RELAYS

UB TYPE

REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers UB-type relays.

1.02 This section is reissued to add spring tension values omitted from Issue 4 (Fig. 501 through 527). This reissue does not affect the Equipment Test List.

1.03 Reference shall be made to Section 020-010-711 covering general requirements and definitions for additional information necessary for proper application of the requirements listed herein.

1.04 ***Operate:*** A relay is said to ***operate*** if, when current is connected to its winding, the armature moves sufficiently to meet the following conditions.

(a) All normally open contacts close, and all normally closed contacts open.

(b) At least one stop disc rests against the core, or when an attachable separator is provided, the armature presses the flap of the separator against the core.

1.05 ***Nonoperate:*** A relay is said to ***nonoperate*** if, when current is connected to its winding, the armature does not move from its position against the backstop.

1.06 ***Hold:*** A relay is said to ***hold*** if, when the current is reduced abruptly from the soak or operate value to the hold value, the armature does not move from the operated position.

1.07 ***Release:*** A relay is said to ***release*** if, when the current is reduced abruptly to the release value or the current is removed, the armature moves from the core to its unoperated position in which the armature is resting against the backstop, and all normally open contacts are open and all normally closed contacts are closed.

1.08 ***Armature gap*** is the gap between the core and the nearer stop disc on the armature, or the armature itself when no stop discs are provided in any position that the armature may assume between the unoperated and the operated positions of the relay. If an attachable separator is used, the armature gap is the gap between the core and the flap of the separator when the flap is flat against the armature, or between the core and the nearer stop disc if the thickness of the separator is less than the height of the nearer stop disc.

1.09 ***Armature travel*** is the armature gap when the armature is resting against the backstop.

1.10 The term ***contact spring*** when used in this section includes, unless otherwise specified, the contact bars welded to the end of the spring. The front end of the spring may or may not be bifurcated.

1.11 A ***pretensioned spring*** is a spring which has been tensioned during its manufacture. Such a spring may be recognized by one or more distinct bends between the insulators and the contact end of the spring.

1.12 Since the bends in pretensiond springs are formed during manufacture to provide the necessary tensions, these bends should not be disturbed during adjustment.

1.13 A ***pair of contacts*** as referred to in this section consists of a single contact bar on one contact spring and the corresponding contact bar on the opposing contact spring.

1.14 The terms ***contact make*** or ***break*** apply to the electrical circuit between the two springs. Contact make may involve the closing of only one pair of the two pairs of contacts. Contact break involves the opening of both pairs of contacts.

1.15 The year of manufacture of UB relays is stamped on the spoolhead preceded or followed by dashes, three to indicate the first quarter, two the second quarter, one the third quarter, and none the last quarter.

1.16 The small prick punch marks on the armature identify the original height of the stop discs as indicated in the table below. With the relay mounted in its normal position, the punch marks are located on the right-hand side of the armature and approximately 3/8 inch from the adjusting nut.

ORIGINAL STOP DISC HEIGHT	ARMATURE MARKING
0.005 Inch	None
0.010 Inch	• • (2 punch marks)
0.015 Inch	• (1 punch marks)

2. REQUIREMENTS

2.01 ***Cleaning:*** The contacts and other parts of the relay shall be cleaned in accordance with the section covering cleaning and reconditioning relay contacts. After cleaning any contact, a check shall be made to see that both contacts on the bifurcated spring involved meet requirement 2.16.

2.02 ***Relay Mounting:*** Relays shall be fastened securely to the mounting plate.

Gauge by feel by grasping the core and armature between the thumb and forefinger and attempting to move the relay. When a D-177796 pivot mounting is used between the relay and mounting plate, the relay mounting will be flexible and this should not be confused with mounting looseness. If in doubt whether movement is due to the flexible mounting or loose mounting screws, check the mounting screws with the 4-inch E screwdriver.

2.03 ***Vertical Clearance***

(a) The clearance between the springs of the relay and apparatus mounted directly above or below shall be

Min 1/4 inch

Gauge by eye.

Note: This clearance is satisfactory if it can be obtained by removing the covers of the apparatus directly above or below, provided such covers are readily removable.

(b) Springs shall not touch the relay cover or magnetic shields if provided.

Gauge by eye.

2.04 ***Cover Spring and Cover Guide Pressure and Cover Cap Tightness***

(a) The cover cap on relays so equipped shall fit snugly. The relay cover shall be securely held in position when the cover cap is being removed and shall resist lateral and vertical displacement during the routine relay maintenance procedures.

Gauge by feel.

(b) ***Fig. 1(A)***—The cover spring shall bear on the front spoolhead when the cover is removed.

Gauge by feel.

(c) ***Fig. 1(B)***—The free end of the cover guide shall bear on the core when the cover is removed.

Gauge by feel.

2.05 ***Contact Alignment:*** The contact alignment of any pair of mating contacts shall be such that neither of the contacts extends beyond the other by more than 1/2 of its length in one direction and 1/4 of its length in the other direction as shown in Fig. 2.

Gauge by eye.

2.06 ***Spring Tang Position and Card Clearance***

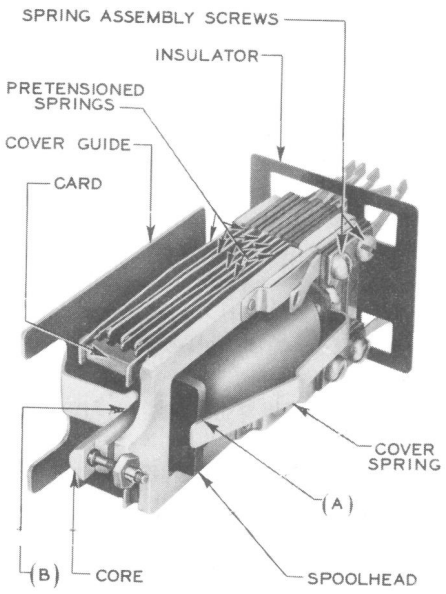


Fig. 1—UB-Type Relay Arranged for Mounting Individual Cover

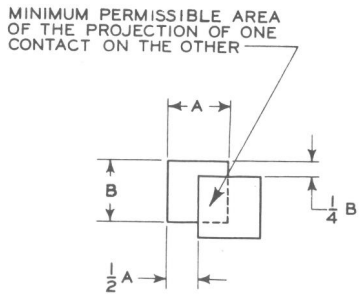


Fig. 2—Alignment of Contacts—Plan View of Contacting Surfaces

(a) The spring tang shall not rub on the spoolhead when moved from its normal position of rest on the spoolhead in the direction of the travel of the spring.

Gauge by eye and feel.

(b) The spring tang shall overlap the spoolhead as shown in Fig. 3(A).

(1) On relays manufactured prior to the second quarter of 1948, the full width of the spring tang shall lie entirely within the projection of the top and bottom edges of the slots in the spoolhead.

(2) On relays manufactured during the second quarter of 1948 and subsequently, the spring tang may project 1/3 of its width above the top edge of the slot in the spoolhead.

Gauge by eye.

(c) The card shall not rub on the end of any spring during the operation of the armature.

Gauge by eye and feel.

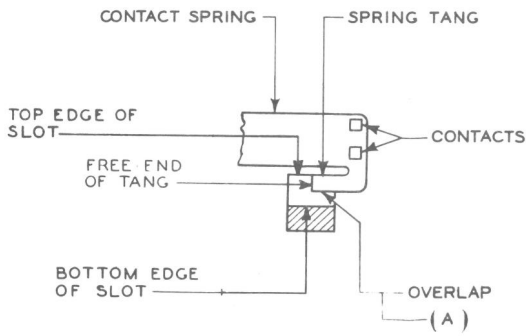


Fig. 3—Spring Tang Position

2.07 ***Adjusting Stud Clearance:*** Fig. 4(A)—On a relay having an adjusting stud, there shall be a clearance between the armature and the adjusting stud in all positions of the armature travel.

Gauge by eye.

2.08 ***Adjusting Nut Tightness:*** On a relay having an adjusting stud, the adjusting nut shall be sufficiently tight on the stud to prevent its being turned with a torque of 3 ounce-inches.

To check this requirement, attempt to turn the adjusting nut with the thumb and forefinger. In case of doubt, this may be checked by the use of the 474A wrench and the 70D gauge. With the wrench on the nut, the gauge shall be applied in the hole in the free end of the wrench and the nut shall not turn when a pressure of 40 grams is applied at right angles to the wrench in the clockwise direction as shown in Fig. 5.

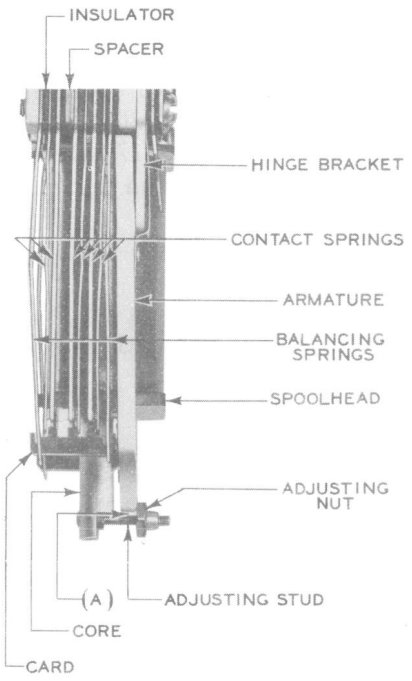


Fig. 4—UB-Type Relay—Top View

Note: When an adjusting nut locknut is used, the adjusting nut tightness requirement is waived.

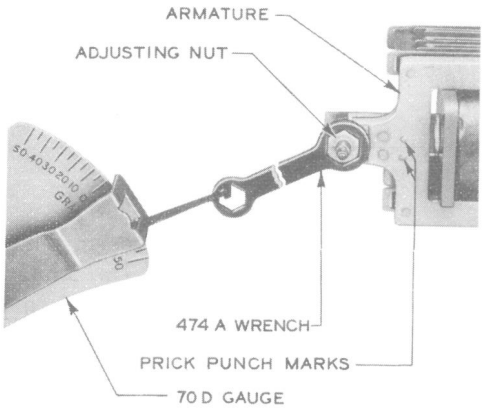


Fig. 5—Method of Checking Tightness of Adjusting Nut

2.09 ***Adjusting Nut Locknut Tightness:*** On a relay having an adjusting stud, the adjusting nut locknut where provided shall be sufficiently tight against the adjusting nut to prevent its being turned with a torque of 3 pound-inches.

To check locknut tightness, hold the adjusting nut in place with a 474A wrench and, with another 474A wrench on the locknut, apply the 62B gauge in the hole in the free end of the wrench on the locknut in the same manner as shown in Fig. 5. The locknut shall not turn when a pressure of 600 grams is applied at right angles to the wrench in the direction to tighten the locknut.

2.10 ***Application of D-178259 and D-178260 Attachable Separators:*** Fig. 6

(a) The attachable separators shall be applied in the field when relays fail to release properly as judged by circuit operation, and this failure is due to missing or worn stop discs or to the discs pounding into the core.

(b) The thickness of the attachable separator for relays with 0.005- or 0.010-inch stop discs shall correspond to the original height of the stop discs as covered in 1.16.

Note: Where the relay was equipped with 0.015-inch stop discs and the discs have worn down or pounded ino the core, the use of the 0.010-inch attachable separator may aid in correcting the condition.

(c) ***Relays Having Adjusting Stud:*** The attachable separator shall be positioned by means of the ears on the front of the metal clip of the separator resting against the step on the core of the relay.

(d) ***Relays Having Welded Backstop:*** The attachable separator shall be positioned on a relay having a welded backstop so that the front edge of the metal clip of the separator rests against the rear surface of the welded backstop.

Note: In order to mount the separator, it will be necessary to remove both ears from the metal clip.

(e) The flap of the attachable separator shall be free in the armature gap and shall not be wrinkled or snagged.

2.11 ***Armature Position:*** Fig. 7(A)—Both legs of the armature shall bear against the hinge bracket with the relay electrically operated and shall also bear against the hinge bracket after the relay has released.

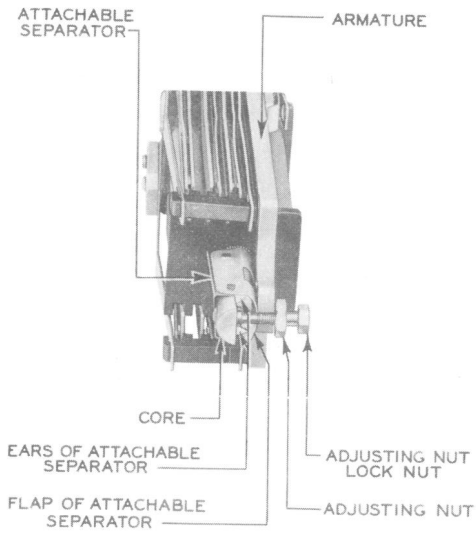


Fig. 6—UB-Type Relay Equipped With Attachable Separator and Adjusting Nut Locknut

Gauge b[illegible]eye.

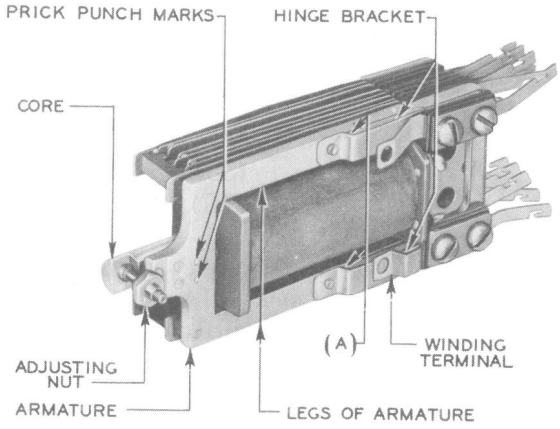


Fig. 7—UB-Type Relay—General View

2.12 ***Armature Travel:*** The armature travel shall be in accordance with the value specified for the relay in the armature travel column on the circuit requirements table. Unless otherwise specified, the armature travel tolerance shall be +0.003 inch.

Use the 131A gauge.

To check the armature travel requirement on relays not equipped with attachable separators, attempt to insert a gauge 0.003 inch larger than the specified gap with the long axis of the gauge in the position as shown in Fig. 8. Where an attachable separator is provided, carefully insert the gauge from the bottom, between the flap of the separator and the core as shown in Fig. 9, in order not to damage the separator. If the gauge enters, it should enter with a snug fit. Do not force the gauge.

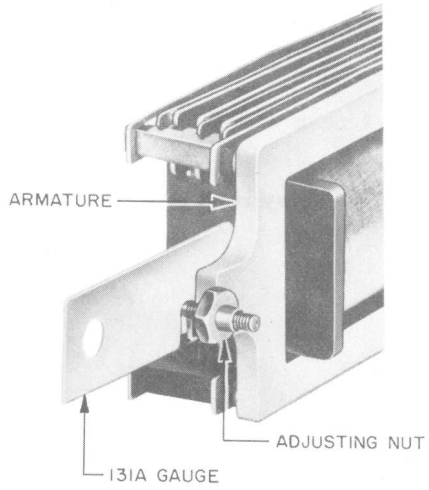


Fig. 8A—Relay Having Adjusting Stud

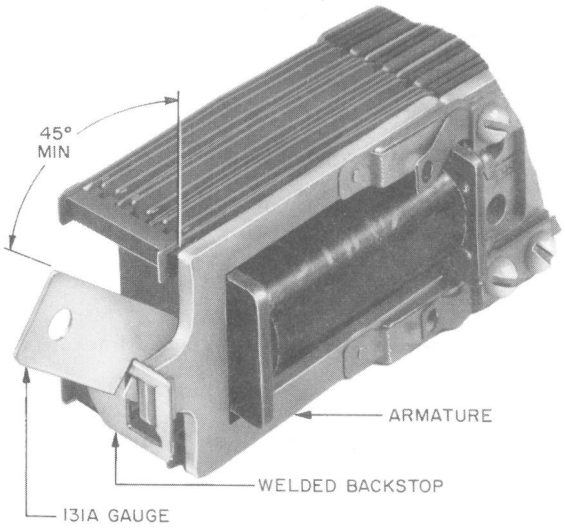


Fig. 8B—Relay Having Welded Backstop

Fig. 8—Position of Gauge When Checking Armature Travel

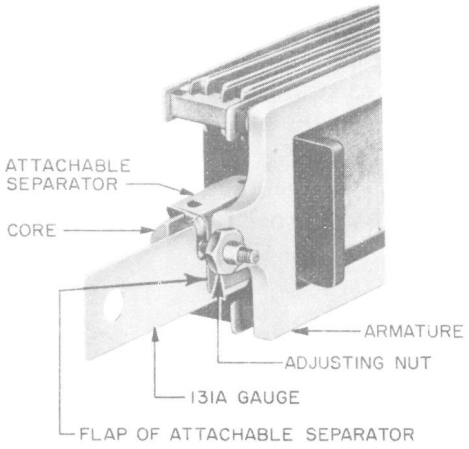


Fig. 9A—Relay Having Adjusting Stud

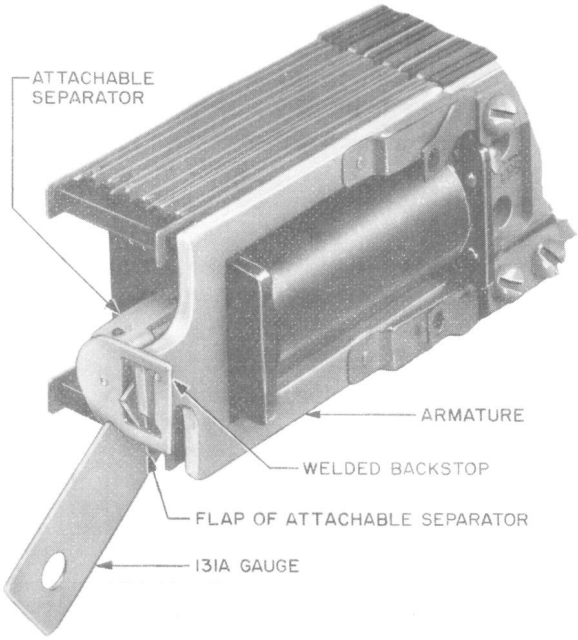


Fig. 9B—Relay Having Welded Backstop

Fig. 9—Position of Gauge When Checking Armature Travel on Relay Equipped With Attachable Separator

2.13 *Spring Tension*

(a) ***Spoolhead Springs:*** (Springs Designated C on Fig. 501 Through 527)—The tension of a spoolhead spring shall be such that the tang rests against the spoolhead with a tension of

Test: Min 25 grams
Readjust: Min 30 grams

To check, apply the 70D gauge to the vertical portion of the spring tang. The requirement is met if the tang of the spring leaves the spoolhead as the gauge registers the required tension.

(b) ***Balancing Springs:*** (Springs Designated E on Fig. 501 Through 527)—The tension of the balancing springs in each spring combination shall be sufficient to hold the associated card against the armature. When the relay is in the unoperated position, the combined tension of the balancing springs in the top and bottom spring combinations shall be sufficient to hold the armature against the backstop as specified in 2.14.

(c) ***Moving Springs:*** (Springs Designated B on Fig. 501 Through 527)

Test: With the relay electrically energized against a 0.013-inch 131A gauge and when either tip of each bifurcated spring is deflected away from its mating spring with a KS-6320 orange stick until it touches the opposite side of the card notch or the adjacent spring, the other tip shall remain in contact with the card or mating contact.

Gauge by eye.

Readjust: Min 20 grams. When checking the readjust values, the tension shall be checked with the armature in the electrically operated position in the case of normally open contacts and with the armature in the

unoperated position in the case of normally closed contacts.

Use the 70D gauge, applying it just back of the contact of first one and then the other prong of the bifurcated spring and adding the two tension values.

Note 1: UB6000 and UB6002 Relays—The tension for springs 1, 3, 6, 8, and 10 in top comb and springs 1, 4, 6, 8, and 10 in bottom comb shall be a minimum of 17 grams.

Note 2: UB6007 Relay—The tension for springs 1, 4, 6, 8, 10, and 12 in top and bottom combs shall be a minimum of 17 grams.

2.14 ***Armature Back Tension:*** Fig. 10(A)—The armature shall be held against the backstop with a pressure of

Test: Min 18 grams
Max 60 grams

Readjust: Min 22 grams
Max 50 grams

Use the 70H or the 70J gauge applied to the back of the armature at a point approximately midway between the points where the stop pins are normally located as shown in Fig. 10. When making this check, do not remove the pressure of any contact spring against its associated card.

2.15 ***Separation Between Springs:*** The clearance between adjacent springs whether in the unoperated or electrically operated position of the relay shall be

Adjacent springs except those designated S on Fig. 501 through 527

Min 0.008 inch

Adjacent springs designated S on Fig. 501 through 527

Shall not touch

Gauge by eye.

2.16 ***Contact Make and Break***

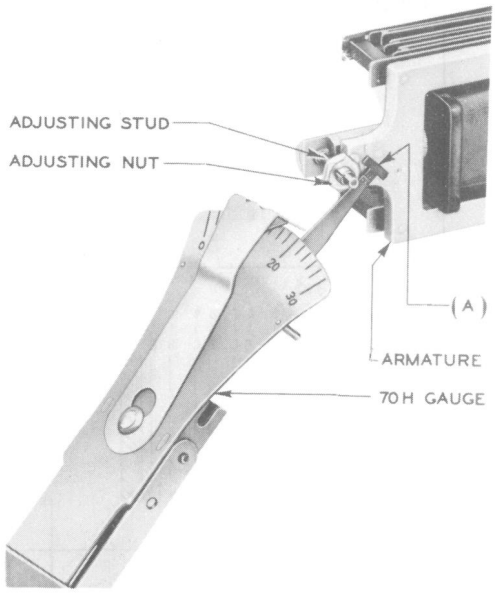


Fig. 10—Method of Checking Armature Back Tension

(a) Both contacts on the bifurcated spring shall make with their associated contacts with the relay in the electrically operated position for normally open contacts and in the unoperated position for normally closed contacts.

Gauge by eye and feel.

(b) With the relay electrically energized against a 131A gauge of the thickness indicated below, inserted into the armature gap, the following requirements shall be met.

Make Combinations and Make Contacts of Break-Make Combinations

(1) Neither pair of contacts shall make on

Test: 0.020 inch
Readjust: 0.017 inch

(2) At least one pair of contacts shall make on

Test: 0.008 inch
Readjust: 0.010 inch

FIG. 501

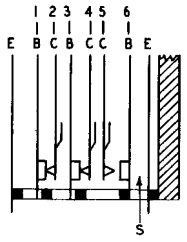


FIG. 502

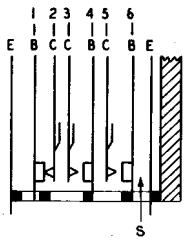


FIG. 503

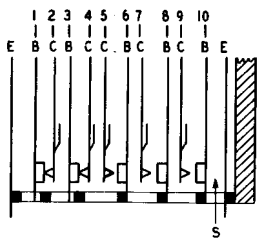


FIG. 504

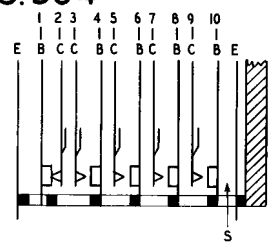


FIG. 505

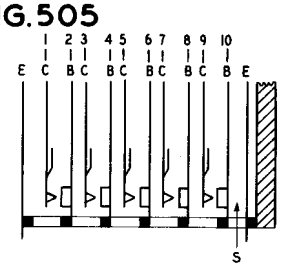


FIG. 506

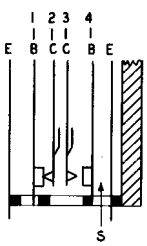


FIG. 507

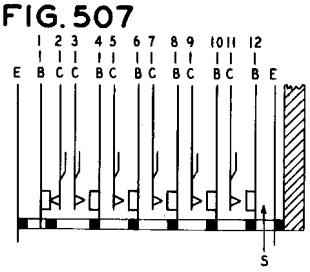


FIG. 508

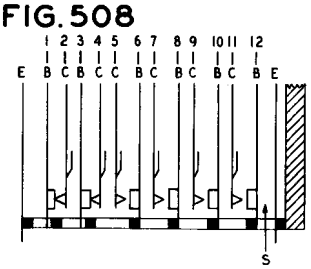


FIG. 509

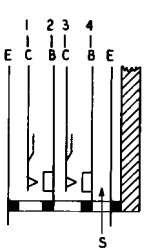


FIG. 510

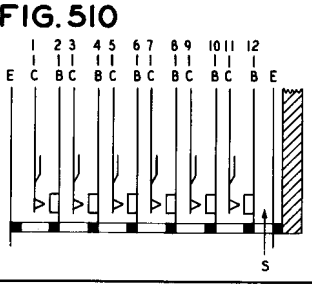


FIG. 511

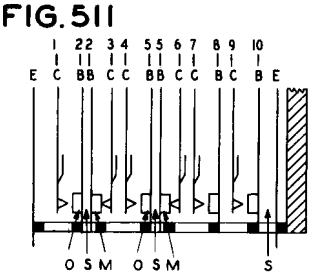


FIG. 512

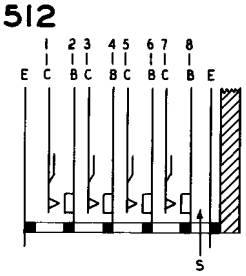


FIG. 513

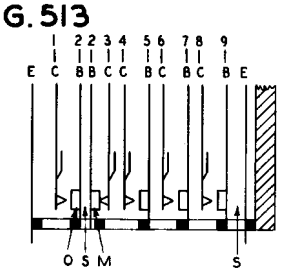


FIG. 514

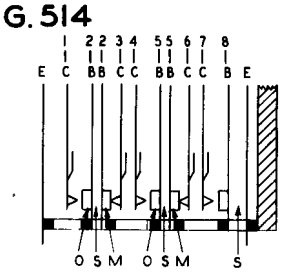
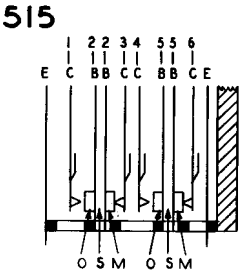


FIG. 515



B springs of make contacts — Tensioned away from the armature
B springs of break contacts — Tensioned toward the armature
C springs — Tensioned toward the armature
C springs of break contacts — Tension measured with armature operated
E springs adjacent to armature — Tensioned toward the armature
E springs adjacent to No. 1 springs — Tensioned either toward or away from the armature
M and O — Both contacts of spring designated M shall break before either contact of spring designated O makes (break-make combination).
S — See Reqt 2.15
μ — Spoolhead springs

FIG. 516

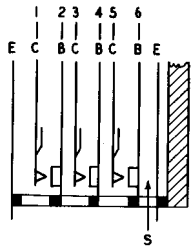


FIG. 517

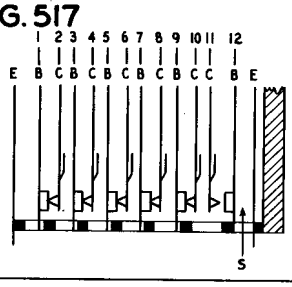


FIG. 518

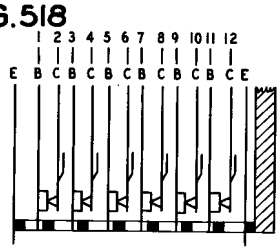


FIG. 519

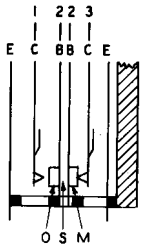


FIG. 520

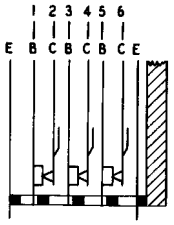


FIG. 521

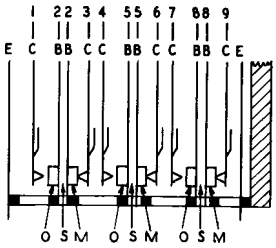


FIG. 522

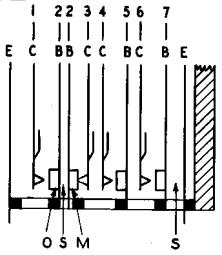


FIG. 523

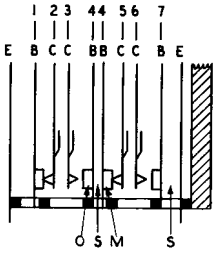


FIG. 524

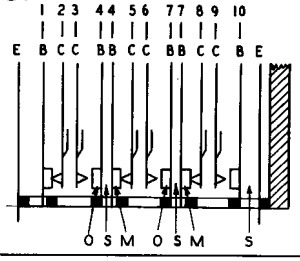


FIG. 525

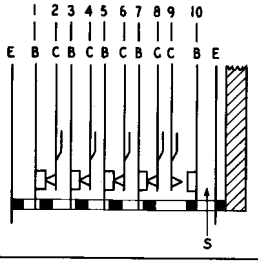


FIG. 526

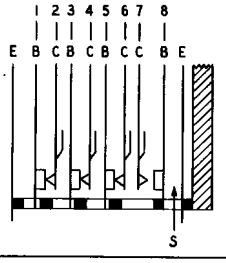
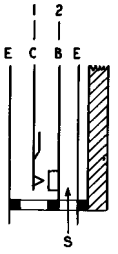


FIG. 527



B springs of make contacts — Tensioned away from the armature
B springs of break contacts — Tensioned toward the armature
C springs — Tensioned toward the armature
C springs of break contacts — Tension measured with armature operated
E springs adjacent to armature — Tensioned toward the armature
E springs adjacent to No. 1 springs — Tensioned either toward or away from the armature
M and O — Both contacts of spring designated M shall break before either contact of spring designated O makes (break-make combination).
S — See Reqt 2.15
μ — Spoolhead springs

Break Combinations

(3) At least one pair of contacts shall not break on

Test: 0.020 inch
Readjust: 0.017 inch

(4) Both pairs of contacts shall break on

Test: 0.008 inch
Readjust: 0.010 inch

Break Contacts of Break-Make Combinations

(5) At least one pair of contacts shall not break on

Test: 0.029 inch
Readjust: 0.026 inch

(6) Both pairs of contacts shall break

Test and Readjust—perceptibly before either pair of make contacts makes.

To check requirements (1) through (6), operate the relay electrically. Release the relay, and insert into the armature gap a 131A gauge of the proper thickness, taking care that the long axis of the gauge is in the position as shown in Fig. 8 or 9 when an attachable separator is used. Energize the relay, and apply a light pressure with the KS-6320 orange stick to the side of the balancing spring nearest the armature to move the card away from the armature. The contacts are open if the bifurcations follow the card and closed if the bifurcations do not follow the card.

When the circuit requirements table specifies insulating individual contacts on the relay being tested or adjusted, it will be satisfactory when checking for contact make and break to remove the insulating paper when checking individual moving springs. In this case it may be necessary to open the contact manually using the KS-6320 orange stick to release the relay.

2.17 ***Electrical Requirements:*** The relay shall meet the electrical requirements specified on the circuit requirements table.

2.18 ***Timing Requirements:*** (Applies After Turnover Only)—When specified on the circuit requirements table, the relay shall meet the times specified.

3. ADJUSTING PROCEDURES

3.001 *List of Tools, Gauges, Materials, and Test Apparatus*

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
300	Spring adjuster
303	Spring adjuster
474A	3/16- by 1/4-inch hex. closed-end offset wrench (two required)
505A	Spring adjuster (for 0.013-inch springs)
506A	Spring adjuster (for 0.018- and 0.023-inch springs) (two required)
510C	Test lamp [Must be equipped with 561A straight tip or the 562B curved tip and W2CB (24V) or W2BL (48V) cord.]
768A	Armature blocking tool
KS-6320	Orange stick
KS-21258	Backstop adjuster
—	3-inch C screwdriver (or the replaced 3-inch cabinet screwdriver)
—	4-inch E screwdriver (or the replaced 4-inch regular screwdriver)
—	B scissors
—	B long-nose pliers
—	Diagonal pliers
GAUGES	
62B	0-700 gram gauge
70D	50-0-50 gram gauge

CODE OR SPEC NO.	DESCRIPTION
GAUGES	
70H	0-30 gram gauge
70J	0-150 gram gauge
131A	Thickness gauge nest (Consists of a nest of 132-type gauges.)
MATERIALS	
D-178259	0.005-inch separator (attachable separator)
D-178260	0.010-inch separator (attachable separator)
TEST APPARATUS	
35 type	Test set
J24753A	Timing test set

3.002 ***General:*** In cases where there is insufficient vertical clearance between relay springs to permit the application of tools and gauges to the relay springs, it will be satisfactory to loosen and, if necessary, remove the relay mounting screws so that the relay may be drawn forward making the relay accessible for any adjustments covered herein.

3.01 ***Cleaning:*** (Reqt 2.01)—Clean the contacts and other parts of the relay as outlined in Section 069-306-801. After cleaning, check that requirement 2.16 is met and, if necessary, adjust as covered in 3.16.

3.02 ***Relay Mounting:*** (Reqt 2.02)

3.03 ***Vertical Clearance:*** (Reqt 2.03)—To tighten the mounting screws, use the 4-inch E screwdriver. To position the relay on the mounting plate, use the 4-inch E screwdriver to slightly loosen the mounting screws of the relay affected and shift the relay as required. Tighten the screws securely, taking care that the relay is in proper alignment and that there is the specified clearance both above and below the relay.

3.04 ***Cover Spring and Cover Guide Pressure and Cover Cap Tightness:*** (Reqt 2.04)

(1) If the cover spring does not rest on the spoolhead or if the cover is not held securely on the relay, adjust the spring with the 300 spring adjuster applying it near the crook in the spring as shown in Fig. 11. If it is not possible to correct the condition in this manner, proceed as covered in (2).

(2) Remove the relay from the mounting plate and remove the screws which hold the cover guide and cover spring in position using the 3-inch C screwdriver. Adjust the cover spring manually by bowing it at the crook in the spring. To adjust the cover guide after it has been removed, bend the part that is secured by the screws as required using the B long-nose pliers. Remount the cover guide and the cover spring, and tighten the mounting screws securely.

(3) If the cover cap does not fit properly, adjust the cover cap prongs as required using the B long-nose pliers.

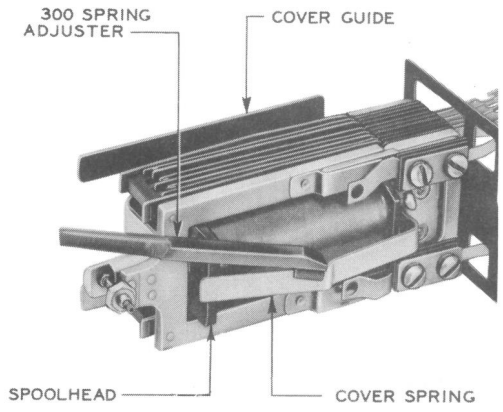


Fig. 11—Method of Adjusting Cover Spring Pressure

3.05 ***Contact Alignment:*** (Reqt 2.05)—If the contacts are misaligned, refer the matter to the supervisor.

3.06 ***Spring Tang and Card Clearance:*** (Reqt 2.06)

(a) ***Spring Tang:*** If the tang rubs on the spoolhead when the spring is moved or if the overlap is not satisfactory, refer the matter to the supervisor.

(b) ***Card:*** If the ends of the springs do not clear the card, check that the balancing springs hold the card securely in place. If they do not, tension the springs as required with the

505A spring adjuster as covered in 3.13 through 3.15. If the card still does not clear the springs, refer the matter to the supervisor.

3.07 ***Adjusting Stud Clearance:*** (Reqt 2.07)—If the armature rubs against the adjusting stud, grasp the adjusting nut with the B long-nose pliers and bend the adjusting stud as required. In this operation, exercise care not to damage the threads on the stud or to loosen the stud. If the stud cannot be adjusted to provide the proper clearance in this manner or if the stud is loose in the core, refer the matter to the supervisor.

3.08 ***Adjusting Nut Tightness:*** (Reqt 2.08)—To tighten loose adjusting nuts, back off the adjusting nut from the adjusting stud using the 474A wrench until its slotted portion is free of the stud. Then force the slotted parts of the nut closer together using the B long-nose pliers as shown in Fig. 12.

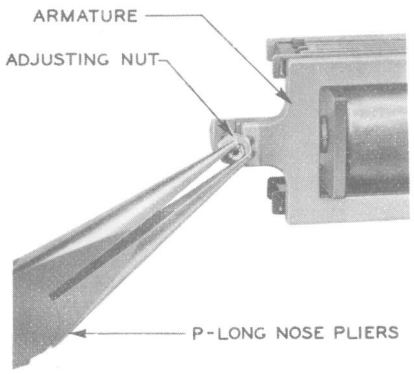


Fig. 12—Method of Tightening Adjusting Nut on Stud

3.09 ***Adjusting Nut Locknut Tightness:*** (Reqt 2.09)—To tighten loose adjusting nut locknuts, hold the adjusting nut in position with a 474A wrench and tighten the locknut against the adjusting nut with another 474A wrench. Exercise care not to tighten the locknut beyond the tension specified in 2.09.

3.10 ***Application of D-178259 or D-178260 Attachable Separators:*** (Reqt 2.10)

(1) Where an attachable separator has previously been used and is to be replaced, use a 3-inch C screwdriver to remove the separator from the core. To mount a separator, proceed as covered in (2) for relays having an adjusting stud and in (3) for relays having a welded backstop.

(2) Insert the 132AF (0.004 inch) gauge into the armature gap as shown in Fig. 13 to guide the flap of the attachable separator into position. This is done to prevent the flap of the separator from snagging on the stop discs. Hold the cardboard strip of separators in the left hand with the flap of the first separator towards the core of the relay and the free edge of the flap downward. Straighten the right-hand end of the strip. Using the index finger of the left hand, slide the first separator approximately 1/8 inch over the end of the strip and insert the free edge of the flap between the gauge and the core. Take care that the flap is entirely behind the adjusting stud, and that the front and rear corners of the flap enter the armature gap at the same time. Slide the flap into position and, while holding the separator in place with the index finger of the left hand as shown in Fig. 13, withdraw the strip. Turn the metal clip in a counterclockwise direction until the ears are in a vertical position. Snap the metal clip over the core so the ears rest against the step on the core, and then remove the gauge. Proceed as covered in (4).

(3) Using the B scissors or the diagonal pliers, remove the ears of the attachable separator after removing the separator from the cardboard strip. Remount the separator on the cardboard strip, and proceed as follows. Insert the 132AF (0.004 inch) gauge into the armature gap as shown in Fig. 8 to guide the flap of the attachable separator into position. This is done to prevent the flap of the separator from snagging on the stop discs. Hold the cardboard strip of separators in the left hand with the flap of the first separator towards the core of the relay and the free edge of the flap downward. Straighten the right-hand end of the strip. Using the index finger of the left hand, slide the first separator approximately 1/8 inch over the end of the strip and insert the free edge of the flap between the gauge and the core. Take care that the flap is entirely behind the welded backstop, and that the front and rear corners of the flap enter the armature gap at the same time. Slide the flap into position and, while holding the separator in place with the index finger of the left hand as shown in

Fig. 13, withdraw the strip. Turn the metal clip in a counterclockwise direction until the side of the metal clip having the stamped designation (thickness of separator) is in the vertical position. Snap the metal clip over the core, and then proceed as covered in (4).

(4) With the separator in place, make sure that the edges of the window of the flap do not touch the stop discs and that there are no wrinkles or snags in the flap. If there are wrinkles or snags, remove the separator as covered in (1) and replace it.

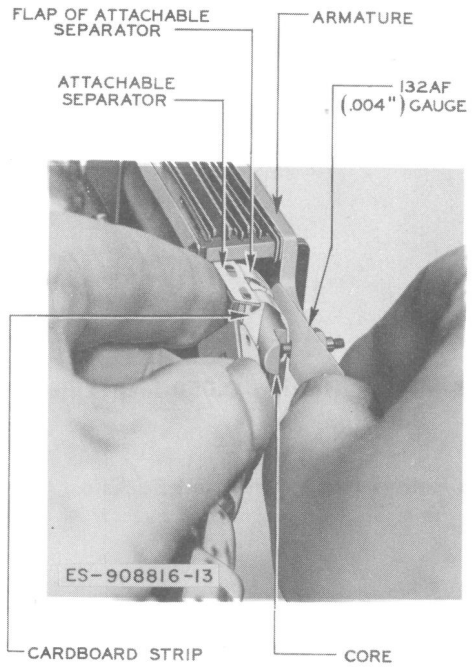


Fig. 13—Method of Applying Attachable Separator on Core

3.11 ***Armature Position:*** (Reqt 2.11)—If the armature does not rest against the hinge bracket after the relay has been electrically operated and released, check that the tension of the balancing springs in one spring combination is approximately equal to the tension of the balancing springs in the other combination. If these tensions are not approximately equal, adjust as covered in 3.13 through 3.15. If after making this adjustment the requirement is still not met in both the operated and unoperated positions of the relay, it is an indication that the hinge bracket is not properly positioned or that the armature hinge is bent. In this case refer the matter to the supervisor.

3.12 ***Armature Travel:*** (Reqt 2.12)

(a) ***Relays Having Adjusting Stud:*** To adjust the armature travel, insert into the armature gap the 131A gauge corresponding to the armature travel specified on the circuit requirements table. See Fig. 8 or 9, depending upon whether or not an attachable separator is used. Take care that the long axis of the gauge is parallel to the horizontal center line of the core. Turn the adjusting nut with the 474A wrench until friction is felt against the gauge. Remove the gauge, and check that requirement 2.08 is met. If the relay is equipped with an adjusting nut locknut, it will be necessary to loosen the locknut with a 474A wrench before adjusting for armature travel. After the armature travel requirement is met, hold the adjusting nut in place with a 474A wrench and tighten the locknut against the adjusting nut with another 474A wrench. Exercise care not to tighten the locknut beyond the tension specified in requirement 2.09.

(b) ***Relays Having 0.032-Inch Thick Welded Backstop:*** To adjust the armature travel, adjust the welded backstop with the 303 spring adjuster applied as shown in Fig. 14.

(c) ***Relays Having 0.050-Inch Thick Welded Backstop:*** To adjust armature travel, place the slot in the KS-21258 adjuster over the backstop and engage it to its full depth. Support the bend in the tool with the thumb and forefinger as shown in Fig. 14 so that torque applied causes the backstop to bend at the tool slot edge. Depending on the direction of adjustment, push or pull on the tool to prevent bending at the core edge or the weld.

3.13 ***Spring Tension:*** (Reqt 2.13)

3.14 ***Armature Back Tension:*** (Reqt 2.14)

3.15 ***Separation Between Springs:*** (Reqt 2.15)

(a) ***Spring Tension***

(1) Spring tensions are specified on a minimum basis. They have, however, in the case of moving springs, a direct bearing on the electrical performance of the relay; and if

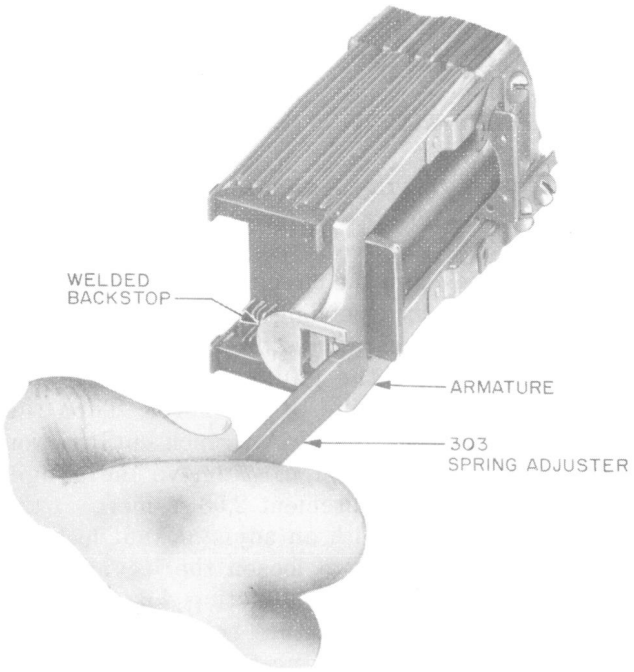


Fig. 14A—Relay Having 0.032-Inch Thick Welded Backstop

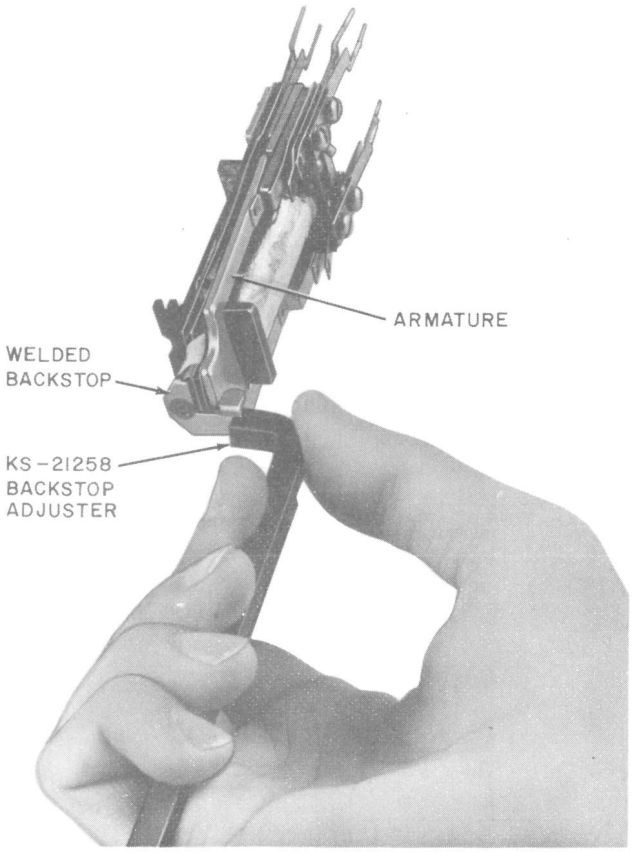


Fig. 14B—Relay Having 0.050-Inch Thick Welded Backstop

Fig. 14—Method of Adjusting for Armature Travel on Relays Having Welded Backstop

they are greatly in excess of the specified minimum, the relay may fail to meet its electrical requirements in which case it will be necessary to reduce the tensions. Attempt to distribute the tensions of the balancing springs and, then if necessary, the moving springs proportionately between the top and bottom spring combinations.

(2) Where there is considerable difference in the tensions of the two prongs of a bifurcated spring and the overall tension requirement cannot be met, reduce the tension of the prong having the greater tension with the 505A spring adjuster. To check that the two tensions are approximately equal, apply the 70D gauge just in back of the contacts, to first one and then the other prong. Then if necessary, increase the tension of the entire spring by adjusting as covered in (3) through (5).

(3) To adjust the springs for tension, use the 505A spring adjuster for 0.013-inch springs and the 506A spring adjuster for all other springs. It is especially important to use the 505A spring adjuster on 0.013-inch springs since the use of any adjuster having a wider slot may result in unsatisfactory adjustment and may affect the adjustment of adjacent springs.

(4) Do not attempt to remove bends from the springs as they have been pretensioned, and removing bends will destroy the adjustment.

Exercise care not to slide or draw the spring adjuster over a bend in the spring.

(5) To adjust a spring for tension, place the slotted portion of the spring adjuster against the spring to be adjusted on the side toward the mating spring just behind the contacts as shown in Fig. 15. Tilt the adjuster so it rests on the mating spring and, using this spring as a guide, slide the adjuster back to the base of the spring. Roll the adjuster over the spring to be adjusted so the spring fits into the slot in the adjuster. When adjusting a balancing spring, use an adjacent spring as a guide. Adjust the moving spring of make contacts away from the armature and the moving spring of break contacts toward the armature. Adjust the balancing springs adjacent to the armature toward the armature and the balancing springs at the extreme left of the card adjacent to the No. 1 contact spring either toward or away from the armature as required. Adjust all stationary springs toward the armature. Do not adjust the spring any more than is necessary since repeated adjustments may injure the spring. Take care when adjusting the springs to adjust them in line with their movement and to avoid tilting. Tilted contact springs cause unequal contact separation of the two pairs of contacts and may result in the failure of one of the contacts on the bifurcated spring to close. If the requirements cannot be met in the above manner, refer the matter to the supervisor.

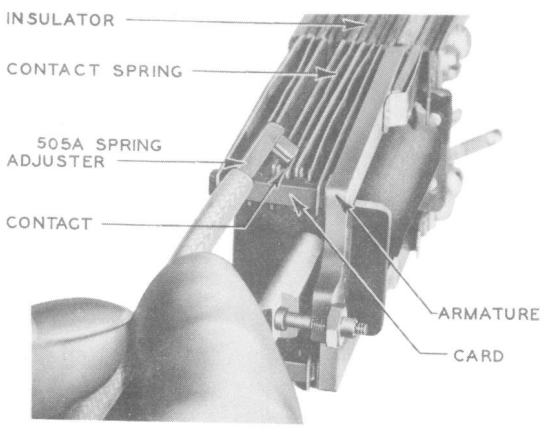


Fig. 15—Method of Applying Spring Adjuster for Adjusting Spring Tension

(b) ***Adjustment for Pressure of Armature Against the Backstop:*** If the armature is not held against the backstop with the specified pressure, alter the tension of the balancing springs as required using the proper spring adjuster as covered in (3) through (5). In adjusting these springs, attempt to tension the springs so the combined tension in one spring combination is approximately equal to the combined tension in the other spring combination. To check the tension of the balancing springs in each spring combination, block unoperated the relay using the 768A armature blocking tool and apply the tip of the 70J gauge to the end of the balancing spring nearest the armature. If the relay is equipped with an attachable separator, apply the blocking tool over the separator, taking care not to damage the separator.

3.16 ***Contact Make and Break:*** (Reqt 2.16)—To adjust to meet these requirements, adjust the spring tangs to the right or left as required using the 506A spring adjuster, meanwhile holding the springs with another 506A spring adjuster as shown in Fig. 16. It is satisfactory if in making this adjustment the spring tang does not rest flat against the spoolhead. If the relay cannot be adjusted in this manner, this difficulty may be due to a worn card in which case replace the card.

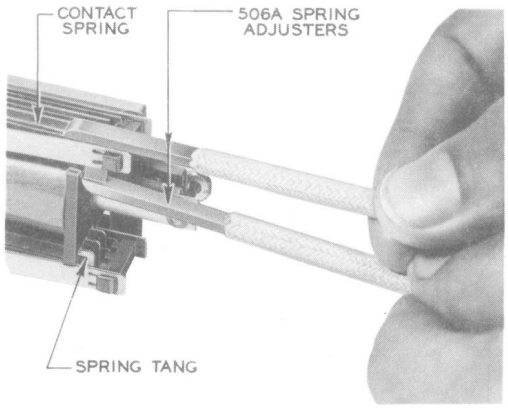


Fig. 16—Method of Adjusting Spring Tang

3.17 ***Electrical Requirements:*** (Reqt 2.17)

(a) To meet the operate and hold requirements, decrease the tension of the balancing spring toward the minimum as covered in 3.13 through

3.15. If the requirements still cannot be met, check that the armature rests against the hinge bracket in the operated position, and if it does not, refer the matter to the supervisor.

(b) To meet the nonoperate requirement when specified, increase the tension of the balancing springs to hold the armature against the adjusting nut.

3.18 ***Timing Requirements:*** (Reqt 2.18)—If the relay meets all the other requirements covered in this section but fails to meet the timing requirements specified on the circuit requirements table, replace the relay.