

202-TYPE SWITCHES REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

- 1.01 This section covers 202-type switches.
- 1.02 This section is reissued to incorporate material from the addendum in its proper location. In this process marginal arrows have been omitted.
- 1.03 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.
- 1.04 Part 1 "General" and Part 2, "Requirements" form part of the Western Electric Co. Inc. Installation Department Handbook.
- 1.05 Requirements are marked with an asterisk (*) when to check for them would necessitate the dismantling or dismantling of apparatus, or would affect the adjustment involved or other adjustments. No check need be made for these requirements unless the apparatus or part is made accessible for other reasons or its performance indicates that such a check is advisable.
- 1.06 The normal (unoperated) position is that position in which the stop on the knob rests against the lower stop on the cam shaft bracket with the normally open contacts open and the normally closed contacts closed.
- 1.07 The operated position is that position in which the stop on the knob rests against the upper stop on the cam shaft bracket with the normally open contacts closed and the normally closed contacts open.

2. REQUIREMENTS

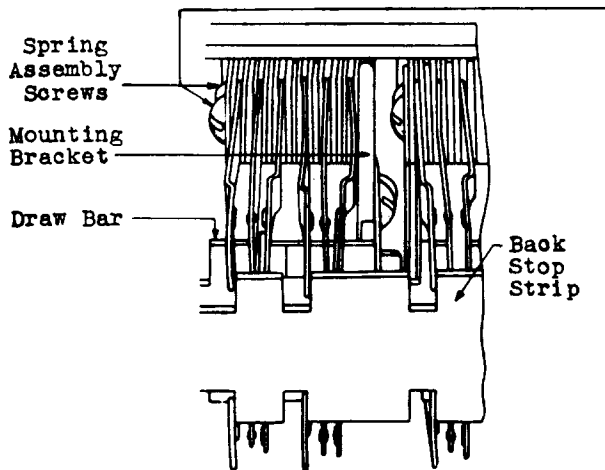


Fig. 1



Fig. 2

- 2.01 Cleaning
- (a) Contacts shall be cleaned when necessary in accordance with the section covering cleaning procedures for relay contacts.
- (b) Other parts shall be cleaned in accordance with approved procedures.
- 2.02 Cover Fit The cover shall fit snugly but shall not be so tight as to prevent placing or removing with the fingers. Gauge by feel.
- 2.03 Mounting The spring assemblies shall be securely fastened to the mounting plate. Gauge by feel.
- 2.04 Tightness of Assembly All springs in a given assembly shall be held in their relative positions to one another by being securely fastened to the mounting bracket at their bases. Gauge by feel.
- 2.05 Contact and Spring Alignment Contacts shall line up so that the point of contact falls wholly within the circumference of the opposing contact disc. Springs shall not touch the switch cover. Gauge by eye and feel.

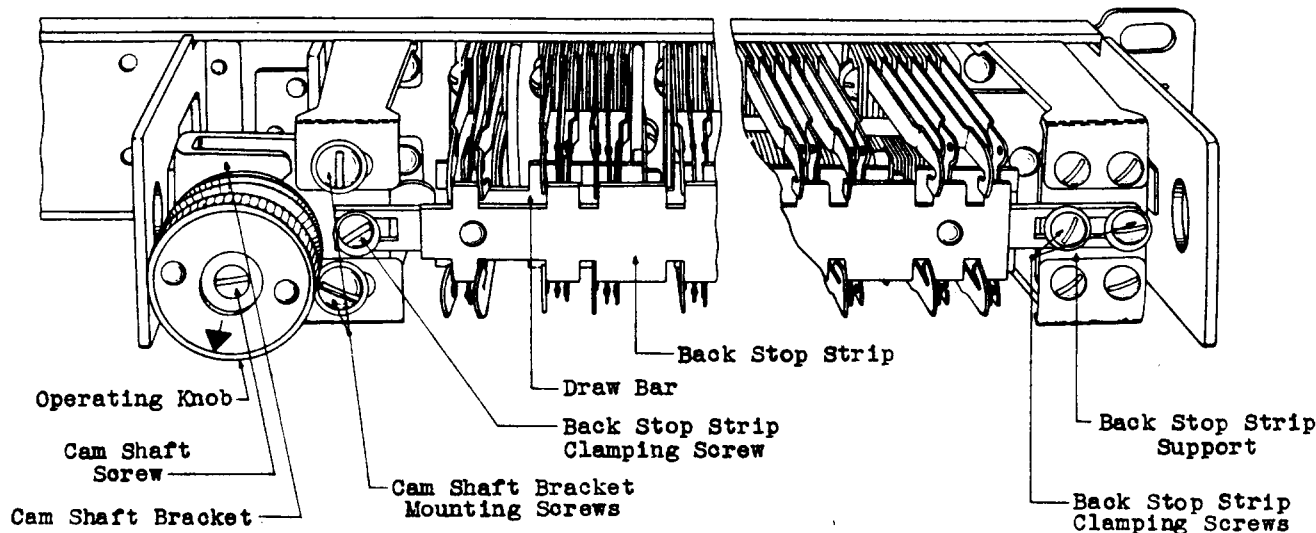


Fig. 3

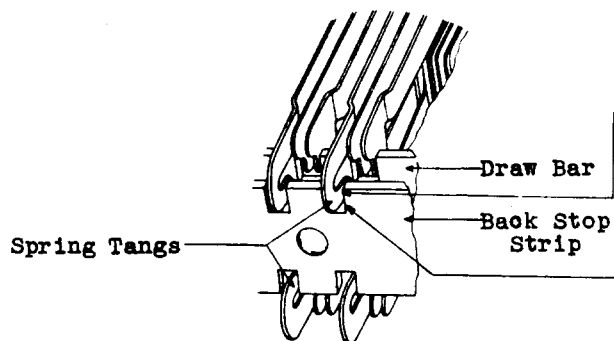


Fig. 4

2.06 Spring Tang Position

- (a) The tangs or the springs shall rest on the back stop strip or drawbar so that they are at least 1/16" below or above the projection of the top or bottom edges respectively of the back stop strip or drawbar. Gauge by eye.
- (b) The springs shall not rub on the back stop strip or drawbar when moved slightly in the normal directions of travel from their normal positions of rest. Gauge by eye and feel.

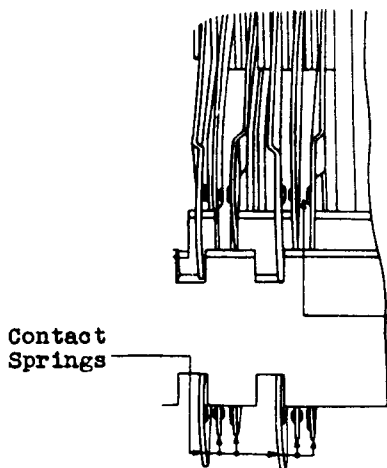


Fig. 5

- *2.07 Cam Shaft Movement The cam shaft shall rotate freely in its bearings between the unoperated and operated positions when relieved of the load. Gauge by feel.

- 2.08 Cam Shaft Bracket Position The side of the cam shaft bracket shall be approximately parallel with the side of the mounting plate of the switch. Gauge by eye.

2.09 Contact Separation

- (a) With the switch in the unoperated position the separation between the contacts of the short springs of the make-make spring combinations shall be

Test - Min. .010", Max. .035"

Readjust Min. .011", Max. .030"

Use the No. 66-C and No. 74-D gauges.

2.09 (Continued)

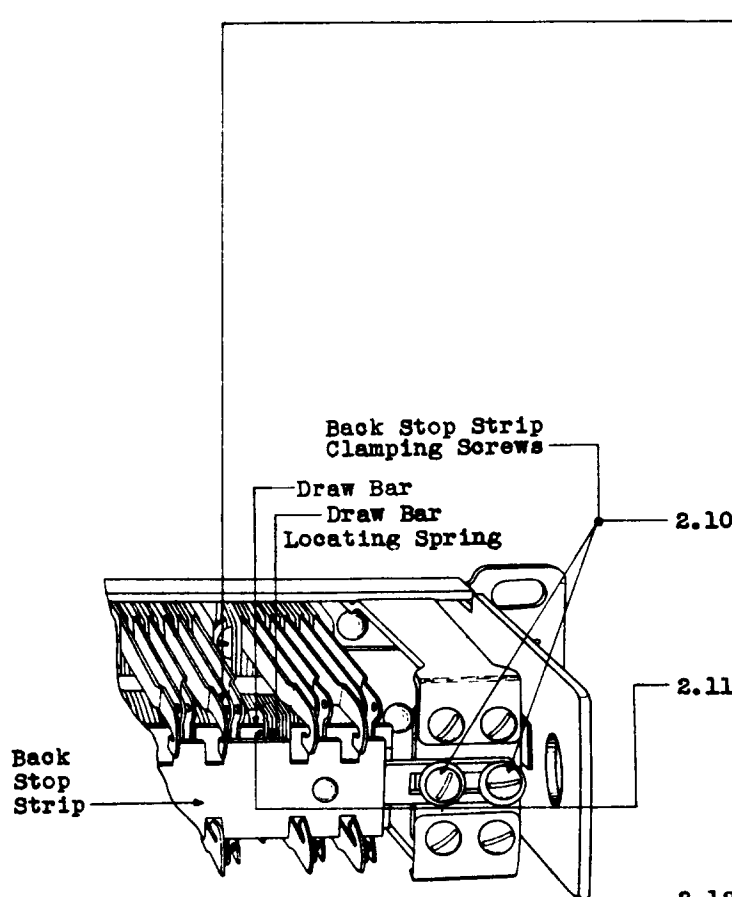


Fig. 6

- (b) With the switch in the unoperated position, the separation between the contacts of the long spring of the make-make spring combinations and the adjacent short spring shall be:

Test - Min. .010", Max. .030"
 Readjust - Min. .011", Max. .025"

Use the No. 66-C and No. 74-D gauges.

- (c) The separation between the normally open contacts of the transfer spring combinations or between the contacts of the transfer spring combinations that are open when the switch is operated shall be:

Test - Min. .047", Max. .060"
 Readjust - Min. .050", Max. .060"

Use the No. 91-C, No. 109-A and R-2228 gauges.

- 2.10 Tightness of Back Stop Strip Clamping Screws The back stop strip clamping screws shall be sufficiently tight to hold the back stop strip in the adjusted position. Gauge by feel.

- 2.11 Drawbar Locating Spring Tension The drawbar locating springs shall have a tension against the shoulders of the drawbar when the switch is in the operated position of
 Min. 5 grams.
 Use the No. 70-F gauge.

2.12 Contact Spring Tension

- (a) The tension of the contact springs shall be in accordance with Fig. 9
- (b) The arrows in this figure indicate the direction in which the springs are tensioned. In measuring the tension specified, apply the gauge to the spring at the contact. 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. Springs tensioned against the back stop strip shall register the required tension when the tang of the spring is lifted slightly off the back stop strip. Springs tensioned against the drawbar shall register the required tension when the tang of the spring is lifted slightly off the draw bar. Use the No. 70-D and 70-E gauges.
- (c) The tension of spring "B" shall be measured with the spring "C" lifted away from the spring "B".

2.12 (Continued)

- (d) The aggregate tension of the springs "F" of all the make-make spring combinations shall be sufficient to overcome the tension of the springs "E" of all the make-make spring combinations together with that of the two drawbar locating springs and provide an excess pressure of the drawbar link against the cam, or
- Test - Min. 550 grams
Readjust - Min. 600 grams
- Use the No. 62-B gauge applied at the right-hand end of the drawbar with the switch in the unoperated position.

SPRINGS	POSITION OF SWITCH	SPRING TENSION IN GRAMS			
		Test		Readjust	
		Min.	Max.	Min.	Max.
A	Unoperated	30	55	30	50
B	Unoperated	50	80	50	75
C	Operated	13	25	15	25
D	Unoperated	30	55	30	50
E	Unoperated	5	15	5	15
F	Unoperated	See Requirement 2.12(d)			

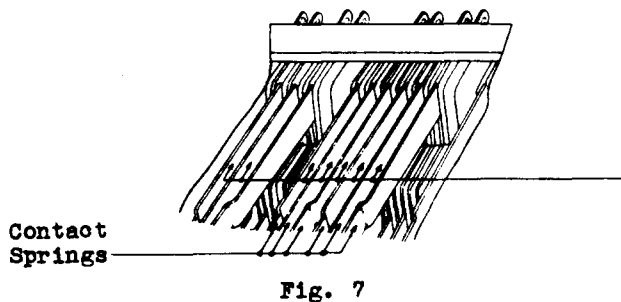


Fig. 7

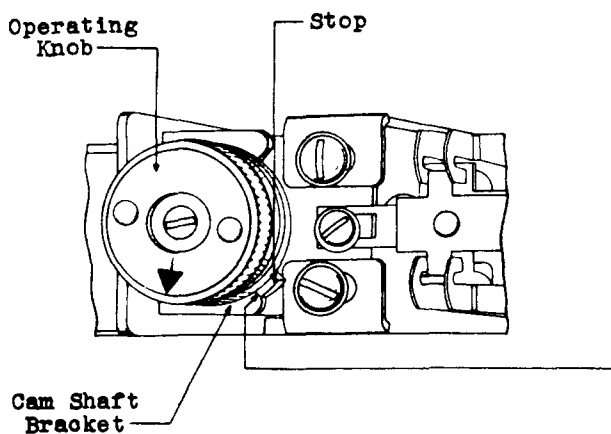


Fig. 8

- 2.13 Straightness of Springs All springs shall be free of sharp bends or kinks due to adjustment. A gradual bow in a spring is permissible. Gauge by eye.
- 2.14 Separation Between Springs There shall be a clearance between adjacent springs, whether in the operated or unoperated positions of the switch, of:
Min. .015"
Gauge by eye.
- 2.15 Operating Pressure The pull required to move the knob from its normal position shall be
Min. 900 grams
Use the No. 79-C gauge. In measuring this requirement the pull shall be applied at the bottom of the stop on the knob and perpendicularly to it.

3. ADJUSTING PROCEDURESTOOLS

<u>Code No.</u>	<u>Description</u>
259	Spring Adjuster (Contact springs)
412-A	Spring Adjuster (Drawbar locating springs)
413-C	Comb
-	Bell System Cabinet Screw-driver 3-1/2" per A.T.&T. Co. Drawing 46-X-40
-	Bell System Regular Screw-driver 4" per A.T.&T. Co. Drawing 46-X-34
-	Bell System P-Long Nose Pliers 6-1/2" per A.T.&T. Co. Drawing 46-X-56

GAUGES

62-B	0-700 Gram Gauge
66-C	Thickness Gauge Nest
70-D	50-0-50 Gram Gauge
70-E	150-0-150 Gram Gauge
70-F	10-0-10 Gram Gauge
74-D	Thickness Gauge Nest
79-B	0-1000 Gram Push-Pull Tension Gauge
91-C	.060" Thickness Gauge
109-A	.049" and .047" - .053" Double End Thickness Gauge
R-2228	.040" and .050" Thickness Gauge

MATERIALS

KS-2423	Cloth
KS-7860	Petroleum Spirits

3.01 CLEANING (Rq.2.01)

M-1 Clean the contacts in accordance with the section covering cleaning procedures for relay contacts. Clean other parts in accordance with procedure 3.07, M-4.

3.02 COVER FIT (Rq.2.02)

M-1 To increase or decrease the tension of the cover springs against the cover, adjust them to the right or left as required with the fingers.

3.03 MOUNTING (Rq.2.03)

M-1 To fasten loose spring assemblies to the mounting plate, tighten the mounting screws with the 4" regular screw-driver.

3.04 TIGHTNESS OF ASSEMBLY (Rq.2.04)

M-1 To tighten loose spring assembly screws, it will be necessary to remove the spring assembly from the mounting plate. First note the contact separation between a spring which rests against the back stop strip and the contact spring which makes contact with it when the switch is operated. This may be used as a reference when replacing the back stop strip which must be removed in making this adjustment. Then remove the back stop strip clamping screws with the 4" regular screw-driver and remove the back stop strip by pulling it forward.

M-2 Insert the No. 413-C comb over the front end of the contact springs as shown in Fig. 11.

M-3 Turn the screw which holds the operating knob to the cam shaft approximately 1-1/2 full turns in a counter-clockwise direction using the 3-1/2" cabinet screw-driver and push the shaft back by applying pressure to the screw with the screw-driver.

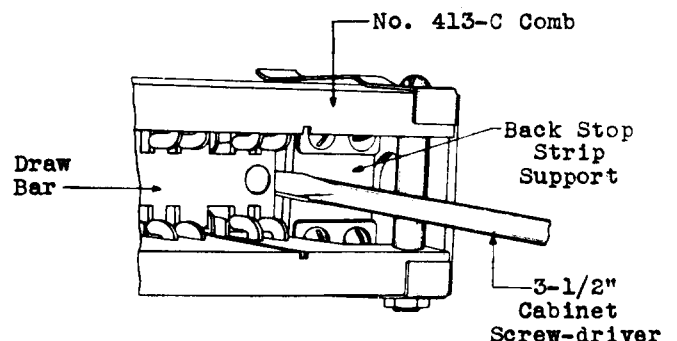


Fig. 10 - Method of Relieving Draw Bar Link of Spring Load

3.04 (Continued)

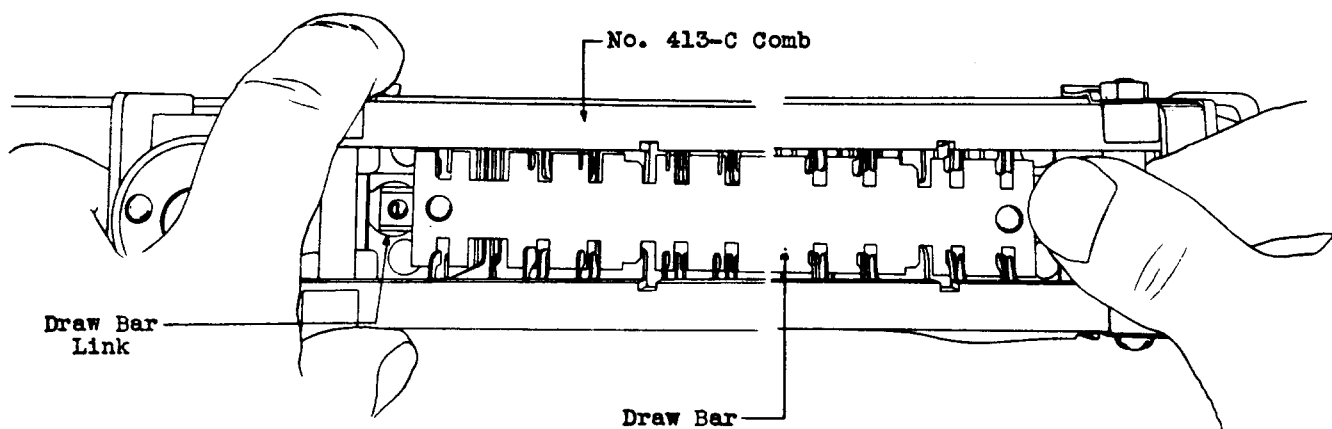


Fig. 11

M-4 Relieve the drawbar link of the spring load and disconnect it from the drawbar as follows: Insert the 4" regular screw-driver between the right end of the drawbar, and the adjacent back stop strip support as shown in Fig.10 and pry the drawbar toward the knob. The prying should be done by twisting the screw-driver and not by any lever action which might cause the comb to be moved out of position. Grasp the drawbar link with the long nose pliers as shown in Fig.12 and moving the link to the rear, disconnect it from over the pin on the metallic end of the drawbar.

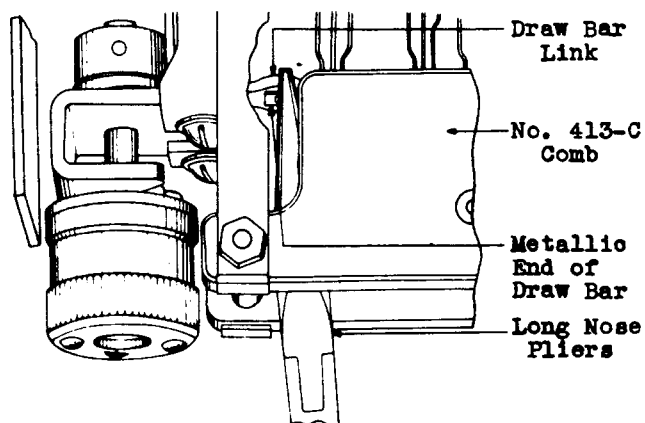


Fig. 12

M-5 Grasp the metallic end of the drawbar with the long nose pliers and remove the drawbar. Then remove the comb.

M-6 Remove the spring assembly mounting screws using the 4" regular screw-driver and remove the spring assembly. Tighten the spring assembly screws securely with the same screw-driver.

M-7 Before replacing the spring assembly on the mounting plate, see that the contact and spring alignment requirements are met on all the spring assemblies of the switch.

M-8 To reassemble the switch, proceed as follows:

M-9 Mount the spring assembly on the mounting plate and tighten the spring assembly mounting screws securely with the 4" regular screw-driver.

M-10 Insert the comb over the front end of the contact springs as before, making sure that each spring combination is engaged by the proper grooves of the comb and that the drawbar locating springs are engaged by their respective grooves. Grasp the metallic end of the drawbar with the long nose pliers as before and place the drawbar between the springs so that each slot of the drawbar engages the proper springs. Remove the comb and if the drawbar locating springs do not ease into position, supporting the

3.04 (Continued)

drawbar, hold the drawbar in position with one hand and manipulate the drawbar locating springs with the long nose pliers so that they slide into position. Grasp the drawbar link with the long nose pliers as shown in Fig.12. Insert the 4" regular screw-driver between the right end of the drawbar and the adjacent back stop strip support as shown in Fig.10 and pry the drawbar towards the knob. Set the drawbar link over the pin on the metallic end of drawbar. Tighten the screw which holds the knob to the cam shaft using the 3-1/2" cabinet screw-driver.

M-11 Replace the back stop strip so that each slot of the back stop strip engages the proper spring. Replace the back stop strip clamping screws, holding the back stop strip in position while tightening the screws so that the separation between the contact previously taken for reference as outlined in M-1, is the same as it was before any screws were loosened.

3.05 CONTACT AND SPRING ALIGNMENT (Rq.2.05)
 3.06 SPRING TANG POSITION (Rq.2.06)

M-1 If the contacts do not line up properly, or the springs are not approximately parallel, or if the contact springs rub on the back stop strip or drawbar, or the springs do not overlap the back stop strip or drawbar sufficiently, an attempt should be made to correct the trouble by applying pressure to the end of the springs exercising care not to disturb or otherwise damage them. If the springs cannot be shifted in this manner remove the spring assembly at fault from the mounting plate as outlined in procedure 3.04. Loosen the spring assembly screws with the 4" regular screw-driver sufficiently to shift the springs so as to correct the fault. Tighten the screws securely and replace the spring assembly on the mounting plate.

3.07 CAM SHAFT MOVEMENT (Rq.2.07)
 3.08 CAM SHAFT BRACKET POSITION (Rq.2.08)

M-1 If the cam shaft does not move freely in its bearings correct as follows.

M-2 Remove the back stop strip and disconnect the drawbar link from the drawbar as outlined in procedure 3.04, M-1, M-3 and M-4.

M-3 Remove the cam shaft bracket mounting screws and remove the bracket from the switch.

M-4 Remove the screw which holds the knob to the cam shaft and remove the shaft from the bracket. Clean the shaft with a KS-2423 cloth moistened with KS-7860 petroleum spirits and wipe off the shaft with a clean dry KS-2423 cloth.

M-5 Replace the shaft in the bracket and replace the knob on the shaft. Do not tighten the screw holding the knob to the shaft securely at this time but leave it approximately 1-1/2 full turns from tight.

M-6 Replace the bracket on the switch and replace the cam shaft bracket mounting screws. Connect the drawbar link to the drawbar as outlined in procedure 3.04, M-10. Tighten the screw which holds the knob to the cam shaft using the 3-1/2" cabinet screw-driver. Replace the back stop strip as outlined in M-11 of the same procedure.

M-7 In tightening the cam shaft bracket mounting screws, position the bracket so that the side of the bracket is approximately parallel with the side of the mounting plate of the switch.

3.09 CONTACT SEPARATION (Rq.2.09)
 3.10 TIGHTNESS OF BACK STOP STRIP CLAMPING SCREWS (Rq.2.10)

M-1 If the separation requirement is not met, determine whether or not the springs are correctly tensioned against the drawbar or back stop strip. If necessary, tension them as outlined in procedure 3.12.

M-2 If the separation between the contacts of those springs of the make-make spring combinations which are tensioned against opposite sides of the slots in the drawbar is not satisfactory, correct by adjusting the tang of one of the springs as follows: Determine approximately the amount of adjustment necessary and then remove the back stop strip and drawbar as outlined in procedure 3.04, M-1 to M-5 inclusive. Adjust the tang using the long nose pliers while holding the spring with the No. 259 spring adjuster as shown in Fig.13. Replace the drawbar and back stop strip as outlined in procedure 3.04, M-10 and M-11.

M-3 If the separation between the contacts of those springs of the make-make spring combinations which are tensioned against the back stop strip and against the drawbar in the direction towards the operating knob is not satisfactory, correct as follows:

3.09-3.10 (Continued)

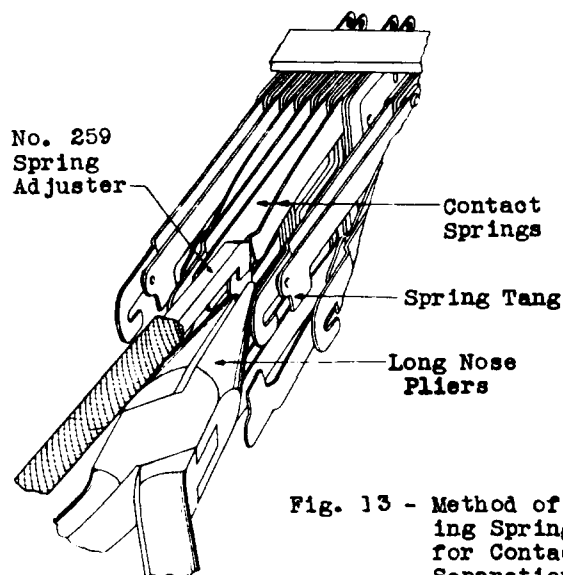


Fig. 13 - Method of Adjusting Spring Tang for Contact Separation

M-4 If only a few of the contacts do not meet the requirement, adjust the tangs of the back stop strip contact spring using the long nose pliers while holding the spring with the No. 259 spring adjuster as shown in Fig. 14.

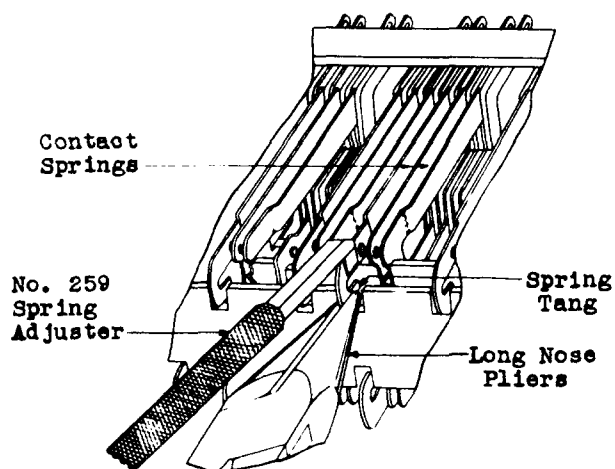


Fig. 14 - Method of Adjusting Spring Tang for Contact Separation

M-5 If many of the contacts do not meet the requirement, loosen the back stop strip clamping screws slightly with the 3-1/2" cabinet screw-driver at

the same time holding the strip from moving away from the knob, due to the tension of the contact springs, with the 4" regular screw-driver inserted between the right end of the strip and the back stop strip support. Then shift the back stop strip by moving the 4" regular screw-driver to the left or right until the requirement is met on as many contacts as possible. Tighten the clamping screws securely using the 3-1/2" cabinet screw-driver. Adjust as outlined in M-4 the tangs of any back stop strip contact springs which it is not possible to adjust by moving the back stop strip.

M-6 If the separation between the contacts of the transfer spring combinations is not satisfactory, adjust the tangs of the back stop strip contact springs using the long nose pliers while holding the spring with the No. 259 spring adjuster.

M-7 If the back stop strip clamping screws are loose, tighten them securely with the 3-1/2" cabinet screw-driver, exercising care that none of the contact separation requirements are affected.

3.11
3.12

DRAWBAR LOCATING SPRING TENSION (Rq.2.11)
CONTACT SPRING TENSION (Rq.2.12)

M-1 Drawbar Locating Spring Tension
If the drawbar locating springs do not have sufficient tension toward the knob to keep them against the shoulders of the drawbar, thereby insuring that the

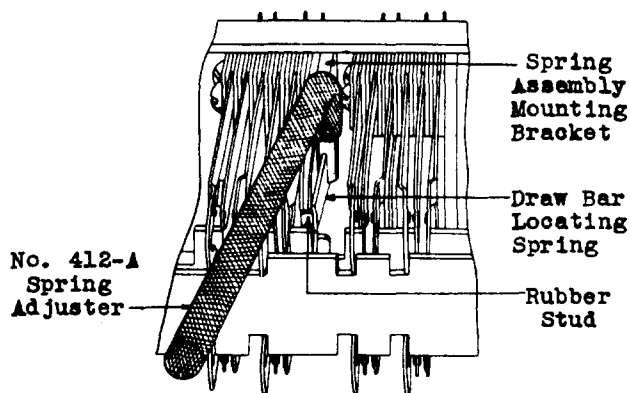


Fig. 15 - Method of Tensioning Draw Bar Locating Spring

3.13-3.14 (Continued)

drawbar will be held in position, increase the tension of the springs using the No. 412-A spring adjuster. Place the adjuster on the spring directly in back of the rubber stud and slide it back to a point approximately 1/4" from the spring assembly bracket as shown in Fig. 15 and then twist it slightly toward the knob.

M-2 Contact Spring Tension If the tension of the contact springs is not satisfactory, correct it with the No. 259 spring adjuster. Place the adjuster on the front end of the spring, but back of the contact, and then slide it back to a point approximately 1/4" from the spring assembly insulators as shown in Fig. 16. The adjustment of the spring is made with a slight twist of the adjuster to the right or left as required, exercising care not to disturb adjacent springs.

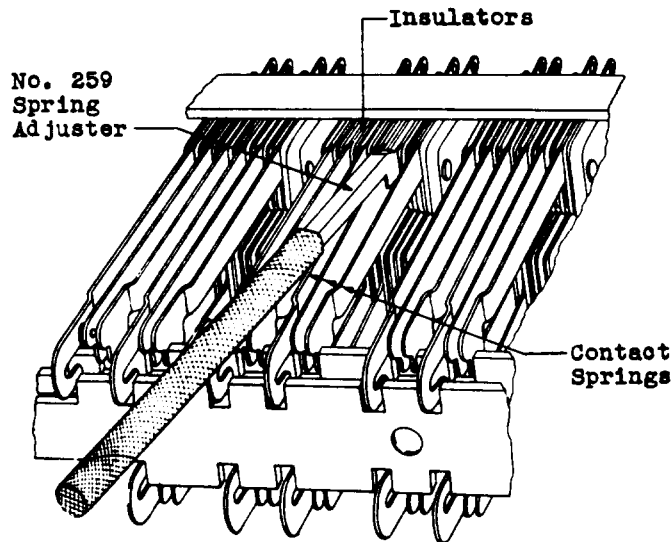


Fig. 16 - Method of Tensioning Contact Springs

3.13 STRAIGHTNESS OF SPRINGS (Rq. 2.13)
3.14 SEPARATION BETWEEN SPRINGS (Rq. 2.14)

M-1 If the springs are not straight and have sharp bends or kinks due to adjustment or if there is insufficient clearance between the springs, correct these conditions by adjusting the springs where they are bent or where the clearance is insufficient. Use the No. 259 spring adjuster exercising care not to destroy the adjustment made in procedures 3.11 and 3.12.

3.15 OPERATING PRESSURE (Rq. 2.15)

M-1 If the pressure necessary to start the operation of the switch is not satisfactory, loosen the knob locking spring assembly mounting screws with the 4" regular screw-driver and shift the locking spring assembly slightly away from the contact spring assemblies and retighten the mounting screws securely.

APPROVED:

Bell Telephone Laboratories, Inc. PAC 5-12-30