Relays Having Break Contacts (with or without make contacts):*** Grasp the horizontal section at the center of the card to be replaced with the KS-8511 tweezers. Carefully remove the card from between the contacts, moving the make-contact springs slightly to the left if necessary. Swing the card to the right so that it hangs freely on the 629A and 629B spring holders. Cut this card with the 5-inch diagonal pliers at the three points indicated in Fig. 26. Remove the

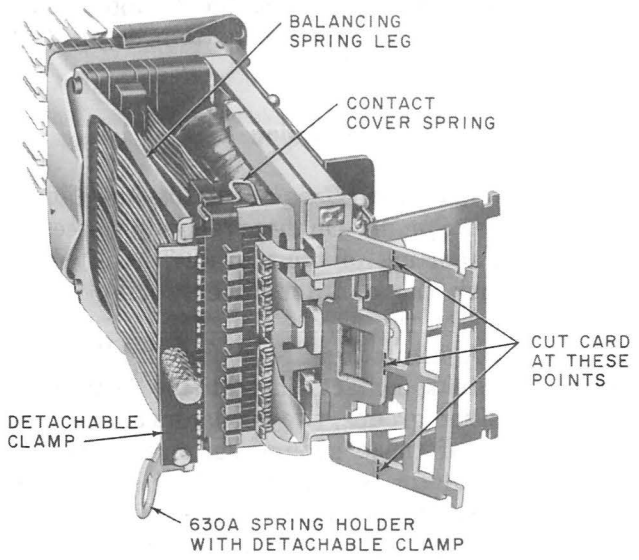

Fig. 26—12-Position Relay—Card Removal Tools Mounted in Place with Detachable Clamp on 630A Spring Holder

portion of the card between the holders with the tweezers.

4.18 ***Relays Having Make Contacts Only:*** On relays having make contacts only, grasp the horizontal section at the center of the card to be replaced with the KS-8511 tweezers. Carefully remove the card from between the contacts, moving the make-contacts springs slightly to the left if necessary.

Mounting New Card and Removing Tools

4.19 ***Relays Having Break Contacts (with or without make contacts)***

(a) Swing the new card so that the vertical sections at the free side of the card are behind the fixed contacts. Do not position the other side of the card on the ends of the armature legs at this time.

(b) If the relay has make contacts, grasp the hand of the 630A spring holder and clamp and move it slightly to the left. With the balancing spring lifter in the other hand, remove the top leg of the balancing spring and then the bottom leg from the notches of the holder. Carefully move the holder to the right, permitting the make-contact spring to fall into their proper grooves in the comb. Remove the clamp from

the spring holder. With the right hand, push the card to the left to open the gap between the movable and fixed contacts sufficiently to permit withdrawing the holder. Swing the holder to the right, withdraw it and release the card.

(c) Move the armature against the armature backstop with the KS-6320 orange stick and hold the armature in this position. With the other hand, position the card on the legs of the armature. Release the armature and hold it against the core with the orange stick. Move the card up and down slightly until the projections on the card engage the notches in the outer legs of the armature.

(d) Remove the 629A and 629B spring holders as follows. Push the card to the right. Unclip one of the holders from the core plate and move it to the left, permitting the break springs to enter the grooves in the comb. Swing the holder to the left and withdraw it through the gap between the fixed and movable break contacts. Remove the other holder in the same manner. Release the card. Make sure that each movable break-contact spring is in its proper groove in the comb.

(e) If the 656A insulators were used, remove them.

(f) Block the relay operated with the KS-16887 L1 wedge. Remount the balancing spring legs in their respective notches in the card, employing a method similar to that covered in 4.09 for disengaging the legs. Remove the wedge and make sure that the card is properly engaged on the armature.

(g) Where the relay was equipped with a buffer spring, remount the spring as covered in 4.06.

(h) Where the relay was equipped with a crosstalk shield, remount the shield as covered in 4.05.

(i) Remount the contact cover on the relay.

4.20 *Relays Having Make Contacts Only*

(a) Hold the new card with the notches at the left and the stamped information on the card visible. Insert the extreme left vertical section of the card between the movable make and fixed contacts. Do not position the other side of the card on the ends of the armature legs at this time.

(b) Grasp the handle at the bottom of the 630A spring holder and clamp with the left hand and move it slightly to the left. With the balancing spring holder in the other hand, disengage the top leg of the balancing spring and then the bottom leg from the notches of the spring holder. Carefully move the holder to the right, permitting the movable make-contact springs to fall into their proper grooves in the comb. Remove the clamp from the spring holder. With the right hand, push the card to the left to open the gap between the fixed and movable make contacts sufficiently to permit withdrawing the spring holder. Swing the holder to the right and withdraw it.

(c) Move the armature against the armature backstop with the KS-6320 orange stick and hold the armature in this position. With the other hand position the card on the legs of the armature. Release the armature and hold it against the core with the orange stick. Move the card up and down slightly until the projection on the card engages the notches in the outer legs of the armature.

(d) Block the relay operated with the KS-16887 L1 wedge. Remount the balancing spring legs in their respective notches in the card, employing a method similar to that covered in 4.09 for disengaging the legs. Remove the wedge and make sure that the card is properly engaged on the armature.

(e) Where the relay was equipped with a buffer spring, remount the spring as covered in 4.06.

(f) Where the relay was equipped with a crosstalk shield, remount the shield as covered in 4.05.

(g) Remount the contact cover on the relay.

COIL—12-POSITION RELAY

4.21 Replacement of the coil requires replacement of the core plate. Note the circuit designation on the core plate to be replaced . Before mounting the new core plate, stamp the circuit designation on the core plate in the same location using the

R-2315 lettering and numbering set. Make sure that this information is stamped on the same side of the core plate as the projecting armature stop.

Removing Contact Cover, Crosstalk Shield, and Buffer Spring

4.22 Remove the contact cover and, if provided, crosstalk shield and buffer spring as covered in 4.05 and 4.06.

Disengaging Balancing Springs Legs

4.23 Disengage the balancing spring legs from the card as covered in 4.09.

Insulating Contact Cover Spring

4.24 On relays having break contacts and a contact cover spring, prevent shorting of the movable break-contact springs with the contact cover spring by using the 656A insulators as covered in 4.10.

Applying Spring Holders to Break-Contact Springs

4.25 If the relay has break-contact springs, use the 629A and 629B spring holders to hold the springs during removal of the card as covered in 4.11 through 4.13, except do not mount a new card on the spring holders.

Applying Spring Holder and Clamps to Make-Contact Springs

4.26 Use the 630A spring holder and associated clamp to hold the make-contact springs as covered in 4.14 through 4.16.

Removing Card

4.27 On relays having break contacts, proceed as covered in 4.17, except do not cut the card but allow it to hang freely on the 629A and 629B spring holders as shown in Fig. 27. Then remove the spring holders with the card. Remove the 656A insulators if they were used.

4.28 On relays having make contacts only, remove the card as covered in 4.18.

Removing Core Plate

4.29 To remove the core plate, proceed as follows.

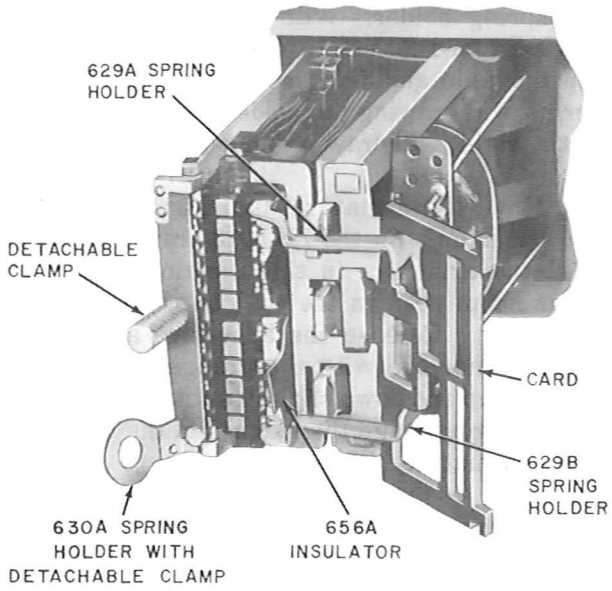

Fig. 27—12-Position Relay—Card Removal Tools Mounted in Place

(a) Mount the 716A ratchet head on the 715A ratchet handle as covered in 4.02(a).

(b) Position the insulated loop of the 716A ratchet head behind the core plate with the ratchet rod in line with and against the center core leg as shown in Fig. 28. Make sure that the rod teeth are positioned downward and that the straight vertical portion of the loop engages the rear of the core plate. Hold the tool so that the rod is in line with the core leg and pull the trigger until the core plate is freed from the relay. Withdraw the ratchet tool with the core plate.

(c) Remove the core plate from the ratchet tool by rotating the rod 180 degrees and moving it back into the handle.

Removing Coil

4.30 To remove the coil, proceed as follows.

(a) Disconnect the external leads from the coil winding terminals. If the leads were soldered, clip off the ends of the terminals as close as possible to the relay mounting plate using the diagonal pliers. Using the 4-inch E screwdriver, loosen the mounting screws of the relay and of the adjacent relays, if necessary,

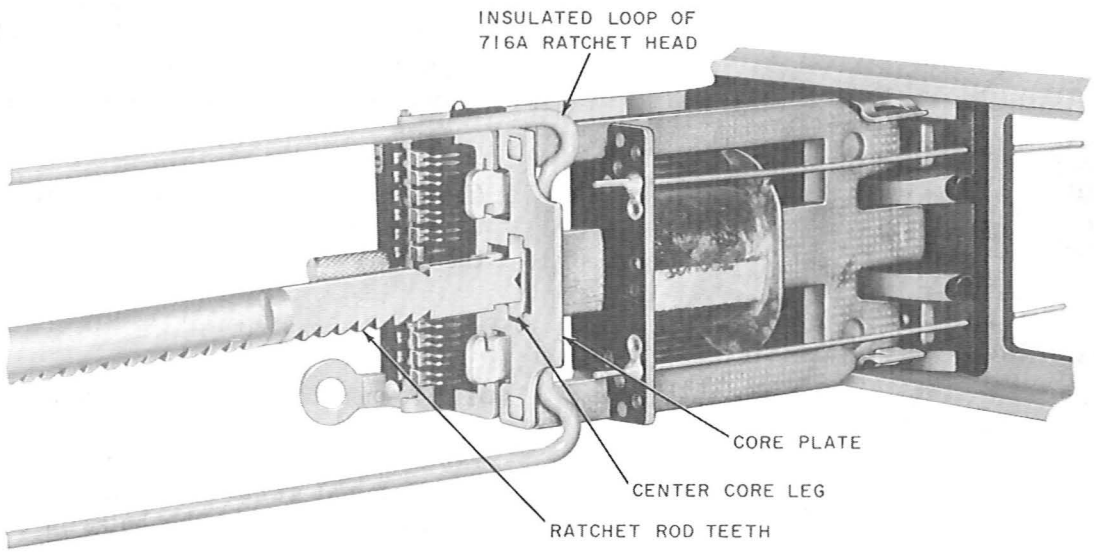

Fig. 28—12-Position Relay—Removing Core Plate

one full turn to permit greater separation between relays when replacing the coil.

(b) Place a KS-2423 cloth under the relay as shown in Fig. 29 to shield adjacent apparatus from solder drippings when removing the coil winding terminals as covered in (c).

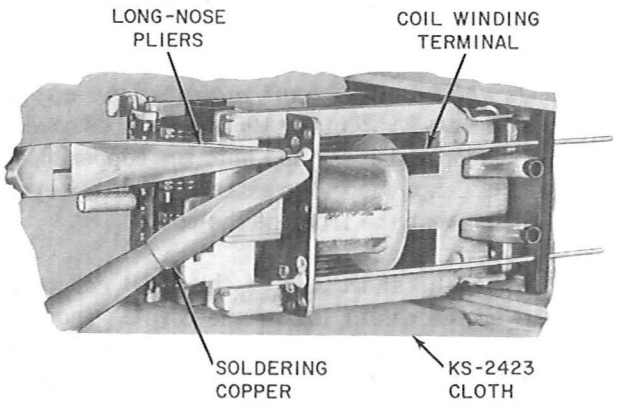

Fig. 29—12-Position Relay—Removing Coil Winding Terminals

(c) Except in the case of the 1050-ohm coil (coil mounted on copper sleeve), remove the coil winding terminals using the soldering copper and the long-nose pliers as shown in Fig. 29. Note the holes in the molded mounting bracket of the relay from which the terminals were removed.

Caution: Do not remove the coil winding terminals on 1050-ohm coils.

(d) Position 718A wedges between the armature and upper and lower core legs as shown in Fig. 30. To do this, move the armature to the left with the left hand. With the other hand, insert approximately 1/2 inch of the smaller end of the wedge between the armature and upper core leg with the straight side of the wedge against the core leg. Similarly, position the second wedge between the armature and lower core leg and release the armature. Carefully push the wedges alternately inward a short distance at a time until the base of each wedge is flush with the outer end of its associated core leg. Make sure that both wedges are horizontal and do not extend beyond the lower edge of the upper core leg and the upper edge of the lower core leg.

(e) Position the rod of the 715A ratchet handle so that its end is approximately 3 inches from the end of the loop and the rod teeth are facing the trigger as covered in 4.02(a).

(f) ***All Coils Except 1050-Ohm Coil (coil mounted on copper sleeve):*** Position the insulated loop of the 716A ratchet head behind

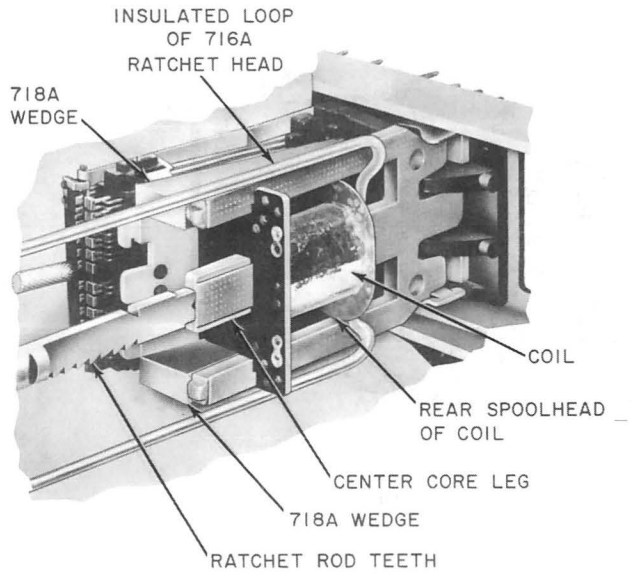

Fig. 30—12-Position Relay—Removing Coil

the rear spoolhead of the coil with the end of the ratchet rod in line with and against the center leg of the core as shown in Fig. 30. Make sure that the straight vertical portion of the loop engages the rear spoolhead of the coil. Hold the tool with the rod horizontal and advance the rod by pulling the trigger until the coil is off the core leg. Remove the coil from the tool as covered in (h).

(g) ***1050-Ohm Coil (coil mounted on copper sleeve):*** All 1050-ohm coils are mounted on copper sleeves which are secured to the core leg of the relay. The copper sleeve should remain on the core leg when the coil is removed. If the copper sleeve is loosened or is removed with the coil, replace the relay. To remove the coil, proceed as follows.

(1) Note the holes in the molded mounting bracket of the relay that position the coil terminals.

(2) Position the insulated loop of the 716A ratchet head behind the coil with the straight portion of the loop pressed lightly against the coil terminals and the end of the ratchet rod in line with and resting against the center core leg. Holding the tool with the rod horizontal, pull the trigger until the coil is off the copper sleeve and remove from the relay.

Caution: Avoid putting heavy pressure against the coil terminals since this might permit the loop of the tool to engage the copper sleeve with possible damage to the tool.

(h) Remove the coil from the ratchet tool by rotating the rod 180 degrees and moving the rod back into the handle.

Mounting New Coil

4.31 To mount the new coil, proceed as follows.

(a) From the rear of the relay, insert the terminal guide tubes furnished with the 1014B tool kit into the holes in the molded mounting bracket of the relay which position the coil terminals and move the tubes forward until they extend beyond the front of the relay.

(b) ***All Coils Except 1050-Ohm Coil (coil mounted on copper sleeve):*** Insert the terminals of the new coil into their respective terminal guide tubes with the opening in the coil in line with the center leg of the core. Manually push the coil onto the core leg, carefully tapping it, if necessary, using the slotted end of the 717B coil setter and the 4-ounce riveting hammer until the core leg extends slightly beyond the opening at the front of the coil. Then proceed as covered in (d).

(c) ***1050-Ohm Coil (coil mounted on copper sleeve):*** Position the 1050-ohm coil as covered in (b), except push the coil onto the copper sleeve until the center core leg extends slightly beyond the opening at the front of the coil.

(d) Place the short slot of the 717B coil setter over the center leg of the core as shown in Fig. 31. Position the coil on the core leg by gently tapping the coil setter with the 4-ounce riverting hammer until the bottom of the slot in the coil setter rests against the end of the core leg.

(e) Carefully remove the 718A wedge and the KS-2423 cloth. Remove the terminal guide tubes and tighten the screws of the relay and of adjacent relays if they were loosened.

(f) Connect the external leads to the coil winding terminals.

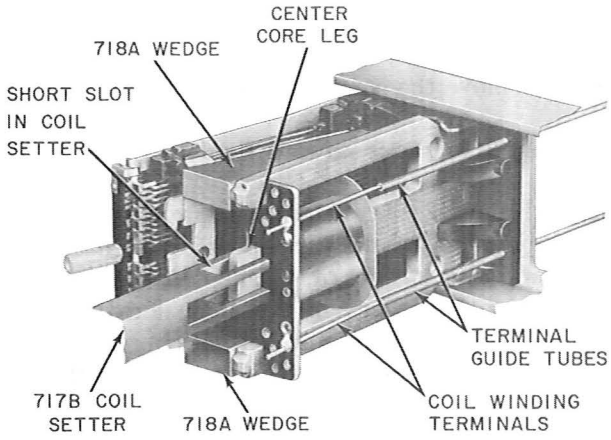

Fig. 31—12-Position Relay—Positioning Replacement Coil with 717B Coil Setter

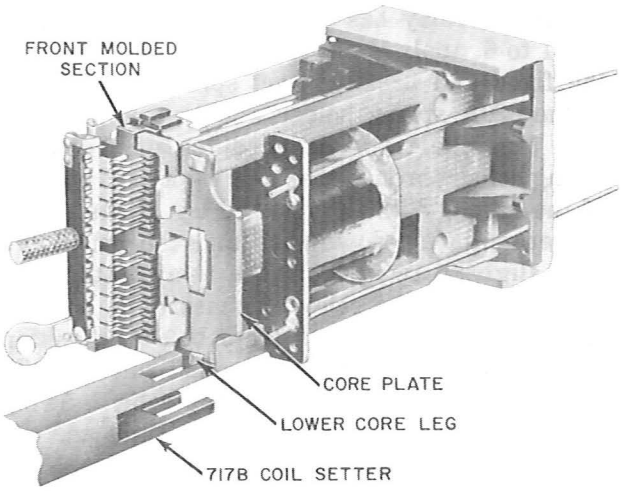

Fig. 32—12-Position Relay—Positioning Core Plate with 717B Coil Setter

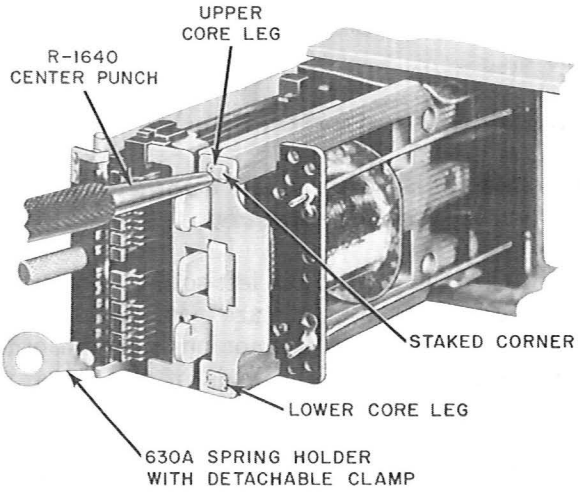

Fig. 33—12-Position Relay—Staking Core Legs to Secure Core Plate

Mounting New Core Plate

4.32 Make sure that the circuit designation has been stamped on the new core plate as covered in 4.21. Proceed as follows.

(a) Place the tip of the KS-6320 orange stick against the center portion of the front molded section of the relay and push the molded section to the left. Position the new core plate in front of the core legs with the armature stop on the core plate facing away from the relay. Manually start the core plate on the core legs and position the upper and lower portion of the front molded section against the core plate. Using the 717B coil setter and the 4-ounce riveting hammer, gently tap the core plate into positon on the core legs. Fig. 32 shows the coil setter being used to position the core plate on the lower core leg.

(b) Using the R-1640 center punch and the 4-ounce riveting hammer, stake each corner of the upper and lower core legs to secure the core plate as shown in Fig. 33.

Remounting Card

4.33 ***Applying Spring Holders to Break-Contact Springs***

(a) If the relay has break contacts in positions 7 to 12, apply the 629A spring holder between the fixed and break-contact springs as follows. Holding the card with the notched ends at the left and the code and date information visible, insert the notched leg of the holder through the opening in the card adjacent to the upper right-hand corner. The shank of the holder should be adjacent to the top of the card. Then, with the card on the spring holder, insert the notched leg of the holder behind the movable break contacts from above so that the six notches in the holder line up with the six positions (7 to 12) on the relay. Swing the outer end of the holder to the right and clip it on the core plate as shown in Fig. 27. Make sure that each pair of twin springs is engaged by the proper notch in the holder.

(b) If the relay has break contacts in positions 1 to 6, apply the 629B spring holder between the fixed and break-contact springs as follows. If the 629A spring holder was used in positions 7 to 12, insert the notched leg of the 629B spring holder through the lower right-hand opening of the card. With the notched leg of the spring holder pointing downward and the other end held slightly away from the relay, rotate the holder toward the relay and insert the notched leg behind the contacts from below. Position the holder so that the six notches line up with the six positions (1 to 6) on the relay. Swing the outer end of the holder to the right and clip it onto the core plate as shown in Fig. 27. Make sure that each pair of twin springs is engaged by the proper notch in the holder. If the 629A spring holder was not used, insert the notched leg of the 629B spring holder through the lower right-hand opening of the card. Then insert the notched leg of the holder between the fixed and break contacts in positions 1 to 6 as covered above.

Remounting Card and Removing Tools

4.34 ***Relays Having Break Contacts (with or without make contacts)***

(a) Swing the card to the left so that the vertical sections at the left are positioned behind the fixed contacts. Do not position the other side of the card on the ends of the armature legs at this time.

(b) Position the card on the armature, remount the buffer spring and the crosstalk shield, if provided, and remount the contact cover as covered in 4.19(b) through 4.19(i).

4.35 ***Relays Having Make Contacts Only***

(a) Hold the card with the notches at the left and the stamped information on the card visible. Insert the extreme vertical section of the card between the make and fixed contacts. Do not position the card on the ends of the armature legs at this time.

(b) Position the card on the armature, remount the buffer spring and crosstalk shield, if provided, and remount the contact cover as covered in 4.20(b) through 4.20(g).

CARD—24-POSITION RELAY

4.36 Remove the contact cover.

Stamping Relay Code on New Card

4.37 Note the code number and date of manufacture stamped on the card to be replaced. Before mounting the new card, stamp the code number and date on the card in the same location using the R-2315 lettering and numbering set. This stamping may be applied to either side of the new card.

Disengaging Balancing Spring Legs

4.38 Disengage the balancing spring legs from the card as follows. Block the relay operated using the KS-16887 L1 wedge. Holding the 628A balancing spring lifter in the left hand, insert the spring lifter next to the upper leg of the balancing spring with the end of the lifter just behind the comb. Roll the end of the lifter under the leg of the spring so that the spring rests in the groove of the lifter. Then draw the lifter forward to the position shown in Fig. 5 for the 12-position relay. With the right hand, place the end of a KS-6320 orange stick on the top edge of the card in line with the fixed contact springs in positions 1 to 12. Lift the spring upward with the spring lifter and, at the same time, press the card downward with the orange stick. When the spring clears the top of the card, move it toward the left so that it is free of the card. Withdraw the spring lifter. When removing the lower leg of the spring, the procedure is the same except that the opposite end of the spring lifter is rolled over the top edge of the leg and pushed downward while the orange stick is pressed upward against the bottom edge of the card. Remove the wedge.

Applying Spring Holders to Movable Contact Springs

4.39 ***Positions 13 to 24:*** Pry the card to be replaced from its position on the armature with the KS-6320 orange stick, placing one end of the orange stick over the center leg of the armature and under the adjacent edge of the card. Tilt the card outward so that it can be moved over the ends of the armature legs. With one hand, push the card to the left. With the other hand, insert the straight end of the 652A spring holder in positions 19 to 24 (upper six positions in the

right row of contacts). Position this end of the tool against the movable contact springs behind the card. Swing the holder to the right and wedge the square-formed section of it against the top leg of the armature as shown in Fig. 34. Position the 652B spring holder against the movable springs in positions 13 to 18 following the same procedure.

4.40 ***Position 1 to 12:*** Insert the 630A spring holder without the clamp between the contact springs in positions 1 to 12 as follows. With the right hand, push the card to the left to open the gap between the fixed and movable contacts sufficiently to permit insertion of the spring holder. With the other hand, insert the spring holder through this gap and turn the handle to the left. Release the card. Position the spring holder so that the larger projection is centered between positions 6 and 7 on the relay and the pairs of twin make springs are engaged by the proper notches in the holder. Next, hold the clamp associated with the spring holder by its handle with the notch at the bottom. Place the metal loop at the top of the clamp on the end of the spring holder that extends above the make-contact springs. Move the clamp downward so that the notch in the bottom of the clamp engages the pin located adjacent to the handle on the spring holder. The clamp will hold the contact springs in their proper notches on the spring holder. (See Fig. 34.)

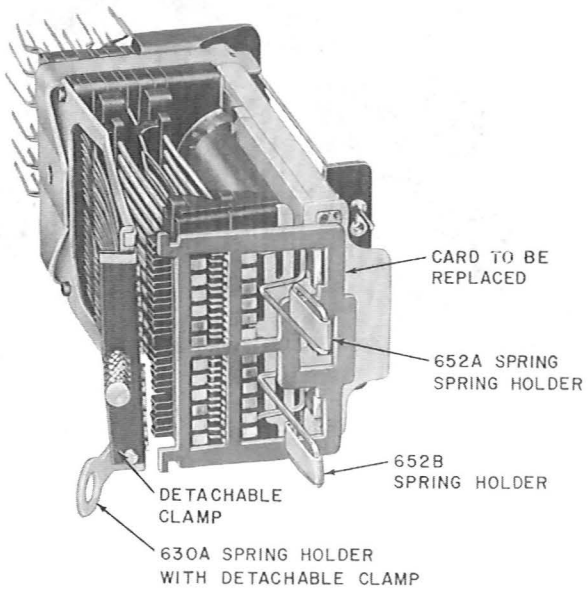

Fig. 34—24-Position Relay—Card Removal Tools Mounted in Place

Removing Card

4.41 Grasp the horizontal section at the center of the card to be replaced with the KS-8511 tweezers. Move the springs in positions 1 to 12 slightly to the left and carefully remove the card from between the contacts.

Mounting New Card and Removing Tools

4.42 Position the new card on the relay so that the stamped information is on the front surface of the card. Move the springs in positions 1 to 12 slightly to the left and insert the card so that the vertical sections of the card are behind the fixed contacts. Do not position the other side of the card on the ends of the armature legs at this time.

4.43 Carefully move the 630A spring holder to the right, permitting the movable contact springs to fall into their proper grooves in the comb. Remove the clamp from the spring holder. With the right hand, push the card to the left to open the gap between the fixed and movable contacts sufficiently to permit withdrawing the spring holder. Swing the holder to the right and withdraw it.

4.44 Remove the 652A and 652B spring holders as follows. Disengage the holder from the armature and swing the holder to the left. Push the card to the left and withdraw the straight end of the holder through the gap between the contacts. Release the card.

4.45 Move the armature against the armature backstop with the KS-6320 orange stick and hold the armature in this position. With the other hand, position the card on the legs of the armature. Release the armature and hold it against the core with the orange stick. Move the card up and down slightly until the projections on the card engage the notches in the outer legs of the armature.

4.46 Block the relay operated with the KS-16887 L1 wedge. Remount the balancing spring legs in their respective notches in the card, employing a method similar to that covered in 4.38 for disengaging the legs. Remove the wedge and make sure that the card is properly engaged on the armature. Remount the contact cover on the relay.

COIL—24-POSITION RELAY

4.47 Replacement of the coil requires replacement of the core plate. Note the circuit designation and stamp it on the new core plate as covered in 4.21.

4.48 Remove the contact cover.

Removing Card

4.49 Remove the card as covered in 4.38 through 4.41.

Removing Core Plate

4.50 Before removing the core plate from the relay, insulate the contacts and remove the 652A and 652B spring holders as follows.

(a) If there are relays mounted directly above or below the relay, remove their contact covers.

(b) Insulate the right row of contacts (positions 13 to 24) by inserting a KS-7187 Bell Seal Bond Paper vertically between the movable and fixed contacts as shown in Fig. 35.

(c) To remove the 652A and 652B spring holders, disengage the holder from the armature and swing it to the left. Withdraw the straight end of the holder from behind the contacts.

(d) Remove the core plate as covered in 4.29.

Removing Coil

4.51 Remove the coil winding terminals, insert the 718A wedges, and remove the coil as follows.

(a) Disconnect the external leads from the coil winding terminals, loosen the screws of the relay, and, if necessary, of the adjacent relays, and remove the terminals as covered in 4.30(a), (b), and (c).

(b) Insert two 718A wedges between the armature and cover spring of the relay as follows. Apply the tip of the KS-6320 orange stick to the notch in the front molded section adjacent to the center portion of the cover spring (Fig. 35) and carefully move the spring assembly to the left. Avoid touching the fixed contact springs with the orange stick. Hold a wedge at the small end with the parallel sides vertical and insert it between the lower portion of the armature and the cover spring until it stops against the coil spoolhead. Similarly, insert a second wedge adjacent to the upper portion of the armature. These wedges, which are shown in the figure, will prevent distortion of the armature springs when the second pair of wedges is inserted between the armature and core legs.

(c) Insert a second pair of 718A wedges between the armature and core legs as covered in 4.30(d) and as shown in Fig. 35.

(d) Remove the coil as covered in 4.30(e), (f), and (h).

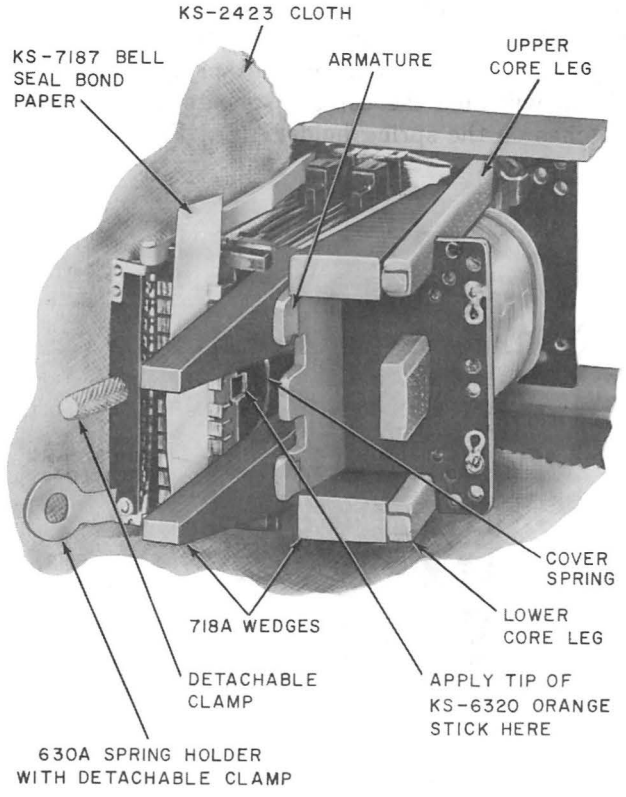

Fig. 35—24-Position Relay—Coil Removal Tools Mounted in Place

4.52 *Mounting New Coil:* Mount the new coil as covered in 4.31.

4.53 *Mounting New Core Plate:* Mount the new core plate as covered in 4.32.

4.54 *Remounting Card*

(a) Insert the straight end of the 652A spring holder behind the movable contacts in positions 19 to 24 (upper six positions in the right row of contacts) from above. Swing the holder to the right and wedge the square-formed section of it against the top leg of the armature as shown in Fig. 34. Similarly, position the 652B spring holder behind the movable springs in positions 13 to 18 from below.

(b) Remount the card, remove the tools, and remount the contact cover as covered in 4.42 through 4.46.

(c) If covers were removed from adjacent relays, remount their contact covers.