

**SIDE SWITCH**  
**(PART OF EARLIER 197-TYPE SWITCHES)**  
**REQUIREMENTS AND ADJUSTING PROCEDURES**

**1. GENERAL**

1.01 This section covers the side switch mounted on some of the earlier types of 197-type switches.

1.02 No changes have been made other than to add a lubrication requirement.

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 Normal Position of Side Switch is that position in which the private magnet is unoperated, the spider arm finger is locked in the first tooth of the escapement spring, and the side switch wiper is resting on the first bank contact.

1.05 One dip of KS-2832 or KS-7506 lubricant for the purpose of this section is the amount of lubricant retained on a No. 4 artist's show card brush after being dipped into the lubricant to a depth of 3/8" and then scraped on the edge of the container to remove the surplus lubricant. There should not be sufficient lubricant adhering to the brush to form a drop on the end of the bristles.

1.06 Private Magnet: In addition to the requirements specified herein, the private magnet shall meet the requirements which are applicable in the section covering step-by-step relays.

**2. REQUIREMENTS**

**2.01 Cleaning**

(a) Switch contacts shall be cleaned when necessary in accordance with the section covering cleaning of relay contacts and parts.

(b) Other parts shall be cleaned in accordance with approved procedures.

**2.02 Lubrication**

(a) KS-7506 Oil: The following parts shall be adequately lubricated with KS-7506 oil. When lubrication is necessary one dip shall be divided between the following points.

(1) The spider arm bearing pin just above the upper bearing lug of the spider arm.

(2) The spider arm bearing pin at the angle formed at the upper surface of the lower bearing lug.

(3) The spider arm link bearing.

(b) KS-2832 Lubricant: The escapement teeth shall be adequately lubricated with KS-2832 lubricant. When lubrication is necessary one dip shall be distributed over all the teeth.

(c) Recommended Lubrication Interval: After turnover it is recommended that the parts listed in requirement (a) be lubricated at intervals of six months and those parts listed in (b) be lubricated at intervals of three 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 interval.

2.03 Adjustable Escapement Springs: On connectors equipped with adjustable escapement springs, the upper springs shall be set so that the teeth are approximately .030" ahead of the teeth of the lower spring and the space between the tips of the upper and lower escapement springs shall be:  
Max. .050"  
Gauge by eye.

2.04 Private Magnet Spring Tension: The springs shall be tensioned to produce satisfactory operation of the side switch. Gauge by eye or feel.

2.05 Private Magnet Contact Follow: There shall be a contact follow on all contacts of:  
Min. .015"  
Gauge by eye.

2.06 Private Magnet Contact Separation: The contact separation for make or break contacts shall be:  
Min. .008"  
Gauge by eye.

2.07 Position of Contact Block: The vertical center line through the contact block assembly shall be approximately parallel to the switch shaft. Gauge by eye.

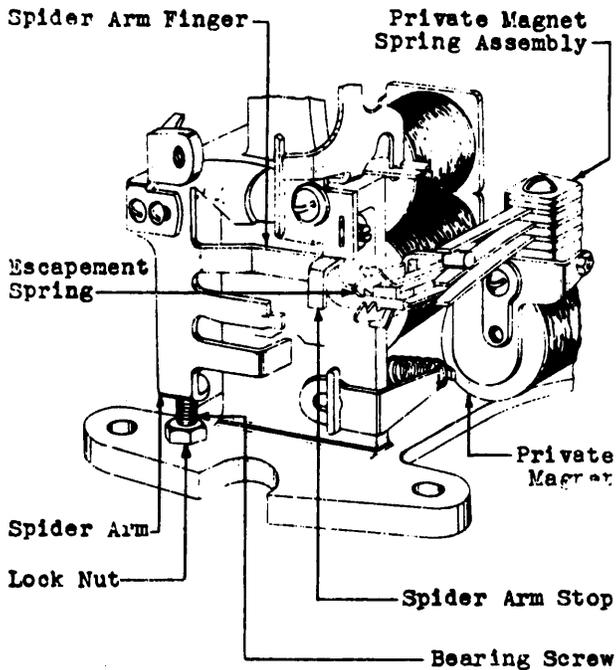


Fig. 1 - Parts of Side Switch

2.08 Block Contact Alignment: The block contacts shall be in alignment both horizontally and vertically to allow the wipers to pass over the upper and lower contacts freely. Gauge by eye.

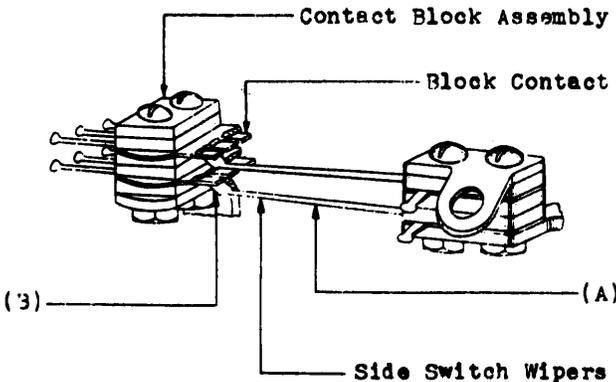


Fig. 2 - Alignment of Block Contacts

2.09 Wiper Forming

(a) The wipers shall be approximately straight from the point where the springs leave the insulators to the

beginning of the enlarged curved tip. The tip of the wipers shall form an angle of approximately 15 degrees. Gauge by eye.

(b) The wipers shall make a knife edge contact on the block contacts. Gauge by eye.

2.10 Wiper Tip Forming: The tips of the wipers shall be curved just enough to prevent them catching on the block contacts but must not be curved enough for the wipers to drop between the contacts and cause the switch to stick. Gauge by eye and feel.

2.11 Wiper Spring Tension - Fig. 2 (A) -The wiper springs shall have enough tension so that when pressure is applied midway between the front and back of the wiper to cause it to move approximately 1/16" the spring will just leave its contact. Gauge by eye.

2.12 Wiper Alignment in the Second Position Fig. 2 (B) - When the side switch is in the second position and the private magnet is at normal, the wiper tips shall rest a little to the left of the center of the bank contacts. When the private magnet is energized the wiper tips shall rest a little to the right of the center of the bank contacts. Gauge by eye.

2.13 Overlap of Wiper Tips on the Block Contacts - Fig. 3 (A) - The tips of the wipers shall rest midway between the front and back of the block contacts. Gauge by eye.

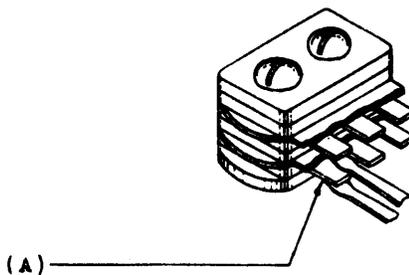


Fig. 3 - Position of the Wiper Tips on the Block Contacts

2.14 Wiper Alignment in the Third Position: The spider arm stop shall hold the wipers approximately centered on their contacts in the third position. Gauge by eye.

2.15 Spider Arm Play: The spider arm shall not bind nor have more than .003" vertical play. Gauge by eye and feel.

2.16 Spider Arm Spring Tension: The spider arm spring shall have sufficient tension to move the wipers from the first to the last position when the movement of the wipers is retarded by hand. The spring shall not be tensioned sufficiently to prevent the release magnet of the 197 type switch from restoring the side switch wipers to normal. Gauge by eye and feel.

2.17 Spider Arm Finger Position: With the switch at vertical normal, the spider arm finger shall set parallel to the switch frame and the top shall be tilted a little to allow the finger to slide freely over the teeth of the lower escapement spring. Gauge by eye.

2.18 Clearance Between Spider Arm Cam Lug and the Shaft Hub: With the lower lug held against the frame, the upper offset of the spider arm cam lug shall clear the hub of the shaft, when at normal, by:

Min. .002"

Max. .006"

Gauge by eye.

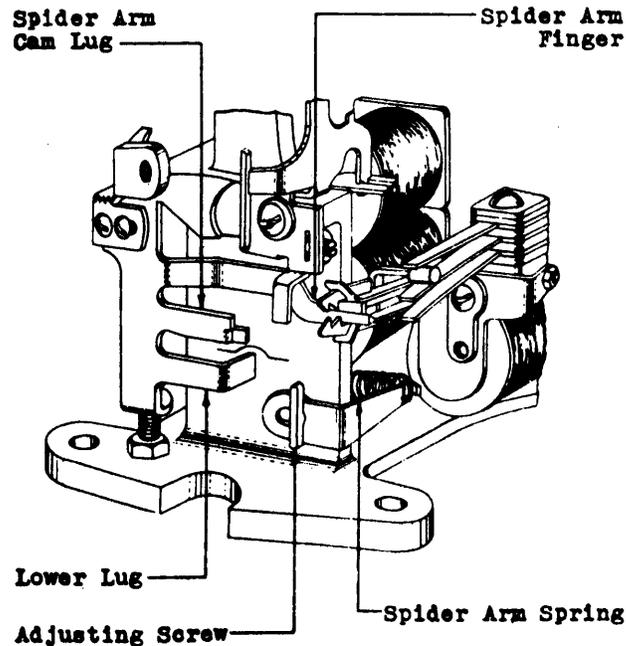


Fig. 4 - Parts of Side Switch

2.19 Clearance Between Spider Arm Cam Lug and Shaft Cam: Fig. 5 (A) - With the shaft up on any level and cut in one step, there shall just be perceptible clearance between the spider arm cam lug and the shaft cam. Gauge by eye.

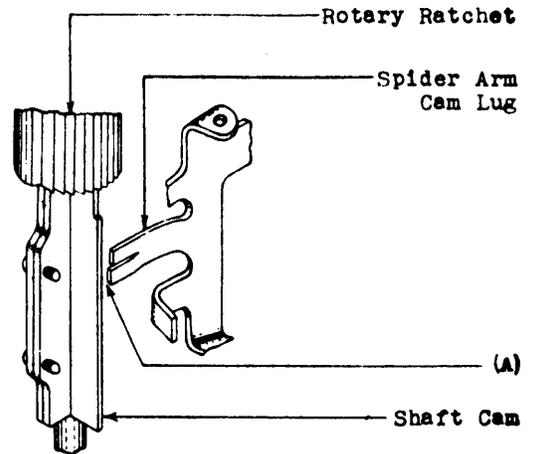


Fig. 5 - Relationship of the Spider Arm Cam Lug and the Shaft Cam

2.20 Clearance Between Rotary Ratchet and Upper Offset of Cam Lug: Fig. 6 (A) With the shaft up one step and the spider arm in second position there shall be a clearance between the upper offset of the spider arm cam lug and the rotary ratchet of Approx. .015" Gauge by eye.

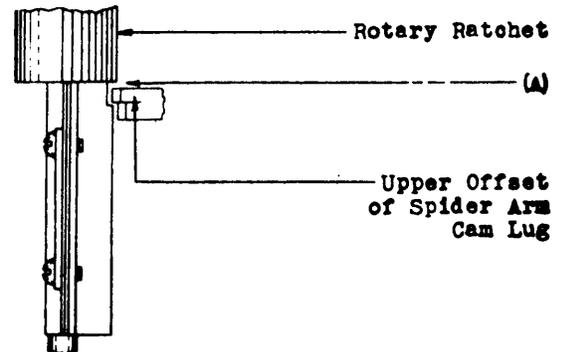


Fig. 6 - Clearance Between Rotary Ratchet and Upper Offset of Cam Lug

2.21 Spider Arm Link Position

(a) With the switch in the second position and the private magnet electrically operated there shall be a clearance between the rotary dog and the rotary teeth when the double dog is held lightly against the spider arm link and the shaft is rotated by hand of:

Max. .010"

Gauge by eye.

(b) With the switch at normal, the release link shall hold the lower spider arm lug lightly against the frame. Gauge by eye.

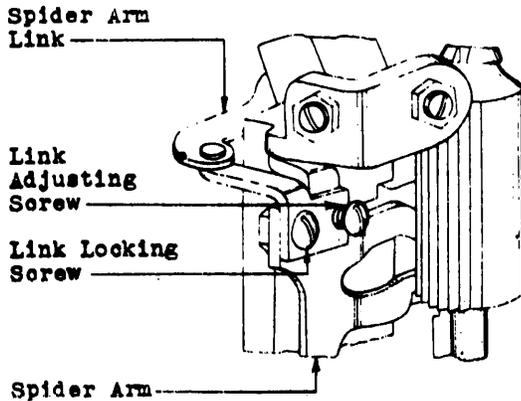


Fig. 7 - Parts of Side Switch

2.22 Private Magnet Position - Fig. 8 (A)

(a) With the private magnet electrically operated there shall be a perceptible clearance between the upper edge of the spider arm finger and the lower edge of the upper escapement spring.

(b) When the private magnet is deenergized, the armature stop spring shall allow the same space between the lower edge of the spider arm finger and the upper edge of the lower escapement spring. Gauge by eye.

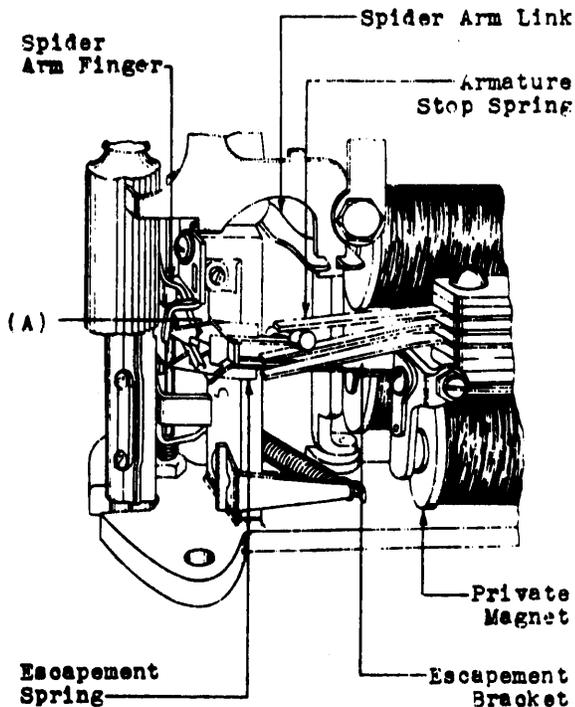


Fig. 8 - Position of Private Magnet

2.23 Clearance Between Spider Arm Finger and the 1st and 2nd Escapement Teeth

(a) With the shaft in the vertical normal position and the double dog disengaged from the release link there shall be a space between the spider arm finger and the first escapement tooth of:

Max. .004"  
Gauge by eye.

(b) With the spider arm in the second position the space between the spider arm finger and the second escapement tooth shall be approximately the same as the space in the 1st position. Gauge by eye.

2.24 Escapement Spring Tension: The escapement springs shall be tensioned to rest firmly against the escapement bracket. Gauge by feel.

2.25 Operate Requirements: After the above requirements have been met, the side switch shall operate satisfactorily when connected in its circuit.

3. ADJUSTING PROCEDURES

3.001 List of Tools and Materials

<u>Code No.</u>	<u>Description</u>
<u>Tools</u>	
206	30° Offset Screw-driver
207	90° Offset Screw-driver
363 (2 Re- quired)	Spring Adjuster
415A	Spring Adjuster
418A	5/16" and 7/32" Hex. Open Double End Flat Wrench
-	A.E.Co. No. 7067 Double Dog Adjuster
-	R-1575 No. 4 Artist's Show Card Brush
-	4 Oz. Riveting Hammer
-	KS-6015 6" Duck-bill Pliers
-	3-1/2" Cabinet Screw-driver
-	4" Regular Screw-driver

3.001 (Continued)

<u>Code No.</u>	<u>Description</u>
-	A.E.Co. No. 21766 Offset Screw-driver
-	KS-6257 3/8" Hex. Straight Socket Wrench

Materials

-	KS-2832 Lubricant
-	KS-7506 Graphite Oil Lubricant

3.002 Before making any adjustments make the associated 197 type switch busy in accordance with approved procedures.

3.003 Retightening of Nuts and Screws: All nuts and screws loosened for the purpose of making adjustments shall be securely tightened after the adjustments are completed.

3.004 Removal of Switch from Frame: Remove the switch when necessary in accordance with the section covering 197 and 198 type switches.

3.01 Cleaning (Rq.2.01)

(1) Clean the relay and switch contacts and parts when necessary in accordance with other sections covering cleaning of relay contacts and parts.

3.02 Lubrication (Rq.2.02)

(1) Lubricate the spider arm bearing at its upper and lower ends and the spider arm link bearing with KS-7506 oil applied with a No. 4 artists show card brush. Distribute the oil retained by the brush after each dip as specified. Also distribute one dip of the KS-2832 lubricant over the escapement teeth.

(2) After the parts have been lubricated operate the switch a few times so as to work the lubricant into the bearings. Keep the switches covered as much as possible after they have been lubricated.

3.03 Adjustable Escapement Springs (Rq.2.03)

To change the lead on adjustable escapement springs, loosen the set screw with the 4" regular screw-driver and move the escapement spring in or out as required.

- 3.04 Private Magnet Spring Tension (Rq.2.04)  
 3.05 Private Magnet Contact Follow (Rq.2.05)  
 3.06 Private Magnet Contact Separation (Rq.2.06)

(1) To change the spring tension, contact follow or contact separation, adjust the springs near the insulators as required with the duck-bill pliers.

3.07 Position of Contact Block (Rq.2.07)

(1) To realign the contact block assembly remove the two mounting screws beneath the frame of the switch with the No. 21766 offset screw-driver and remove the block. Place the bracket in a vise and adjust the assembly bracket up or down as required by means of the riveting hammer.

3.08 Block Contact Alignment (Rq.2.08)

(1) To realign the block contact so that the upper and lower contacts are in alignment vertically, loosen the assembly screws slightly with the 4" regular screw-driver and move the contacts to the right or left as required.

(2) To realign the contacts horizontally, adjust the contacts as required with the No. 363 spring adjuster.

- 3.09 Wiper Forming (Rq.2.09)  
 3.10 Wiper Tip Forming (Rq.2.10)  
 3.11 Wiper Spring Tension (Rq.2.11)

(1) Use the No. 415A spring adjuster to adjust for proper wiper forming and wiper spring tension. Place the adjuster on the spring approximately 1/4" from the point where the spring leaves the insulators. Adjust the springs with a slight twist up or down as required, exercising care not to disturb the adjacent spring. In adjusting the spring exercise care to adjust them in line with their movement so as not to twist them off center. When a satisfactory adjustment cannot be obtained in this manner, distribute the tension by adjusting the spring as outlined in (2), giving the spring its final adjustment at a point approximately 1/4" from the point where the spring leaves the spring assembly. Also adjust the springs so that the flat part of the wiper next to the tip will have sufficient clearance to prevent it from catching on the side switch block contacts.

(2) Where a spring is bowed, place the No. 415A spring adjuster at the far

**3.09-3.11 (Continued)**

end of the bow and adjust the spring slightly in the opposite direction to the bow and then while applying only enough pressure to hold the spring just off its block contact, draw the adjuster forward the length of the bow, pausing momentarily at each 1/16" of the spring to apply a slightly greater pressure than the drawing pressure in a direction opposite the bow. If the spring is bent, follow the same procedure as outlined for a bowed spring except that it will only be necessary to adjust the spring from approximately 1/4" beyond the bend to approximately 1/4" in front of the bend.

(3) If a wiper does not make a knife edge contact on the block contacts, or if the form of the wiper tip requires adjustment hold the wiper at the base of the tip of the wiper with a No. 363 spring adjuster and adjust the tip of the spring with another No. 363 spring adjuster as shown in Fig. 9.

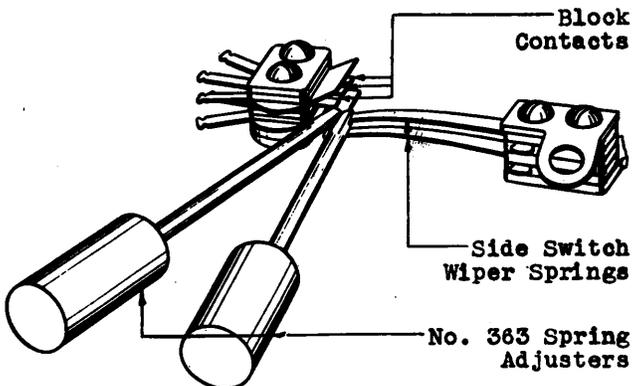


Fig. 9 - Method of Adjusting the Side Switch Wiper Tips

**3.12 Wiper Alignment in the Second Position (Rq.2.12)****3.13 Overlap of Wiper Tips on the Block Contacts (Rq.2.13)**

(1) If the wipers rest too far to the right or left when the side switch is in the second position, loosen the two mounting screws beneath the frame of the switch with the No. 21766 offset screw-driver and move the side switch block to the right or left as required.

(2) To center the wiper tips between the front and back of the block contact, move the side switch block forward or backward as required.

Note: Front and back or right and left, refer to the positions as seen from the front of the switch.

**3.14 Wiper Alignment in the Third Position (Rq.2.14)**

(1) To center the wipers on the block contacts in the third side switch position, adjust the spider arm stop as required with the No. 7067 double dog adjuster as shown in Fig. 10.

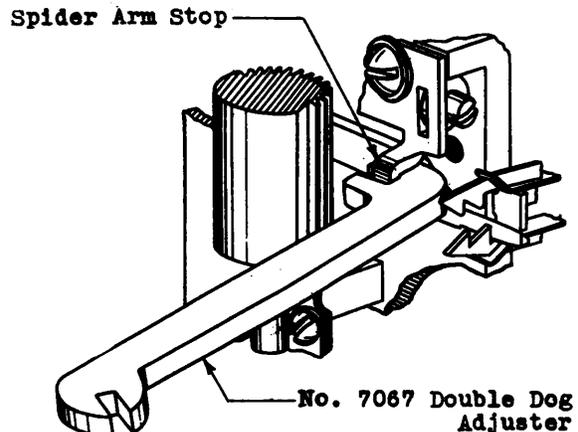


Fig. 10 - Method of Adjusting the Spider Arm Stop

**3.15 Spider Arm Play (Rq.2.15)**

(1) To change the vertical play of the spider arm, loosen the lock-nut on the bearing screw with the No. 418-A wrench and turn the bearing screw clockwise or counter-clockwise as required with the Nos. 206 and 207 offset screw-drivers to give the required vertical play.

**3.16 Spider Arm Spring Tension (Rq.2.16)**

(1) Vary the tension of the spider arm spring by turning the "T" adjusting screw clockwise or counter clockwise as required.

**3.17 Spider Arm Finger Position (Rq.2.17)**

(1) If the spider arm finger is not parallel to the frame when in the normal position, adjust it as required with the No. 7067 double dog adjuster.

(2) To tilt the spider arm finger apply the No. 7067 double dog adjuster as shown in Fig. 11 and twist the finger slightly by bearing upward on the tool.

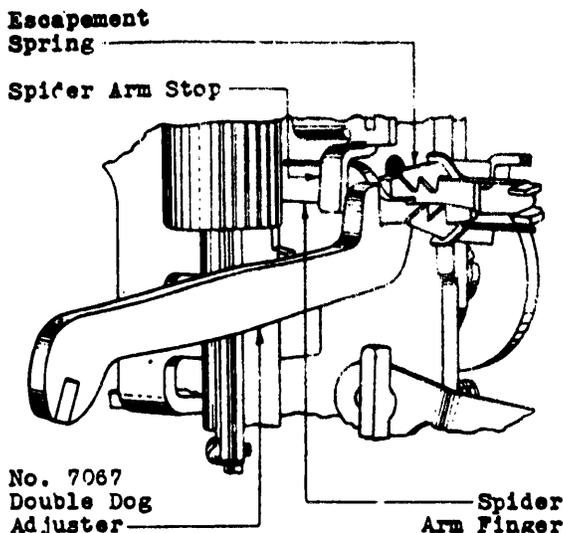


Fig. 11 - Method of Tilting the Spider Arm Finger

**3.18 Clearance Between Spider Arm Cam Lug and the Shaft Hub (Rq.2.18)**

(1) To change the clearance between the spider arm cam lug and the shaft hub raise the shaft to the fifth level and adjust the lug as required with the No. 7067 double dog adjuster as shown in Fig. 12.

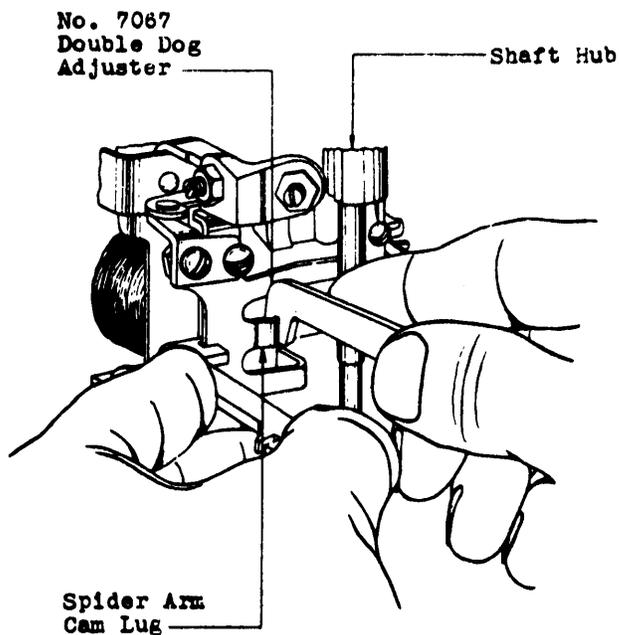


Fig. 12 - Method of Adjusting the Clearance Between the Spider Arm Cam Lug and the Shaft Hub

**3.19 Clearance Between Spider Arm Cam Lug and Shaft Cam (Rq.2.19)**

(1) To change the clearance between the shaft cam and the spider arm cam lug, loosen the set screws in the cam with the 3-1/2" cabinet screw-driver and turn the cam into the proper position.

**3.20 Clearance Between Rotary Ratchet and Upper Offset of Cam Lug (Rq.2.20)**

(1) If there is no clearance between the upper offset of the spider arm cam lug and the rotary ratchet replace the spider arm.

**3.21 Spider Arm Link Position (Rq.2.21)**

(1) To change the position of the spider arm link, loosen the link locking screw with the 4" regular screw-driver and turn the adjusting screw in a clockwise direction to decrease the space between the double dog finger and the spider arm link and in a counter clockwise direction to increase this space.

**3.22 Private Magnet Position (Rq.2.22)**

**3.23 Clearance Between the Spider Arm Finger and the 1st and 2nd Escapement Teeth (Rq.2.23)**

(1) To equalize the clearance between the spider arm finger and the upper and lower escapement springs, remove the cover plate located on the rear of the switch frame. Then loosen the private magnet locking screws with the 4" screw-driver and turn the adjusting bushing with the KS-6257 wrench so that when the private magnet is energized there will be a perceptible clearance between the spider arm finger and the lower edge of the upper escapement spring. Tighten the locking screws and adjust the armature stop spring with the duck-bill pliers so that there is a corresponding clearance between the finger and the upper edge of the lower escapement spring when the private magnet is deenergized.

(2) To meet the requirement of maximum .004" between the spider arm finger and the first escapement tooth, loosen the private magnet locking screws with the 4" screw-driver and turn the adjusting bushings with the KS-6257 wrench in a clockwise direction to increase the space and in a counter-clockwise direction to decrease the space. Care should be taken to move each bushing an equal amount so as not to change the clearance between the spider arm finger and the upper and lower escapement springs.

(3) To equalize the space between the spider arm finger and the escapement teeth in the first and second positions, move the side switch to the second position and adjust the escape-

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**3.23 (Continued)**

ment bracket to the right or left with the fingers until the space is approximately equal to the space in the first position.

'4) If the space in first and second positions cannot be equalized as explained in (3) change the offset between the upper and lower lugs of the spider arm cam lug. Employ this method as a last resort only.

**3.24 Escapement Spring Tension (Rq.2.24)**

(1) To change the tension of the escapement springs, loosen the escapement

spring mounting screw with the No. 21766 screw-driver and adjust the escapement springs with the duck-bill pliers. Tension the springs near the point where they are attached to the escapement bracket.

**3.25 Operate Requirements (Rq.2.25)**

(1) If the switch fails to operate satisfactorily it is an indication that the contact spring tension may be excessive. Reduce this tension slightly. If the switch still fails to operate satisfactorily, recheck requirements 2.18 to 2.20 inclusive and if necessary readjust to meet these requirements.