

## 11-A TUNING FORKS REQUIREMENTS AND ADJUSTING PROCEDURES

### 1. GENERAL

1.01 This section covers the No. 11-A tuning fork.

This section is reissued to incorporate material from the addendum in its proper location.

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 Requirements are marked with an asterisk (\*) when to check for them would necessitate the dismantling or dismounting 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.

1.04 Normal position of the tuning fork is that position in which the plunger mounting nut is resting against the mounting bar and the plunger spring is resting against the plunger and is disengaged from any ratchet tooth.

1.05 Operated position of the tuning fork is that position in which the plunger is depressed to the limit of its stroke and the plunger spring is resting against the plunger.

### 2. REQUIREMENTS

2.01 Cleaning The tuning fork shall be cleaned in accordance with approved procedures.

2.02 Cover Fit The cover shall slide easily and shall remain in either extreme position without tendency to slip. Gauge by eye and feel.

2.03 Clatter When the plunger is operated the fork shall vibrate without initial clatter and shall dampen uniformly. Gauge by ear and by eye.

2.04 Visibility - Fig. 1 (A) - With the fork in the normal position, there shall be no space visible between the edges of the shields when viewed perpendicularly to the direction of vibration. Gauge by eye.

\*2.05 Position of Vibrating Element - Fig. 1 (B) - The vibrating element shall be rigidly mounted on the mounting bar. Gauge by eye and feel.

\*2.06 Clearance Between Shield Faces - Fig.

1 (C) - The clearance between faces of the shields on the prongs shall be: Min. .010" Gauge by eye.

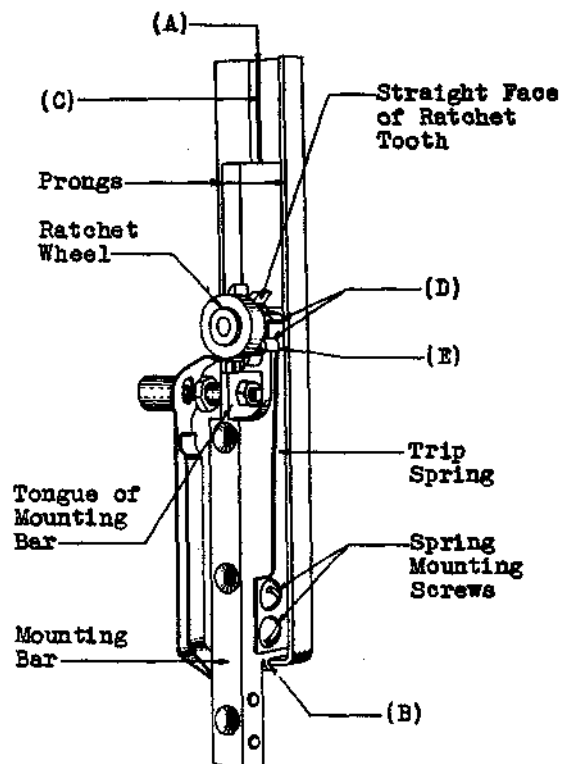


Fig. 1

\*2.07 Engagement of Trip Springs with Ratchet Teeth

(a) Fig. 1 (D) - The tangs on the trip springs shall engage squarely with the ratchet teeth on either side of the tang. Gauge by eye.

(b) Fig. 1 (E) - The side of the trip spring nearer the ratchet wheel shall clear the wheel by approximately 1/32" when the ratchet wheel is pressed against the shoulder in any position about its axis. Gauge by eye.

**2.08 Position of Trip Springs and Ratchet Wheel**

(a) Fig. 2 (A) - The tangs on the trip springs shall lie flat and shall bear snugly against the bottom surfaces of the ratchet wheel teeth. Gauge by eye.

(b) With the movement of the ratchet wheel taken up in a clockwise direction:

(1) Fig. 2 (B) - the straight face of each ratchet tooth when it is nearest the mounting bar shall be approximately parallel to the tongue of the mounting bar. Gauge by eye.

(2) Fig. 2 (C) - the clearance between the straight face of any ratchet tooth and one tang shall not exceed .003" when the tang of the other spring is engaging a ratchet tooth. Gauge by eye.

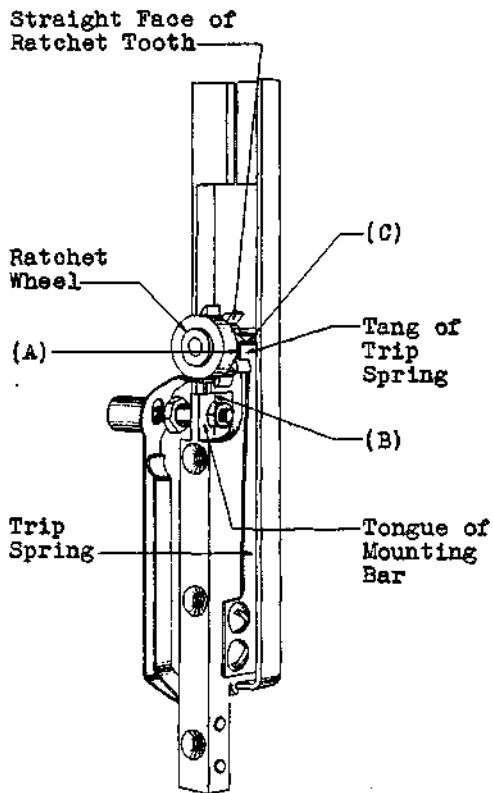


Fig. 2

**\*2.09 Engagement of Plunger Spring with Ratchet Wheel**

(a) Fig. 3 (A) - With the shoulder of the ratchet wheel pressed against the mounting bar and with the plunger spring just engaging the ratchet wheel, the clearance between the edge of the extreme end of the spring nearer the ratchet teeth and the teeth shall be:

Min. - 1/64"

Max. - 1/32"

Gauge by eye.

(b) Fig. 3 (B) - With the engaging edge of the plunger spring engaging the straight face of any ratchet tooth the edge of the spring shall be approximately parallel to the edge of the ratchet tooth. Gauge by eye.

(c) Fig. 3 (C) - With the movement of the ratchet wheel taken up in a counter-clockwise direction, the clearance between the curved surface at the

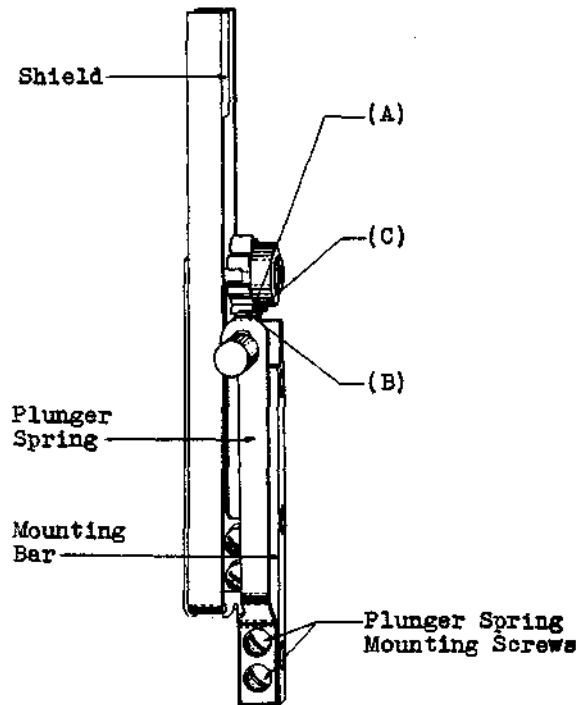


Fig. 3

end of the plunger spring and the circular portion of the ratchet wheel as the plunger spring engages the ratchet tooth shall be:

Max. .008"

Gauge by eye.

(d) Fig. 4 (A) - With the play of the ratchet wheel taken up in a clock-wise direction, the engaging end of the plunger spring shall engage the straight face of any ratchet tooth as follows:

Min. - The thickness of the spring

Max. - Shall not overlap the tooth by more than .005"

Gauge by eye.

(e) Fig. 4 (B) - As the plunger is operated, the curved surface at the end of the plunger spring shall squarely engage the circular portion of the ratchet wheel. Gauge by eye.

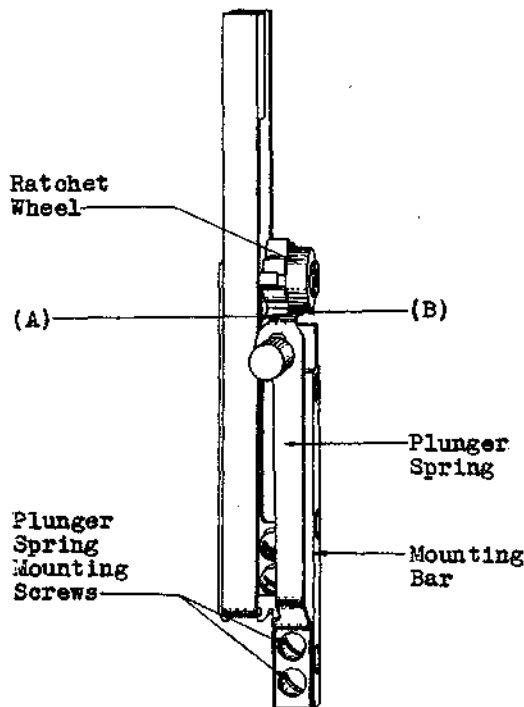


Fig. 4

## \*2.10 Position of Shouldered Stop Bushing

(a) Fig. 5 (A) - With the plunger fully depressed and with the play of the ratchet wheel taken up in a clock-wise direction, the shouldered stop bushing shall be so positioned that the clearance between the tang of the trip spring and the straight face of a ratchet tooth is:

Min. .008"

Gauge by eye.

(b) Fig. 5 (B) - With the plunger fully depressed, there shall be no tendency for the tangs of the trip springs to ride on the next ratchet tooth in any position of the ratchet wheel. Gauge by eye.

\*2.11 Plunger Release When the plunger is slowly released from the operated position, the end of the plunger spring shall pass over the ratchet tooth without sticking and shall disengage that tooth.

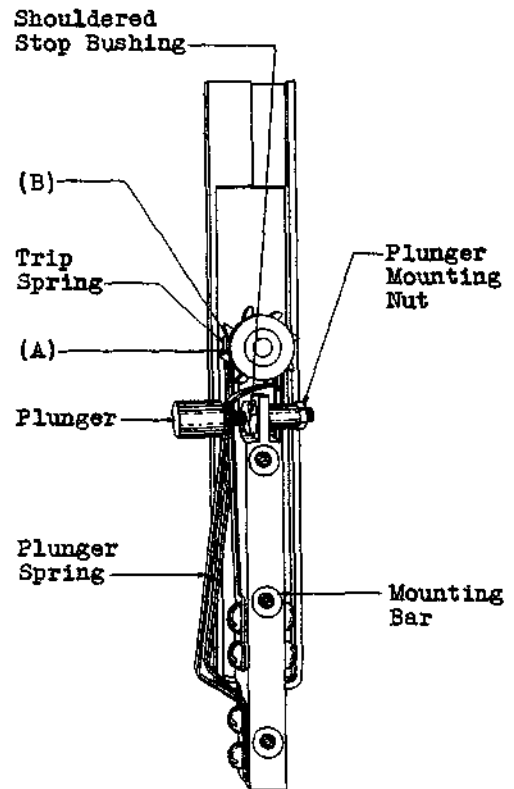


Fig. 5

**\*2.12 Plunger Shaft Clearance - Fig. 6 (A) -**  
 With the plunger in the operated position and at right angles to the mounting bar, the plunger shaft shall clear the edges of the hole in the plunger spring by:  
 Min.  $1/64$ "  
 Gauge by eye.

**\*2.13 Clearance Between Plunger Spring and Mounting Bar - Fig. 6 (B) -** The clearance between the plunger spring and the tongue on the mounting bar for all positions of the plunger spring shall be:  
 Min. .008"  
 Gauge by eye.

**\*2.14 Tension of Plunger Spring - Fig. 7 (A)**  
 With the plunger in the normal position the plunger spring shall rest against the plunger with a tension of:  
Test - Min. 85 grams  
           - Max. 110 grams  
Readjust - Min. 90 grams  
               - Max. 110 grams

Use the No. 79-C gauge.  
 This tension shall be measured along the center line of the plunger with the plunger

at right angles to the mounting bar and with the tension of the auxiliary plunger spring removed.

**\*2.15 Bow - Fig. 7 (B) -** The long portion of the plunger spring shall be free of sharp bends or kinks due to adjustment. A gradual bow in the spring is permissible. Gauge by eye.

**\*2.16 Tension of Auxiliary Plunger Spring Fig. 7 (C) -** The auxiliary plunger spring shall rest against the plunger spring with a tension of  
Test - Min. 75 grams  
           - Max. 90 grams  
Readjust - Min. 80 grams  
               - Max. 90 grams

Use the No. 79-C gauge.  
 This tension shall be measured at a point  $1/4$ " in from the end of the spring and in the direction perpendicular to the mounting bar.

**\*2.17 Position of Auxiliary Plunger Spring Fig. 7 (D) -** The auxiliary plunger spring shall be approximately parallel to the plunger spring.

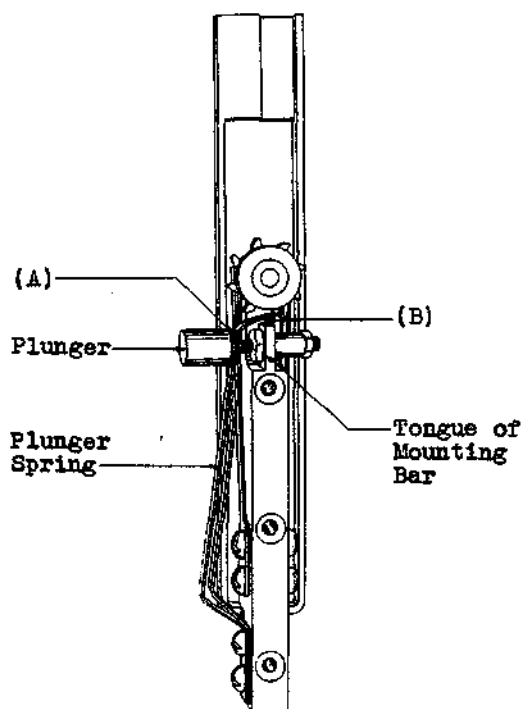


Fig. 6

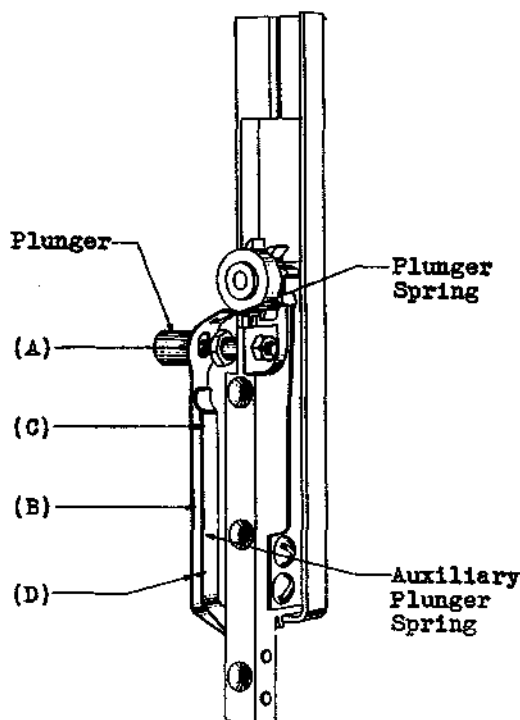


Fig. 7

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

| <u>Code No.</u>  | <u>Description</u>  |
|------------------|---|
| <u>Tools</u>     |   |
| 74               | Wrench - 5/32" and 7/32" Hex. Open Double-End Flat                        |
| 220              | Wrench - 3/16" Hex. Socket  |
| KS-6015          | Duck-bill Pliers  |
| -                | Bell System Cabinet Screw-driver - 3-1/2" 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     |
| <u>Gauges</u>    |   |
| 79-C             | 0-200 Gram Push-Pull Tension Gauge  |
| <u>Materials</u> |   |
| KS-2423          | Cloth   |
| KS-7860          | Petroleum Spirits   |
| -                | Toothpicks, Hardwood, Flat at One End and Pointed at the Other            |

3.002 To make any adjustments it will be necessary to remove the case and cover mounting screws with the 3-1/2" cabinet screw-drivers. Then while holding the plunger depressed, grasp the shields with the duck-bill pliers and draw the fork from the case. Take care in performing this operation not to twist the prongs of the fork. After the adjustments have been made satisfactorily, replace the fork in the case, replace the cover and securely tighten all mounting screws.

3.003 Take care in making any adjustments not to change the weight of the vibrating element.

**3.01 Cleaning (Rq.2.01)**

M-1 Clean the cover as outlined in procedure 3.02. Clean other parts as follows.

M-2 To clean the plunger spring and trip springs, remove all foreign matter with a toothpick that has been dipped in petroleum spirits. To clean the ratchet wheel and ratchet wheel bearing, remove the ratchet wheel from the fork and clean the teeth with a toothpick which has been dipped in petroleum spirits. Then clean the ratchet wheel bearing by wiping it with a KS-2423 cloth moistened with petroleum spirits. Other parts shall be cleaned by wiping them with clean KS-2423 cloth.

**3.02 Cover Fit (Rq.2.02)**

M-1 If the cover binds in either extreme position it is due either to the sides of the case being bent or to dirt clinging to the sides of the case and cover. To remedy either condition, remove one of the cover guide screws with the 3-1/2" cabinet screw-driver and remove the guide. Then remove the cover.

M-2 If the sides of the case are bent so that the cover does not slide easily, straighten them with the long nose pliers. If the binding is due to dirt, clean the inside surfaces of the cover and the outside surfaces of the case with KS-2423 cloth, moistened with petroleum spirits. Then replace the cover and insert the cover guide in it. Replace and securely tighten the cover guide screw.

M-3 If the cover slides too easily, remove the cover as outlined above and bend the end of the case slightly with the long nose pliers.

**3.03 Clatter (Rq.2.03)****3.04 Visibility (Rq.2.04)**

M-1 If a clatter is present when the plunger is operated or if the fork does not dampen uniformly, adjust the prongs with the duck-bill pliers as required.

M-2 If there is a separation between the edges of the shields when the tuning fork is in its normal position, adjust the prongs as required with the duck-bill pliers. Take care when making this adjustment not to kink or bow the prongs as this would interfere with the operation of the fork.

**3.05 Position of Vibrating Element (Rq.2.05)**

M-1 If the vibrating element is not rigidly secured in place on the mounting bar, replace the fork as the frequency of vibration is unsatisfactory.

**3.06 Clearance Between Shield Faces (Rq.2.06)**

M-1 If the clearance between adjacent faces of the shields is not satisfactory, grasp a prong of the fork with the one hand while holding the fork with the other and bend the prong backward or forward as required.

**3.07 Engagement of Trip Springs with Ratchet Teeth (Rq.2.07)****3.08 Position of Trip Springs (Rq.2.08)**

M-1 If the engagement of the trip springs and the ratchet teeth or the clearance between the spring and the ratchet wheel is not satisfactory, loosen the spring mounting screws with the 3-1/2" cabinet screw-driver and shift the

spring so that the edge of the mounting portion of the spring is approximately parallel to the edge of the mounting bar. Then tighten the mounting screws securely in place.

M-2 If the tang of a trip spring does not lie flat against the bottom surface of the ratchet wheel, remove the spring mounting screws with the 3-1/2" cabinet screw-driver and remove the spring. At this time note that the trip spring is flat as this is the proper shape of the spring. Then adjust the tang with the long nose pliers as required. Replace and locate the spring and then tighten the mounting screws securely in place.

M-3 If a tang does not rest on the bottom surface of the ratchet wheel due to a kink or bend in the trip spring, remove the spring as outlined above and straighten it with the long nose pliers. Replace the spring and check the position of the tang.

M-4 If the ratchet tooth nearest the tongue of the mounting bar is not parallel to the mounting bar when the play of the ratchet wheel is taken up in a clockwise direction, note which trip spring tang touches the straight face of a ratchet tooth and loosen the mounting screws of that spring with the 3-1/2" cabinet screw-driver and shift the spring as required. Then tighten the mounting screws securely.

M-5 If the engagement between a ratchet tooth and the tang of a trip spring is not satisfactory when the play in the ratchet wheel is taken up in a clockwise direction, loosen the trip spring mounting screws of the spring at fault with the 3-1/2" cabinet screw-driver and shift the spring until the top edge of the tang touches the straight face of the ratchet tooth. Then tighten the mounting screws securely. Check that the requirement is met on every tooth of the ratchet wheel. Take care in making this adjustment that the relation between the lowest ratchet tooth and the mounting bar is satisfactory.

M-2 If the engagement or release of the plunger spring with the ratchet tooth is not satisfactory, adjust the plunger spring as required at a point above the plunger shaft with the long nose pliers taking care that the general profile of the spring remains unchanged. After making this adjustment, adjust the curved surface at the end of the spring as outlined below.

M-3 If the clearance between the curved surface at the end of the plunger spring and the ratchet wheel is not satisfactory or if the spring does not strike the circular portion of the ratchet wheel squarely when it is operated, proceed as follows: Depress the plunger and, while holding it depressed, adjust the curved end of the plunger spring as required with the long nose pliers. Take care that the general profile of the spring remains approximately the same.

M-4 If the clearance between the tangs of the trip springs and the straight face of the ratchet tooth is not satisfactory or if the tangs of the trip springs ride on the following ratchet tooth, hold the plunger bushing in place with the No. 74 wrench and loosen the plunger mounting nut with the No. 220 wrench. Then, while holding the plunger with one hand, adjust the position of the plunger bushing as required with the No. 74 wrench. With the plunger bushing satisfactorily located, tighten the plunger mounting nut securely.

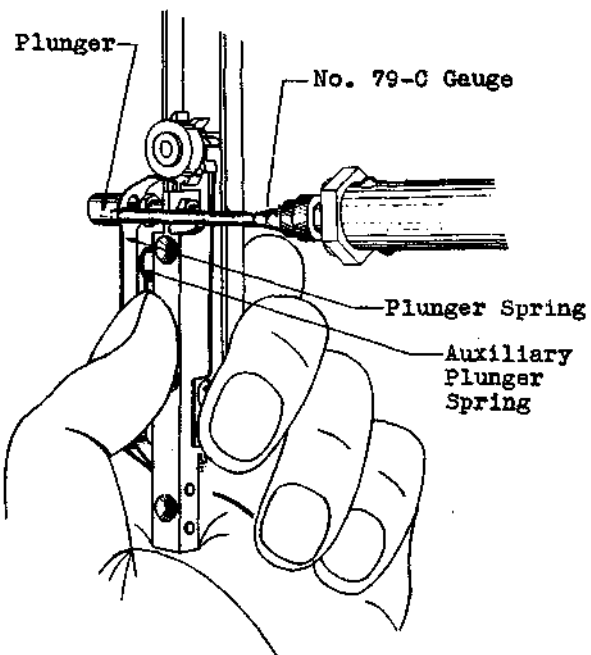


Fig. 8 - Method of Measuring Tension of Plunger Spring

- 3.09 Engagement of Plunger Spring with Ratchet Wheel (Rq.2.09)
- 3.10 Position of Shouldered Stop Bushing (Rq.2.10)
- 3.11 Plunger Release (Rq.2.11)
- 3.12 Plunger Shaft Clearance (Rq.2.12)

M-1 Before making any adjustments on the plunger spring that would change its shape, check the general profile of the spring against the standard shown in Fig. 5 and, if necessary, adjust the spring with the long nose pliers.

### 3.13 Clearance Between Plunger Spring and Mounting Bar (Rq.2.13)

M-1 If the clearance between the tongue of the mounting bar and the plunger spring is not satisfactory, adjust the straight portion of the plunger spring between the plunger and the free end at a point near the engaging edge of the spring with the long nose pliers.

### 3.14 Tension of Plunger Spring (Rq.2.14)

#### 3.15 Bow (Rq.2.15)

M-1 To check the tension of the plunger spring, lift the auxiliary plunger spring from the plunger spring by holding the spring with the finger, and then place the tip of the No. 79-C gauge against the plunger spring at a point along the center of the plunger as shown in Fig. 8 and pull in a direction directly opposing the pull of the spring. The gauge should register the specified tension the instant the spring starts to move away from the plunger stop.

M-2 If the tension of the plunger spring is not satisfactory, remove the plunger mounting nut with the long nose

pliers and place the duck-bill pliers on the long portion of the spring at a point just above the bend and adjust as required. Take care in making this adjustment not to kink or bow the spring so as to avoid the possibility of spring breakage.

### 3.16 Tension of Auxiliary Plunger Spring (Rq.2.16)

### 3.17 Position of Auxiliary Plunger Spring (Rq.2.17)

M-1 To check the tension of the auxiliary plunger spring, place the tip of the No. 79-C gauge against the spring at a point 1/4" from the end of the spring and pull in a direction directly opposing the pull of the spring. The gauge should register the specified tension the instant the spring starts to move away from the plunger spring.

M-2 If the tension of the auxiliary plunger spring is not satisfactory, remove the plunger mounting nut with the long nose pliers and adjust as required with the long nose pliers at the bend of the spring.