236-TYPE (D-87799) RELAYS
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers 236 type (D-87799) relays.

1.02 Reference shall be made to Section 020-010-711 covering General Requirements and Definitions for additional information necessary for the proper application of the requirements listed herein.

1.03 Part 1, "General" and Part 2, "Requirements" form part of the Western Electric Co. Inc. Installation Department handbook.

1.04 Operate means that the operate current shall pull the armature toward the core until the armature rests against the stop pin or in case the stop pin does not protrude through the core, the armature shall touch the core.

1.05 Release means that when the current is reduced from the operate value to open-circuit, or when the thermal element is energized, the armature shall move from the operated position sufficiently to open normally open contacts min. .005" and to make reliably contacts that have been broken.

1.06 Armature Travel The unoperated armature air-gap is specified in the "ARM. TRVL." column of the circuit requirement table end is the gap between the core and the nearest point on the armature, excluding the adjustable stop pin when the armature is resting against the adjusting nut.

2. REQUIREMENTS

2.01 Cleaning The contacts and other parts shall be cleaned when necessary in accordance with the section covering cleaning of relay contacts and parts.

2.02 Relay Mounting Relays shall be fastened securely to the mounting plate. Gauge by feel.

2.03 Cover Spring Pressure - Fig. 1(A) - The cover spring shall have sufficient pressure against the cover to hold the cover securely in place. The cover spring shall bear on the front spoolhead when the cover is off. Gauge by feel.

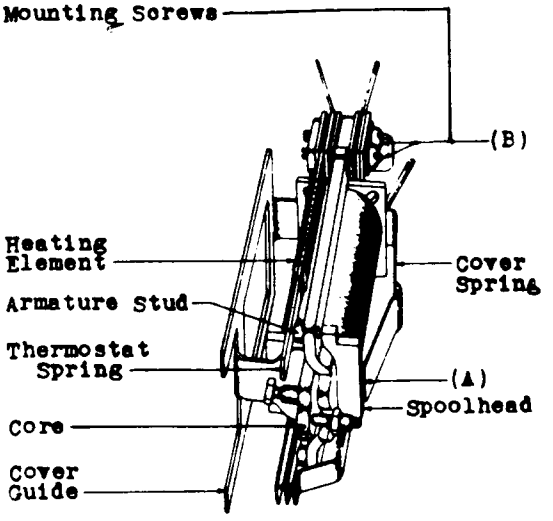


Fig. 1

2.04 Cover Guide Position The free end of the cover guide shall bear on the core when the cover is removed. Gauge by feel.

2.05 Tightness of Assembly - Fig. 1 (B) - All springs in a given assembly shall be held in their relative positions to one another and to the relay core by being securely fastened to the relay core at their bases. If it is found necessary to measure the tightness of assembly, such tightness shall be considered as satisfactory if the springs in a given assembly do not move in their mounting when a pressure of 680 grams (24 ounces) is applied in a vertical direction at the contact end of all springs in the same assembly taken together. Gauge by feel.

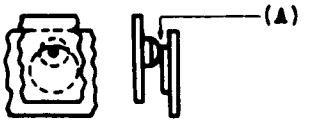


Fig. 2

2.06 Contact and Spring Alignment - Fig. 2(A) - (a) Contacts shall line up so that

2.06 (Continued)

the point of contact falls wholly within the boundary of the opposing contact.

(b) Springs shall not touch the relay cover. Gauge by eye.

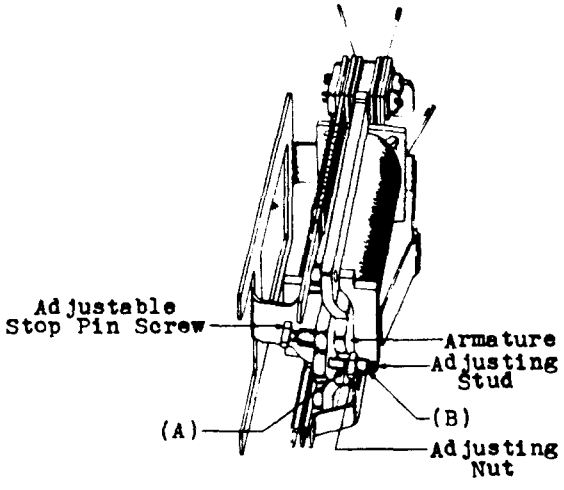


Fig. 3

2.07 Spring Tang Position - Fig. 4 (A) -

(a) Spring tangs shall rest on the spoolhead so that the ends of the tangs are below or above the projection of the top or bottom edges, respectively, of the spoolhead
Min. - 1/32"
Gauge by eye.

(b) The tang shall not rub on the spoolhead when moved slightly in the direction of travel of the spring from its normal position of rest on the spoolhead. Gauge by eye.

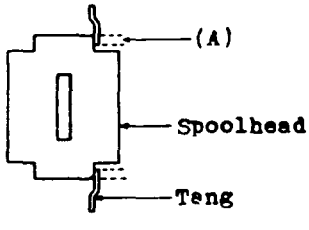


Fig. 4

2.08 Adjusting Stud Clearance - Fig. 3 (A) - The armature shall not rub against the adjusting stud. Gauge by eye and feel.

2.09 Adjusting Nut Tightness - Fig. 3 (B) - The adjusting nut shall be sufficiently tight on the stud to prevent its being turned with the thumb and forefinger. This requirement is considered as having been met if the nut does not turn under a turning pressure of one inch ounce. In case of doubt this may be checked by the use of the No. 349 wrench and No. 70-D gauge. With the wrench on the nut the gauge shall be applied to the wrench at the top or bottom side of the hole in the free end and the nut shall not turn with a pressure of 22 grams or less.

2.10 Adjustable Stop Pin Tightness - Fig. 5 (A) - The adjustable stop pin shall be sufficiently tight in the bracket to remain in any adjusted position. Gauge by feel.

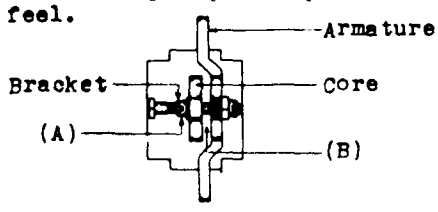


Fig. 5

2.11 Armature Travel - Fig. 5 (B) -

(a) The armature travel (unoperated air gap) shall be:
.025"
Use the No. 66-C gauge.

(b) Unless otherwise specified, the tolerance shall be:

Test	+.005"	-.0025"
Readjust	+.0025"	-.0025"

2.12 Straightness of Springs - Fig. 6 (A) - All springs shall be free of sharp bends

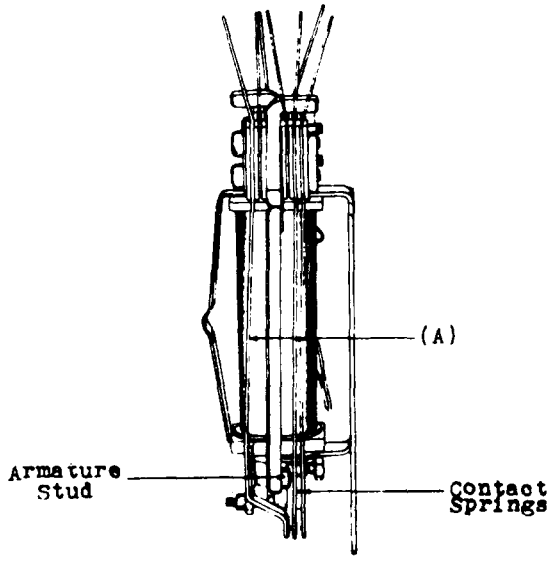
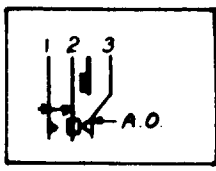


Fig. 6

2.12 (Continued)

or kinks due to adjustment. A gradual bow in a spring is permissible. Gauge by eye.

2.13 Separation Between Springs - Fig. 8 (A)- There shall be a clearance between adjacent springs, whether in the operated or unoperated positions of the relay of
Min. .008"
Gauge by eye.



CONT PRESS		SPRINGS					
		1	2	3			
L OR 10	T	8	8	25			
	R	9	9	27			
H OR 20	T	15	15	25			
	R	17	17	27			

Fig. 7

2.14 Contact Pressure - Fig. 7 -
(a) The contact pressure shall be in accordance with the information given in the "Cont. Press." of the "Circuit Requirement Table". The particular set of tensions to be used is given in the "Cont. Press." column.
(b) The arrows in Fig. 7 indicate the direction in which the springs are tensioned. In measuring the tensions specified apply the gauge to the tip of the spring in proximity to the contacts. Where the contacts are located inside of the line of the front spoolhead, apply the gauge at the tip of the spring. The gauge should be held in such a position that the reed and the spring whose tension is being measured are practically in a straight line. Unless the symbol "A.O." (Armature Operated) is shown associated with the arrow mark leading to a spring the tension shall be measured when the armature is in its normal position of rest. Springs tensioned against spoolheads shall register the required tension when the tang of the spring is lifted slightly off the spoolhead. Springs whose contacts are tensioned against the contact of opposing springs shall register the required tension when contact between the springs is broken. The "T" (Test) and "R" (Readjust) tensions given are the minimum allowable. Use the No. 70-D gauge to check the tensions.

2.15 Stud Gap - Fig. 8 (B) -
(a) There shall be a slight clearance between the armature stud or bushing and spring 2 of Fig. 7 when the armature is resting against the adjusting nut. Gauge by eye.

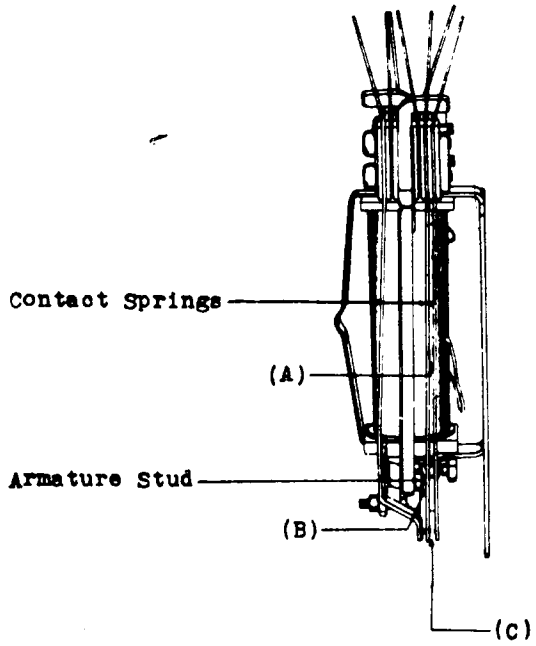


Fig. 8

When this spring actually has a contact pressure of 25 grams or more, regardless of the minimum tension specified, this clearance is regarded as having been met if the normally closed contact, does not break when a .003" gauge (Test) or a .005" gauge (Readjust) is inserted between the adjusting nut and the armature. Use the No. 66-C gauge.
(b) With the armature resting against the adjusting nut, there shall be a clearance between the armature stud and the thermostat spring, of
Approximately 1/32"
Gauge by eye.

2.16 Contact Separation - Fig. 8 (C) - The separation between any pair of contacts normally open or between any pair of contacts that are opened when the relay is operated shall be
Min. .005"
Use the No. 74-D gauge.

2.17 Contact Follow on the normally open contacts shall be perceptible (approximately .005"). The contact follow is considered satisfactory if the following test is met. With the relay operated on the specified "Test" or "Readjust" current, the front contact shall not make with an .008" gauge inserted between the adjustable stop pin and the armature.

2.17 (Continued)

or between the armature itself and the core when the stop pin does not protrude through the core but the front contact shall make with a .004" gauge inserted in place of the .008" gauge. Use the No. 66-C gauge.

2.18 Spring Sequence In Fig. 7, spring 2 shall break from 3 before it makes with 1.

A relay shall meet any other spring sequence specified on the circuit requirement table.

2.19 Electrical Requirements A relay shall meet the electrical requirements specified on the circuit requirement table.

2.20 Timing Requirements A relay shall meet the timing requirements when specified on the circuit requirement table.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges and Test Apparatus

Code No.	Description
Tools	
50	Spring Adjuster
206	Screw-driver 30 Degree Offset
207	Screw-driver 90 Degree Offset
259	Spring Adjuster
349	Wrench 3/16" and 7/32" Hex. Closed - Double-end Offset
-	Bell System 3-1/2" Cabinet Screw-driver per A.T.&T.Co. Drawing 46-X-40
-	Bell System P-Long Nose pliers - 6-1/2" per A.T.&T.Co. Drawing 46-X-56
Gauges	
66-C	Thickness Gauge Nest
70-D	50-0-50 Gram Gauge
70-E	150-0-150 Gram Gauge
74-D	Thickness Gauge Nest
Test Apparatus	
35-C	Test Set

3.01 Cleaning (Rq.2.01)

M-1 Clean the contacts and other parts in accordance with the section covering cleaning of relay contacts and parts.

3.02 Relay Mounting (Rq.2.02)

M-1 To tighten loose mounting screws, use the 3-1/2" cabinet screw-driver.

3.03 Cover Spring Pressure (Rq.2.03)
3.04 Cover Guide Position (Rq.2.04)

M-1 If the cover spring does not rest on the spoolhead, adjust the spring with the No. 259 spring adjuster applying it near the crook in the spring as shown in Fig. 9. If impossible to correct in this way proceed as outlined under M-2.

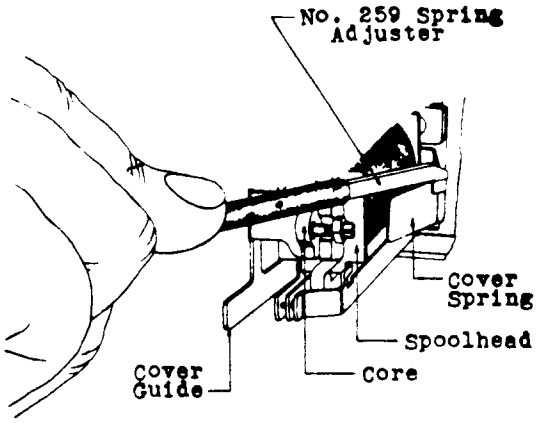


Fig. 9 - Method of Adjusting for Cover Spring Pressure

M-2 Remove the relay from the mounting plate and then remove the screw that holds the cover guide and cover spring in place. Use the 3-1/2" cabinet screw-driver. Adjust the spring manually by bowing it outward at the crook in the spring. To adjust the cover guide, after it is removed, bend inward the part that is secured by the screw. Use the long nose pliers.

3.05 Tightness of Assembly (Rq.2.05)

M-1 To tighten loose spring assembly mounting screws use the Nos. 206 and 207 offset screw-drivers. If the mounting centers of the relays do not permit the use of the offset screw-drivers remove the relay from the mounting plate and tighten the spring assembly mounting screws with the 3-1/2" cabinet screw-driver. Take care not to destroy the adjustments made under procedures 3.06 and 3.07.

3.06 Contact and Spring Alignment (Rq.2.06)
3.07 Spring Tang Position (Rq.2.07)

M-1 If the contacts do not line up properly, or if the tang does not overlap the spoolhead sufficiently attempt to correct the trouble by applying pressure to the end of the springs using the No. 259 spring adjuster, exercising care not to distort or otherwise damage the springs. If the springs cannot be shifted, remove the relay from the mounting plate and loosen the spring assembly mounting screws, sufficiently to shift the springs so as to correct the fault. Tighten the spring assembly mounting screws, securely, if loosened. Before mounting the relay make the adjustments

3.06-3.07 (Continued)

outlined under 3.03, 3.04 and 3.05, if necessary. Tighten the mounting screws securely when mounting the relay.

M-2 Use the 3-1/2" cabinet screwdriver in loosening and tightening the screws.

3.08 Adjusting Stud Clearance (Rq.2.08)

M-1 If the armature rubs against the adjusting stud correct as follows:

M-2 If due to a bent adjusting stud, straighten the stud by grasping the nut with long nose pliers and bending the stud as required. Exercise care not to damage the threads on the stud or loosen the stud.

M-3 If due to an improper manner in which the armature is hinged to the core, the relay should be changed.

3.09 Adjusting Nut Tightness (Rq.2.09)

M-1 To tighten loose nuts back off the nut from the stud until its slotted portion is free of the stud and then force the slotted parts closer together with long nose pliers as shown in Fig.10. Use the No. 349 wrench to turn the nut.

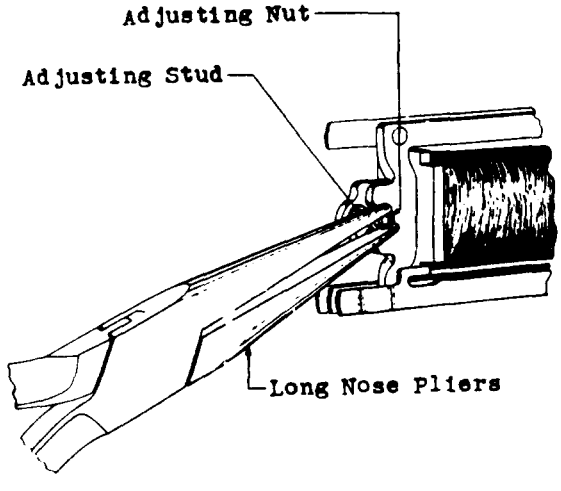


Fig. 10 - Method of Tightening Adjusting Nut on Stud

M-2 If in doubt as to whether or not the adjusting nut is tight enough, the tightness may be checked with the No. 70-D gauge and No. 349 wrench as shown in Fig. 11. The nut should not turn when a pressure of 22 grams or less is applied.

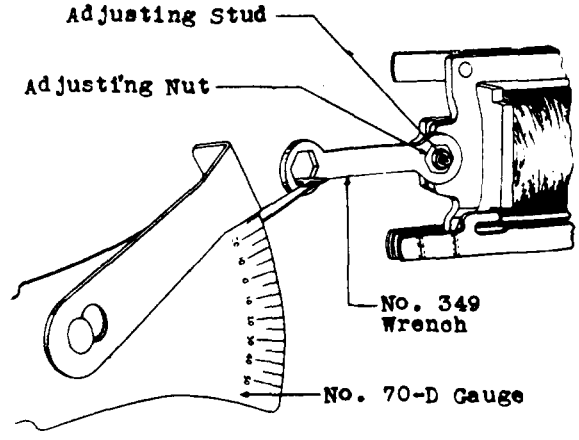


Fig. 11 - Method of Checking Adjusting Nut Tightness

3.10 Adjustable Stop Pin Tightness (Rq.2.10)

M-1 To tighten loose stop pin screws, back off the screw until it is held only by one or two threads and then force the slotted parts of the bracket closer together with long nose pliers as shown in Fig. 12. Use the No. 349 wrench to turn the screw.

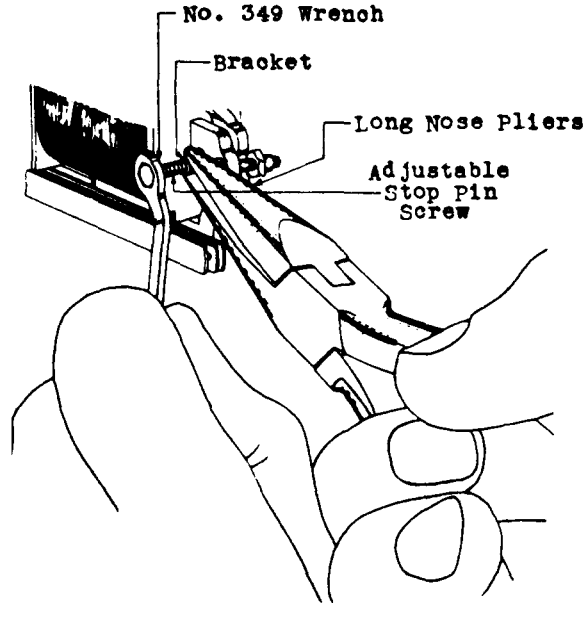


Fig. 12 - Method of Tightening Adjustable Stop pin

3.11 Armature Travel (Rq.2.11)

M-1 To adjust the armature travel, insert the proper blade of the No. 66-C gauge and turn the adjusting nut with the No. 349 wrench until the gauge fits snugly.

3.12 Straightness of Springs (Rq.2.12)
3.13 Separation Between Springs (Rq.2.13)

M-1 If the springs are not straight or there is insufficient clearance between the springs these conditions may be corrected by adjusting the springs where they are bent or where the clearance is insufficient with the No. 259 spring adjuster.

3.14 Contact Pressure (Rq.2.14)
3.15 Stud Gap (Rq.2.15)

M-1 Contact Pressure Use the No. 259 spring adjuster to adjust the contact springs for contact pressure. Place the adjuster on the front end of the spring but back of the contacts and armature stud, and then slide it back to a point about 1/4" from where the spring leaves the spring assembly. Adjust the spring at this point with a slight twist to the left or right as required, exercising care not to disturb adjacent springs.

M-2 Normally straight springs that have been adjusted should have no sharp bends due to adjustment. A gradual bow is permissible.

M-3 In tensioning springs, exercise care not to deform the armature hinge plate.

M-4 In connection with spring tensions that are specified to obtain contact pressure, note that they are specified on a minimum basis. They have, however, a direct bearing on a relay's electrical requirements, and if they are greatly in excess of their minimum tension, the relay may fail to meet its electrical requirements in which case the tension may have to be reduced slightly toward their specified minimum. In readjusting, however, it is desirable to have as much tension as possible on the various springs, consistent with meeting the other requirements.

M-5 Check the tensions with the No. 70-D gauge. In using the gauge the tip of the reed should engage the tip of the spring whose tention is to be measured. Hold the gauge in such a position that the reed and spring being measured are practically in a straight line. See Fig. 13.

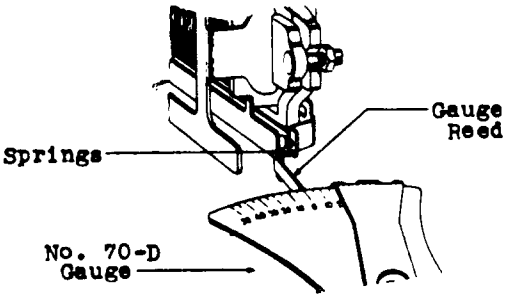


Fig. 13 - Method of Gauging Spring Tension

M-6 Stud Gap The stud gap requirement should also be met at the same time springs are adjusted to meet the contact pressure requirements. If it is difficult to meet this requirement by a readjustment of the springs, it will be satisfactory to bend the tang a slight amount. Use long nose pliers to bend the tangs, holding the springs with the spring adjuster as shown in Fig. 14. It is satisfactory if, in making this adjustment, the tang does not rest flat on the spoolhead.

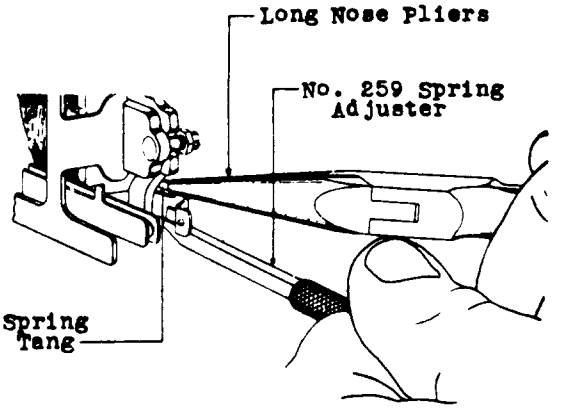


Fig. 14 - Method of Adjusting Spring Tang

M-7 The gap between the thermostat spring and the armature stud has a direct bearing on a relay's timing requirements since the heating time of the thermostat spring and the total operating cycle of the relay is roughly proportional to this gap. If the gap is greatly in excess of or greatly below the specified value, and the relay

3.14-3.15 (Continued)

fails to meet its timing requirements, increase or decrease this gap as required.

M-8 Use the No. 50 spring adjuster to adjust the thermostat spring for the proper clearance between it and the armature stud. Place this adjuster as close as possible to the point where the thermostat spring leaves the spring assembly as shown in Fig. 15 in order to prevent interference with the heating element.

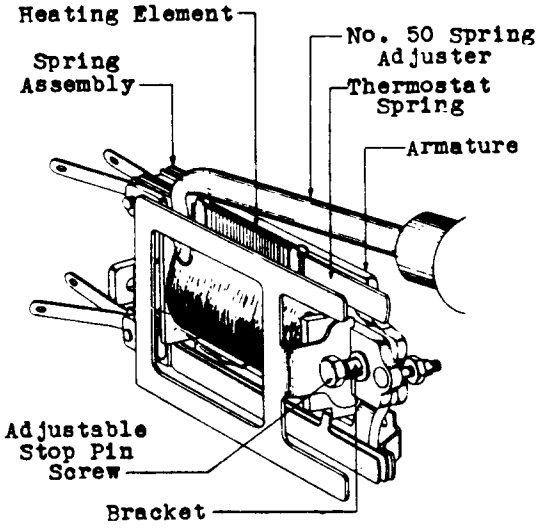


Fig. 15 - Method of Adjusting For Stud Gap on the Thermostat Spring

3.16 Contact Separation (Rq.2.16)

M-1 To correct the contact separation, adjust the contact spring with the No. 259 spring adjuster or the spring tang with long nose pliers. See procedure 3.14 and 3.15, M-6 regarding the bending of spring tangs.

M-2 In adjusting the front contact separation on break before make springs, adjust the springs so that the contact separation is sufficient to insure that spring sequence will be obtained under operating conditions.

3.17 Contact Follow (Rq.2.17)

M-1 To correct the follow, adjust the contact separation as required.

3.18 Spring Sequence (Rq.2.18)

M-1 To adjust for spring sequence, modify the contact pressure, stud gap, contact separation and contact follow requirements.

3.19 Electrical Requirements (Rq.2.19)
3.20 Timing Requirements (Rq.2.20)

M-1 If the relay fails to meet the electrical and timing requirements adjust as follows:

M-2 To meet the operate requirement decrease the spring tension toward the minimum, reduce the contact follow toward the minimum or increase the stud gap.

M-3 To meet the timing requirements turn the adjustable stop pin screw in a clockwise or counter-clockwise direction as required with the No. 349 wrench. Turning the adjustable stop pin screw in a clockwise direction will set up a greater operated air-gap and thereby decrease the heating time. Similarly turning the adjustable stop pin screw in a counter-clockwise direction will decrease the operated air-gap and increase the heating time. The height of the adjustable stop pin should be approximately .004".

M-4 The timing requirements may also be met by increasing or decreasing, as required, the gap between the thermostat spring and the armature stud since the heating time of the thermostat spring and the total operating cycle of the relay is roughly proportional to this gap.

M-5 Replace the cover and check to insure that the relay meets its electrical and timing requirements. This check can generally be made by observing the operation of associated apparatus in the circuit.