

188- AND 189-TYPE SWITCHES REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers 188 and 189 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 Normal Position: The operating bar is in the normal position when the cam is resting on that portion of the cam's periphery nearest the center of the cam. In this position, all the normally closed

contacts are closed, and all the normally open contacts are open.

1.06 Operated Position: The operating bar is in the operated position when the cam roller is resting on that portion of the cam's periphery furthest from the center of the cam. In this position, all the normally closed contacts are open and all the normally open contacts are closed.

1.07 Neutral Position: The operating bar is in the neutral position when the cam roller is resting on that portion of the cam's periphery between the points referred to in normal and operated positions, upon which a movement of the cam in either direction will cause no lateral movement of the operating bar.

1.08 One drop of oil for the purpose of this section is the amount of oil released from a piece of No. 22 bare tinned copper wire after it has been dipped into the lubricant to a depth of 3/4" and slowly removed.

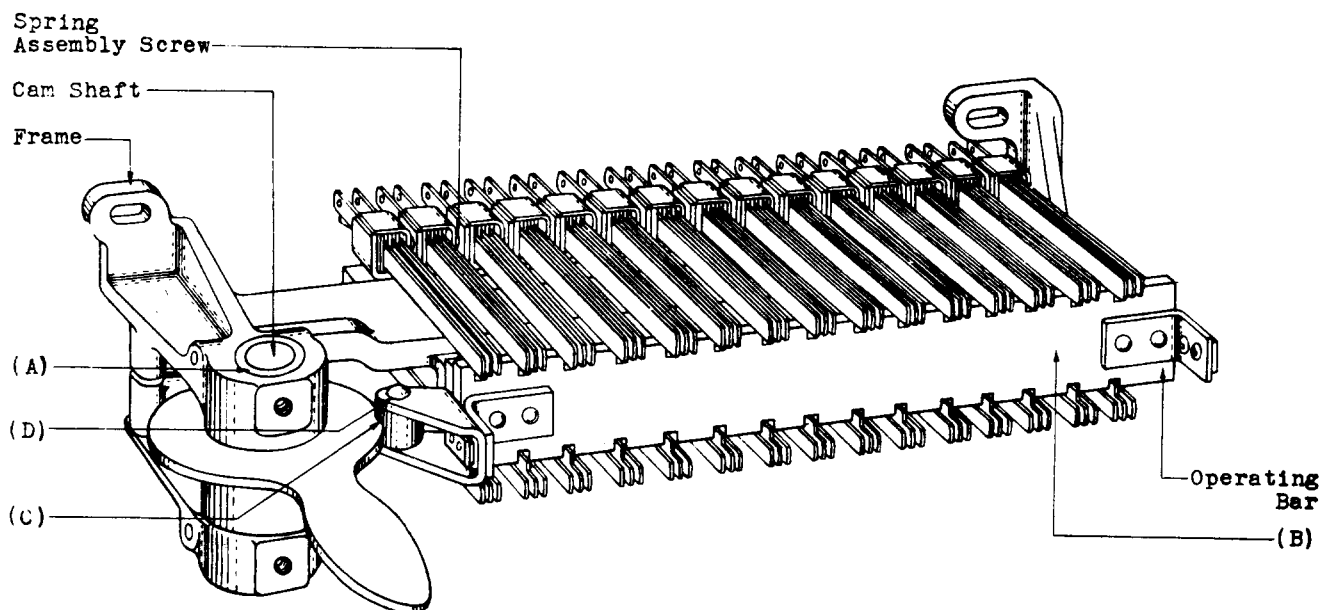


Fig. 1 - 188 Type Switch

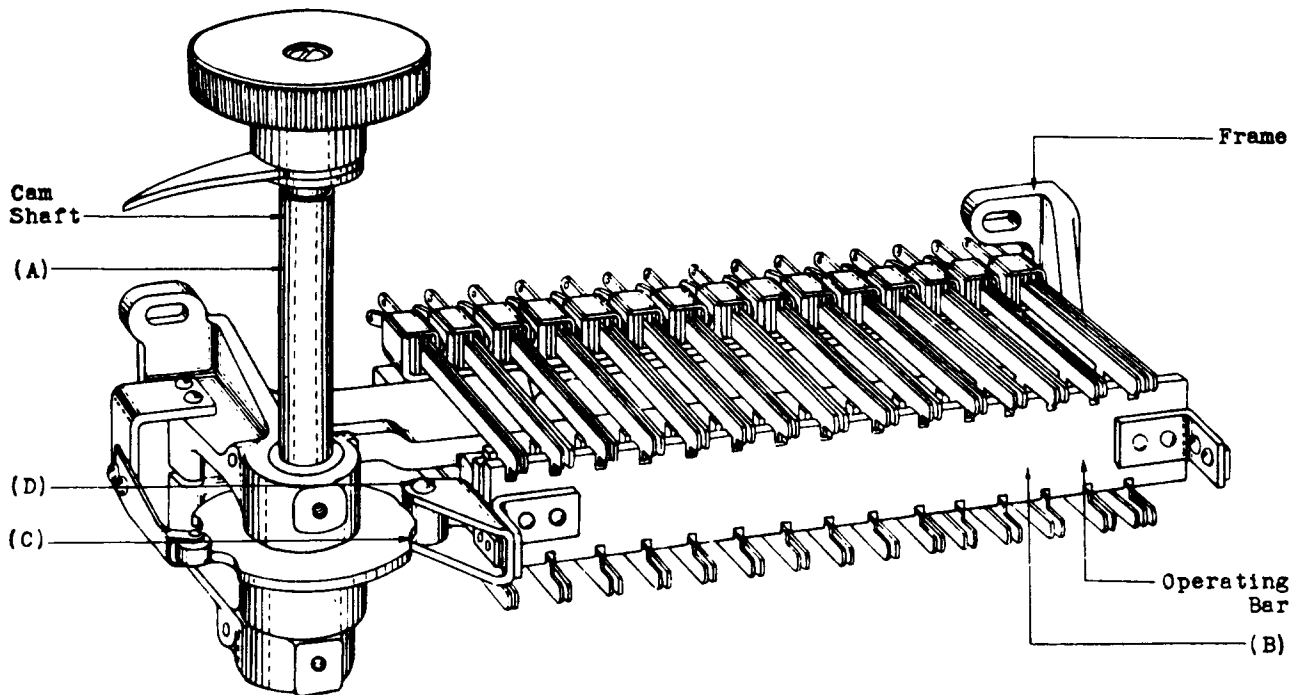


Fig. 2 - 189 Type Switch

2. REQUIREMENTS

2.01 Cleaning

(a) Figs. 1 (A) and (B) and 2 (A) and (B) - The cam shaft and operating bar shall be kept free from lubricants. The operating bar shall also be kept free from dust and dirt.

(b) The contacts shall be cleaned in accordance with the section covering cleaning procedures for relay contacts and parts.

2.02 Lubrication

(a) Cam Bearing Surface - Figs. 1 (C) and 2 (C) - The cam bearing surface shall be adequately lubricated with Veedol medium cup grease.

(b) Cam Roller Bearing - Figs. 1 (D) and 2 (D) - The cam roller bearing of 188 type switches and the cam roller bearing nearest the spring assembly of 189 type switches shall be adequately lubricated with KS-6438 oil. When lubrication is necessary two drops of KS-6438 oil shall be applied to the cam roller bearing.

(c) After turnover, it is recommended that initially, the parts covered in (a) and (b) be lubricated at intervals of six months. This interval may be extended if periodic inspections have indicated that local conditions are such as to insure that these requirements will be met during the extended intervals.

2.03 Record of Lubrication During the period of installation a record shall be kept by date of the lubrication which shall be turned over to the Telephone Company with the equipment. If no lubrication has been done it shall be so stated.

2.04 Tang Engagement

(a) Fig. 3 (A) - The operating spring tang shall engage with the notch in the operating bar min. 1/32" and shall clear the bottom of the notch. Gauge by eye.

(b) Fig. 3 (B) - The contact spring tang shall engage with the notch in the spring stop bar min. 1/32" and shall clear the bottom of the notch. Gauge by eye.

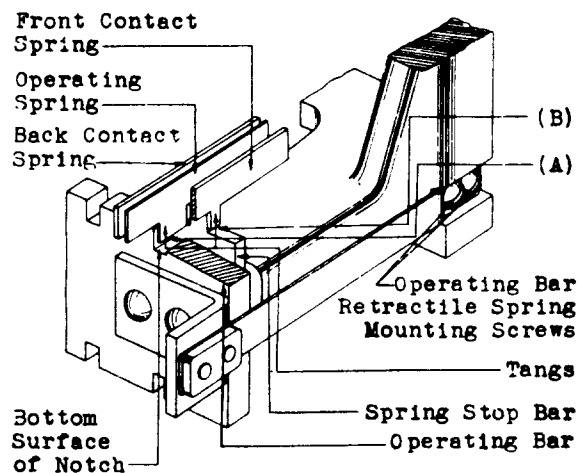


Fig. 3

2.05 Contact Alignment - Fig. 4 (A) - The contacts shall line up so that the point of contact falls wholly within the boundary of the opposing contact, except for opposing contacts having the same diameter in which case their centers shall not be out of alignment more than 25% of the diameter of the contacts. Gauge by eye.

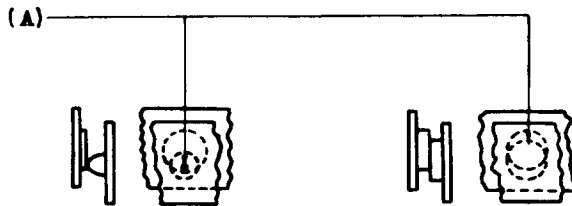


Fig. 4

2.06 Tang Pressure

(a) **Operating Spring Tang (189 Type Switches Only)** When the switch is in the position indicated in the following table the operating spring tang of the spring combination listed below shall rest against the side of the notch in the operating bar with a pressure of

Max. 30 grams

Contacts	Position of Operating Bar
Lower "N" Springs	Normal
All "A" to "J" Springs	Neutral
Upper "K" Springs	Neutral

Use the No. 68-B gauge.

(b) **Fig. 5 (A) - Front Contact Spring Tang** With the operating bar in the normal position, the pressure of the front contact spring tang against the side of the notch in the spring stop bar nearer the cam roller shall be

Min. 25 grams

Max. 60 grams

Use the No. 68-B gauge.

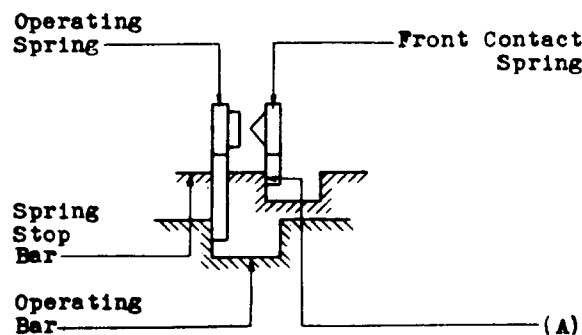


Fig. 5

(c) **Fig. 6 (A) - Back Contact Spring Tang** With the operating bar in the operating position the pressure of the back contact spring tang against the side of the notch in the spring stop bar further from the cam roller shall be

Min. 87.5 grams

Max. 112.5 grams

Use the No. 70-E gauge.

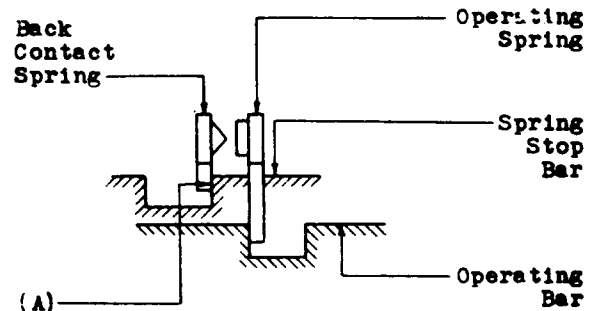


Fig. 6

2.07 Pressure of Operating Spring Against Back Contact Spring on Break and Transfer Spring Combinations - Figs. 7 (A) and 8 (A) - With the operating bar in the normal position, this pressure shall be:

Min. 20 grams

Max. 50 grams

Use the No. 68-B gauge.

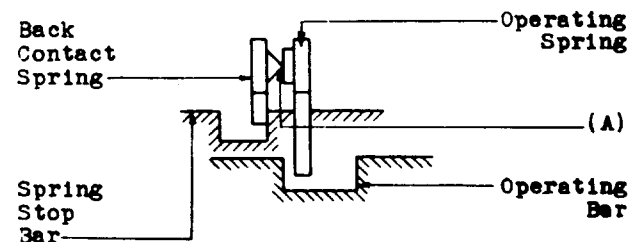


Fig. 7

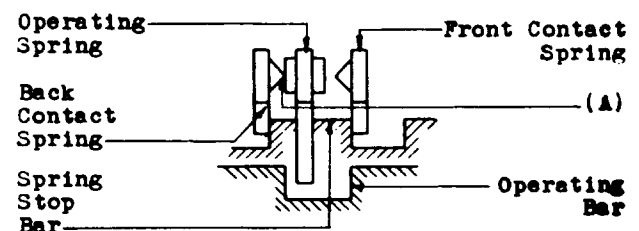


Fig. 8

2.08 Clearance Between Operating Spring and Operating Bar on Break and Transfer Spring Combinations - Figs. 9 (A) and 10 (A) -
With the operating bar in the position indicated in the following table this clearance shall be

Test - Min. .005"
Readjust - Min. .010"

Switch	Contacts	Position of Operating Bar
189-A	Upper "N" Springs	Normal
189-A	Both "O" Springs	Normal
189-A	Lower "K" Springs	Neutral
189-A	Both "L" and "M" Springs	Neutral
188 Type	All Closed Contact Springs	Normal

Gauge by eye.

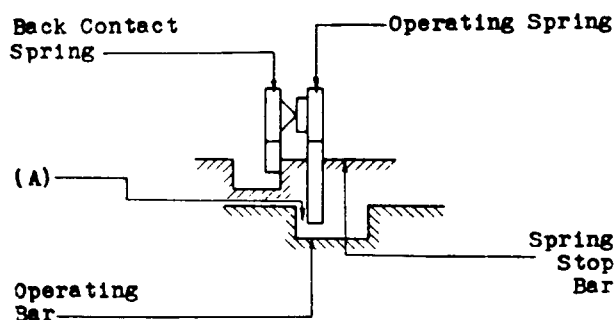


Fig. 9

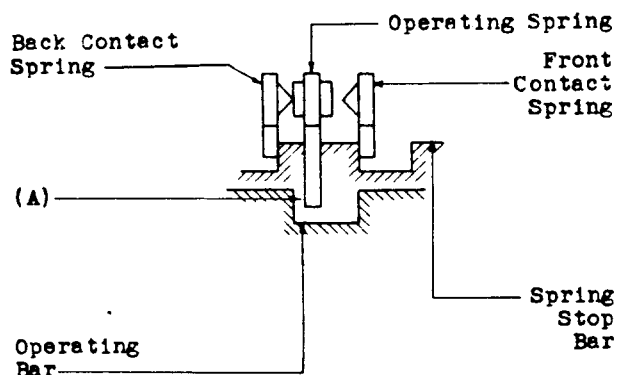


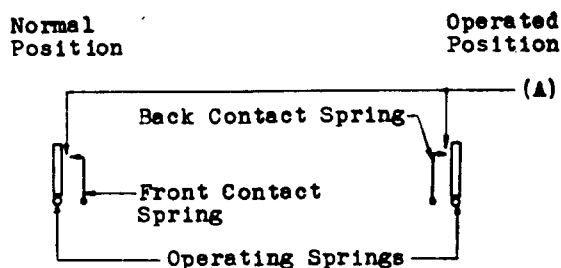
Fig. 10

2.09 Contact Separation - Figs. 11 (A) and 12 (A) - The separation between any pair of contacts that are open shall be:

Test - Min. .005"
Readjust - Min. .010"

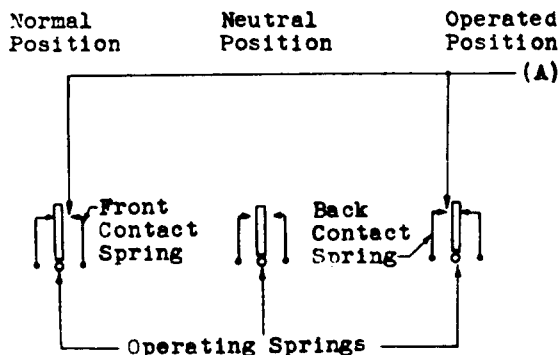
Gauge by eye.

On 189 type switches this requirement shall be checked with the operating bar in the neutral position when contacts are open in that position.



Make (Normally Open) and Break (Normally Closed) Spring Combinations

Fig. 11



Transfer (Break-Make) Spring Combination

Fig. 12

2.10 Contact Follow - Figs. 13 (A) and 14 (A) -

With the operating bar in the operated position (except as noted in (a)) there shall be sufficient contact follow to insure that the contacts shall make with a .009" gauge inserted between the tang of the front contact spring and the side of the notch in the spring stop bar nearer the cam roller. Use the No. 74-D gauge.

(a) In the case of 189 type switches the contact follow of the normally open contacts of the lower "N" and both "O" spring assemblies shall be checked when the switch is in the neutral position.

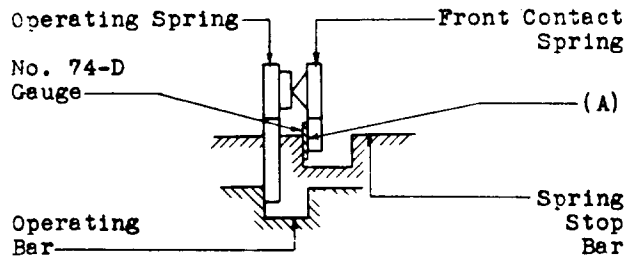


Fig. 13

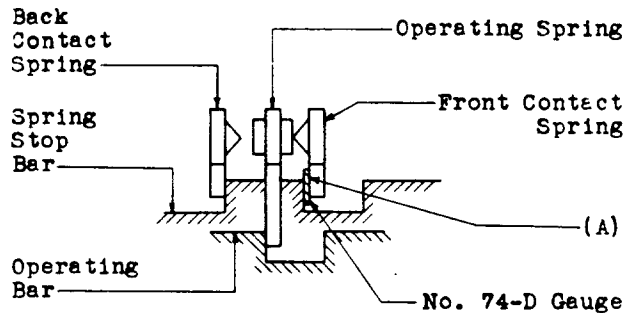


Fig. 14

2.11 Contact Sequence (188 Type Switches Only) Unless otherwise specified, the closed contact of a transfer spring combination shall break before the open contact makes. Gauge by eye.

2.12 Pressure Between Cam and Roller - Fig. 15 (A) - When the operating bar is in the normal position the pressure between the cam and the roller shall be:

Test - Min. 150 grams
Max. 400 grams

Readjust - Min. 200 grams
Max. 400 grams

Use the No. 62-B gauge.

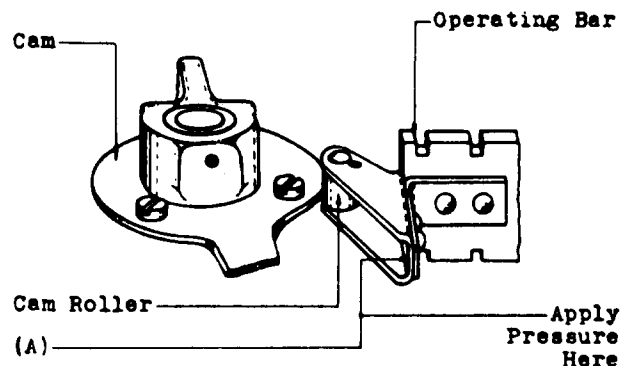


Fig. 15

2.13 Pressure of the Centering Roller Spring (189 Type Switch Only) - Fig. 16 (A) - The pressure of the centering roller spring measured at a point 1/4" back from the center of the roller when the switch is in the normal position shall be

Test - Min. 450 grams, Max. 650 grams

Readjust - Min. 500 grams, Max. 600 grams

Use the No. 62-B gauge.

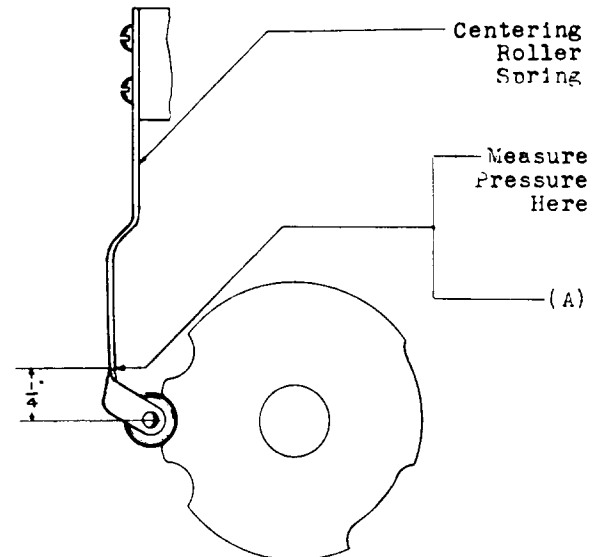


Fig. 16

2.14 Cover Retaining Spring Pressure (188 Type Switches) The cover retaining spring shall have sufficient pressure against the cover to hold the cover securely in place. Gauge by feel.

3. ADJUSTING PROCEDURES**3.001 List of Tools, Gauges and Materials**

<u>Code No.</u>	<u>Description</u>
<u>Tools</u>	
206	Screw-driver - 30° Offset
207	Screw-driver - 90° Offset
215	Spring Adjuster
259	Spring Adjuster
300	Spring Adjuster
KS-6015	Duck-bill Pliers
-	Small Brush (1/4" Round)
-	Bell System Regular Screw-driver - 4" per A.T. & T. Co. Drawing 46-X-34
-	Bell System Cabinet Screw-driver - 3-1/2" per A.T. & T. Co. Drawing 46-X-40
<u>Gauges</u>	
62-B	0-700 Gram Gauge
68-B	70-0-70 Gram Gauge
70-E	150-0-150 Gram Gauge
74-D	Thickness Gauge Nest
<u>Materials</u>	
KS-2423	Cloth
KS-6438	Oil
KS-7860	Petroleum Spirits
-	Veedol Medium Cup Grease
-	No. 22 Bare Tinned Copper Wire

3.002 In making adjustments on the 189 type switch when mounted in a test box, it will be necessary to remove the switch to adjust the parts not readily accessible.

3.01 Cleaning (Rq.2.01)

(1) If lubricant from the cam roller bearings is observed on the operating bar or if the surface of the cam roller is dirty or covered with a gummy deposit of old lubricant wipe it off with a KS-2423 cloth moistened in KS-7860 petroleum spirits. Wipe off with a dry KS-2423 cloth any dirt and dust which may from time to time accumulate on the operating and spring stop bars.

(2) If the cam is covered with old, dirty or gummy lubricant, clean the surface as thoroughly as possible with a clean KS-2423 cloth moistened with KS-7860 petroleum spirits. Then clean it further, if necessary, with a 1/4" round brush moistened with KS-7860 petroleum spirits.

(3) To remove lubricant from the cam shaft, wipe off the shaft with a KS-2423 cloth moistened with KS-7860 petroleum spirits.

(4) Take precaution to prevent the KS-7860 petroleum spirits splattering on adjacent apparatus or dirt or grease dropping down onto the apparatus below.

(5) If necessary, clean contacts in accordance with the section covering cleaning procedures for relay contacts and parts.

3.02 Lubrication (Rq.2.02)

(1) To lubricate the cam bearing surface proceed as follows. If the surface is dirty, clean it as outlined in procedure 3.01. When the surface is clean, apply fresh Veedol medium cup grease with another small brush as follows: Thoroughly saturate the brush with grease and scrape off any excess on the surface of the brush by a rotary motion of the brush on the side of the container. Then paint the grease onto the cam bearing surface by short strokes. Use the brush to wipe off any excess grease.

(2) When it is necessary, lubricate the cam roller with two drops of KS-6438 oil. If any excess oil is noticed at the bottom of the roller, wipe it off with a clean dry KS-2423 cloth. It is advisable occasionally when lubricating the roller to apply more than the above required amount of oil in order to flush out the bearing. Wipe off any excess oil or sediment which may appear at the bottom of the roller. A hole in the roller bracket has been provided in the more recent switches through which to lubricate the cam roller bearing.

**3.03 Record of Lubrication (Rq.2.03)
(No procedure)****3.04 Tang Engagement (Rq.2.04)****3.05 Contact Alignment (Rq.2.05)**

(1) If failure to meet requirement 2.04 is common to most of the operating springs, loosen the operating bar retractile spring mounting screws with the No. 206 or No. 207 screw-driver, move the bar to a position where the greatest number of tangs will meet the requirement, and securely tighten the screws.

(2) When individual operating springs or contact springs do not meet the limits specified, shift the spring at fault in the spring assembly so as to meet both

3.04-3.05 (Continued)

requirements. If this cannot be done without loosening the spring assembly screws, remove the spring assembly. To do this, loosen the spring assembly bracket mounting screw with the 4" regular screw-driver, and pull the bracket out far enough so that the spring assembly screws are exposed. Take care not to disturb the wiring. Loosen the spring assembly screws slightly with a 3-1/2" cabinet screw-driver and move the spring at fault up or down as required. Retighten the screws. Remount the bracket on the switch taking care that the springs are within the limits specified in requirements 2.06 to 2.11 inclusive.

3.06 Tang Pressure (Rq.2.06)**3.07 Pressure of Operating Spring Against Back Contact Spring on Break and Transfer Spring Combinations (Rq.2.07)****3.08 Clearance Between Operating Spring and Operating Bar on Break and Transfer Spring Combinations (Rq.2.08)****3.09 Contact Separation (Rq.2.09)****3.10 Contact Follow (Rq.2.10)****3.11 Contact Sequence (Rq.2.11)**

(1) In general, to adjust any springs which may be at fault, apply the No. 259 adjuster to the spring just behind the contact disc or point and give it a slight turn in the desired direction.

(2) After a contact or operating spring has been adjusted note that the contacts are properly aligned and, if necessary, readjust the springs as covered in procedure 3.04.

(3) Tang Pressure If the pressure is not within the specified limits, apply the No. 259 adjuster to the spring at fault close to the base of the spring assembly and adjust the spring as required.

(4) Pressure of Operating Spring Against Back Contact Spring on Break and Transfer Spring Combinations If the pressure is not within the specified limits apply the No. 259 adjuster to the operating spring close to the base of the spring assembly and adjust the spring as required.

(5) Clearance Between Operating Spring and Operating Bar on Break and Transfer Spring Combinations If the clearance is less than the specified limit, see if the operating spring tang of the back contact spring is distorted from its normal position. If the tang is distorted straighten it with the KS-6015 duckbill pliers. If the back contact spring is at fault, adjust it.

(6) Contact Separation Adjust either the operating or the contact spring for the proper separation. In general if the operating spring is not distorted, it will

be better to obtain the required contact gap by adjusting the contact spring rather than by adjusting the operating spring.

(7) Contact Follow Insert the proper blade of the No. 74-D gauge between the tang of the front contact spring and the side of the notch in the spring stop bar nearer the roller, and see that the contacts are still made. If they are not, adjust the front contact spring toward the operating spring.

(8) Contact Sequence To adjust for contact sequence, increase or decrease the contact separation as outlined in (1) and (6) or adjust the follow of the springs as outlined in (7) to within the limits specified.

(9) After the adjustments are completed, check the position of the operating springs to insure that there is the specified minimum clearance between the tang of the operating spring and the side of the slot in the operating bar nearer the roller end of the normally closed contact spring combinations.

3.12 Pressure Between Cam and Roller (Rq.2.12)

(1) To adjust the pressure of the roller against the cam, adjust the operating bar retractile springs near their points of support with a No. 300 adjuster as shown in Fig. 17. Notice that in the case of normally open spring combinations, the pressure of the operating springs is added to the pressure of the retractile springs when the roller is resting on that portion of the cam cutting nearest the center. If the pressure

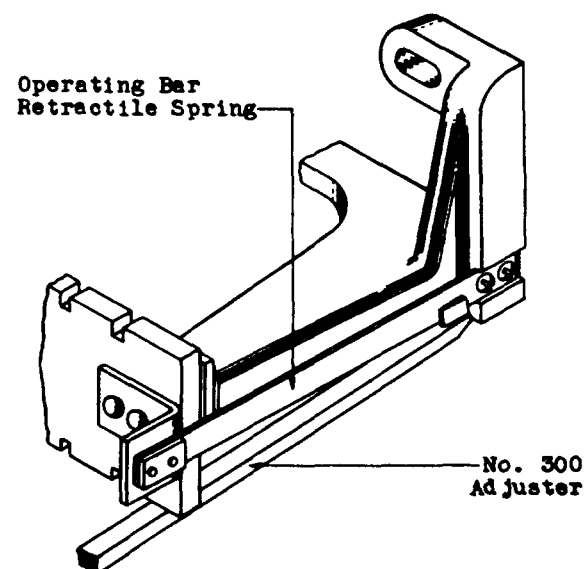


Fig. 17 - Method of Adjusting Retractable Spring Tension

3.12 (Continued)

between the cam and cam roller exceeds the specified limits and the tension of the retractile springs cannot be further reduced, reduce the tension of each operating spring away from the maximum until the requirement is met.

3.13 Pressure of the Centering Roller Spring (Rq.2.13)

- (1) If the tension of the spring is not satisfactory, adjust the spring as

close as possible to the point where it is attached to the frame with the No. 215 adjuster.

3.14 Cover Retaining Spring Pressure (Rq.2.14)

- (1) If the cover retaining spring does not hold the cover securely in place, adjust the spring with the fingers as required.