

## 4-TYPE FOOT SWITCHES REQUIREMENTS AND ADJUSTING PROCEDURES

### 1. GENERAL

1.01 This section covers 4 type foot switches.

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.

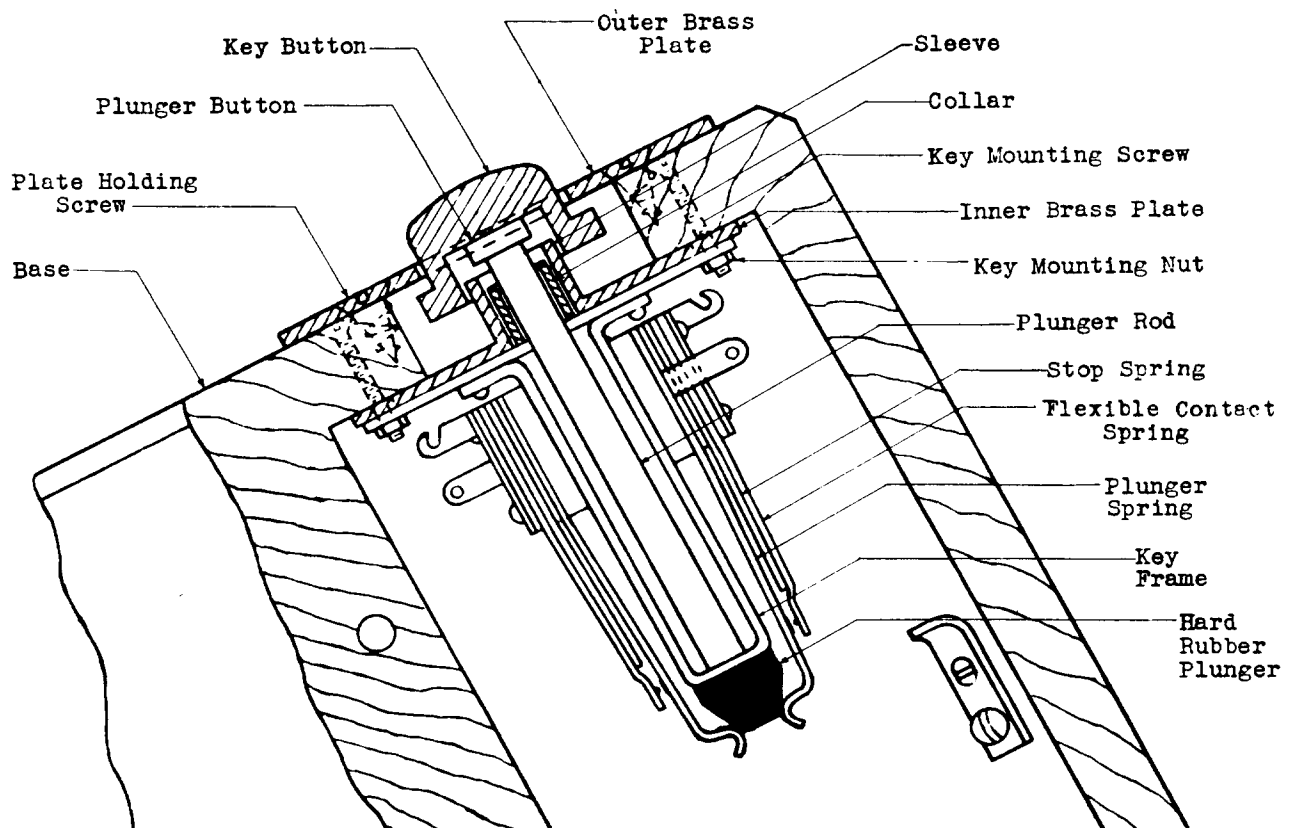
1.03 Part 1, "General" and Part 2, "Requirements" form part of the Western Electric Co. Inc. Installation Department handbook.

1.04 Requirements are marked with an asterisk (\*) when to check for them would neces-

sitate 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.

1.05 The Normal (Unoperated) Position is that position in which the plunger is resting against the key frame with the normally open contacts open, and the normally closed contacts closed.

1.06 The Operated Position is that position in which the plunger is depressed to the limit of its stroke with the normally closed contacts open, and the normally open contacts closed.



No. 4-B Foot Switch

Fig. 1

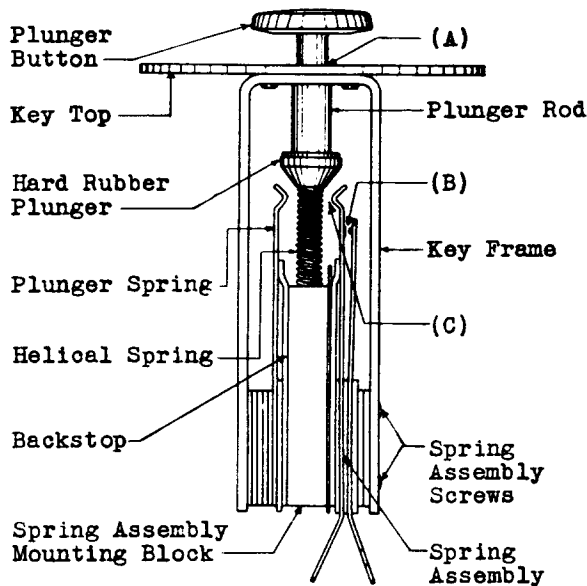
## 2. REQUIREMENTS

### 2.01 Cleaning

- (a) Contacts shall be cleaned in accordance with the section covering cleaning procedures for key contacts.
- (b) Other parts shall be cleaned in accordance with approved procedures.

### 2.02 Key Button and Plunger Movement - Figs. 2 (A) and 4 (A)

- (a) The plunger shall move freely in its bearings and when released shall return to its normal position with a snap. Gauge by feel and eye.
- (b) (Nos. 4-B and 4-C Foot Switches Only)  
The key button shall not bind on the brass plate or sleeve. Gauge by feel.



No. 4-A Foot Switch

Fig. 2

- \*2.03 Contact Alignment - Fig. 3 (A) - Contacts shall line up so that the point of contact falls wholly within the boundary of the opposing contact. Gauge by eye.

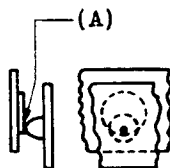


Fig. 3

### \*2.04 Contact Separation

- (a) No. 4-A Foot Switch - Fig. 2 (B)  
There shall be a separation between all open contacts of:

Test - Min. .014"  
Readjust - Min. .016"  
Gauge by eye.

- (b) Nos. 4-B and 4-C Foot Switches - Fig. 5 (B) - There shall be a separation between all open contacts of:

Test - Min. .010"  
Readjust - Min. .012"  
Gauge by eye.

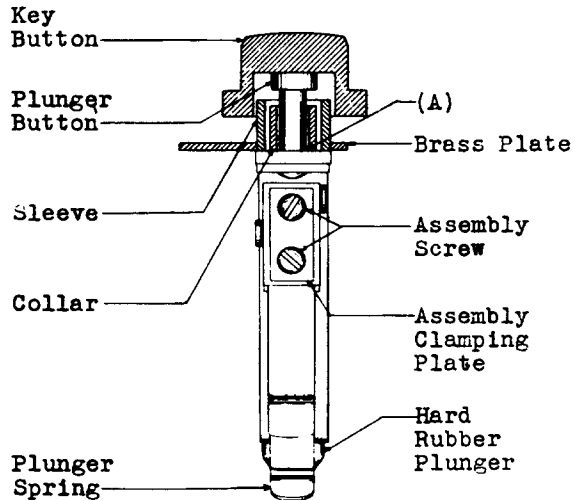


Fig. 4

### \*2.05 Spring Clearance

- (a) No. 4-A Foot Switch - Fig. 2 (C)  
There shall be a clearance between the contact springs and the helical spring of:

Test - Min. .025"  
Readjust - Min. .030"  
Gauge by eye.

- (b) Nos. 4-B and 4-C Foot Switches - Fig. 5 (A) - There shall be a clearance between springs designed never to make contact and between any spring and the frame, whether in the normal or operated position of the foot switch of:

Test - Min. .014"  
Readjust - Min. .016"  
Gauge by eye.

- \*2.06 Contact Pressure Fig. 2 (B) - With the plunger depressed to the limit of its stroke there shall be a pressure between all closed contacts of:

Test - Min. 50 grams  
Readjust - Min. 55 grams  
Use the No. 68-B gauge.

\*2.07 Contact Follow Fig. 5 (C) - With the plunger depressed to the limit of its stroke there shall be a follow on all contacts of:

Test - Min. .008"  
 Readjust - Min. .010"  
 Gauge by eye.

\*2.08 Flexible Contact Spring Position (Nos. 4-B and 4-C Foot Switches Only) Fig. 5 (D) - In the normal position the flexible spring shall rest at least on the end of the stop spring that is nearest the contact on the flexible spring. Gauge by eye.

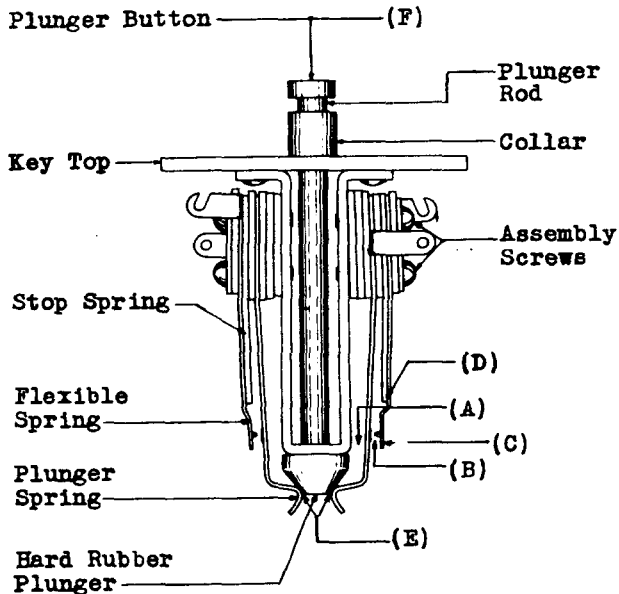


Fig. 5.

\*2.09 Position of Plunger Springs with Relation to the Hard Rubber Plunger (Nos. 4-B and 4-C Foot Switches Only) Fig. 5 (E) In the normal position the plunger springs shall rest against the hard rubber plunger. Gauge by eye.

\*2.10 Plunger Spring Pressure (Nos. 4-B and 4-C Foot Switches Only) - With the plunger in the operated position the difference in the pressure between opposite plunger springs shall be:  
 Test - Max. 150 grams  
 Readjust - Max. 140 grams  
 Use the No. 70-E gauge.

2.11 Contact Sequence When specified on the circuit drawing.

2.12 Plunger Operate Pressure - Fig. 5 (F)

(a) No. 4-A Foot Switch The pressure required to operate a plunger to the limit of its stroke shall be:

Test - Max. 2050 grams  
 Readjust - Max. 2050 grams  
 Use the No. 79-E Gauge.

(b) Nos. 4-B and 4-C Foot Switches - The pressure required to operate a plunger to the limit of its stroke shall be:

Test - Min. 625 grams  
 Max. 2050 grams  
 Readjust - Min. 675 grams  
 Max. 2050 grams

Use the No. 79-B gauge for the minimum limit, and the No. 79-E gauge for the maximum limit.

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

<u>Code No.</u>	<u>Description</u>
<u>Tools</u>	
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
-	Bell System Regular Screw-driver - 4" per A.T.&T. Co. Drawing 46-X-34
<u>Gauges</u>	
68-B	70-0-70 Gram Gauge
70-E	150-0-150 Gram Gauge
79-B	0-1000 Gram Push-Pull Tension Gauge
79-E	0-3000 Gram Push-Pull Tension Gauge
<u>Materials</u>	
KS-2423	Cloth
KS-8372	Trichloroethylene
-	Toothpicks, Hardwood, Flat at One End and Pointed at the Other

3.002 When readjustments are required on the springs remove the key unit of the foot switch from its base.

**3.01 Cleaning**

M-1 Clean the contacts in accordance with the section covering cleaning procedures for key contacts. Clean other parts in accordance with procedures 3.02, M-1, M-4 and M-9, 3.03, M-6 and 3.11, M-1 and M-2.

**3.02 Key Button and Plunger Movement (Rq.2.01)**

M-1 Key Button Movement (Nos. 4-B and 4-C Foot Switches Only) If the key button binds and there is play on all sides of the button the bind may be caused by dirt between the button and the plate or between the button and the sleeve. Remove the plate holding screws with the 3-1/2" cabinet screw-driver, remove the brass plate and the button. Moisten a clean KS-2423 cloth with trichloroethylene and wipe off the key button, the bearing surface of the outer brass plate and the sleeve. Then wipe them with a

dry KS-2423 cloth and replace the key button and brass plate.

M-2 If the key button binds against the brass plate due to lack of play between the button and the plate proceed as follows: Loosen the key mounting nuts slightly with the long-nose pliers and shift the key unit as required, taking care to obtain a satisfactory clearance between the sleeve and the key button. Tighten the key mounting nuts securely.

M-3 Plunger Movement If the plunger rod binds in the key frame, it is probably due to an accumulation of dirt between the plunger rod and the key frame. In the case of the No. 4-B or No. 4-C foot switch not equipped with a removable cover, remove the key from the base of the foot switch by removing the outer brass plate as outlined in M-1. Then remove the key mounting screws with the 3-1/2" cabinet screw-driver holding the key mounting nuts with the long-nose pliers. In the case of the No. 4-B or No. 4-C foot switch equipped with a removable cover, remove the four cover mounting screws with the 4" regular screw-driver and lift the cover from the base as far as is permitted by the length of the skimmers.

M-4 Place a few drops of trichloroethylene in the slot between the plunger rod and the key frame. Operate the plunger rod a few times and then wipe it with a clean dry KS-2423 cloth. Repeat this operation a number of times until all the dirt has been removed. In the case of the No. 4-A foot switch, this can be done without removing the key from the base.

M-5 If the bind on a No. 4-A foot switch is not due to the above condition, see whether the plunger rod is binding in the plunger guide of the spring assembly mounting block. If the plunger rod binds in the plunger guide of the spring assembly mounting block remove the plate holding screws with the 3-1/2" screw-driver and remove the key. Then loosen the spring assembly mounting screws and shift the block slightly so as to eliminate the bind. Retighten the spring assembly screws firmly.

M-6 Bind may be due to a roughened, bent or dirty plunger rod. To determine whether a plunger rod is bent, revolve it and watch for side motion of the rubber plunger. At the same time it is advisable to see whether the rubber plunger is worn.

M-7 If the bind on a No. 4-A foot switch is due to a roughened or bent plunger rod replace the key. If it is due to a broken or distorted helical spring or worn hard rubber plunger remove the spring assembly screws, with the 3 1/2" cabinet

screw-driver, remove the spring assembly and spring assembly mounting block, the helical spring and finally the hard rubber plunger. Replace the helical spring or hard rubber plunger and reassemble the key.

M-8 If the plunger rod of a No. 4-B or No. 4-C foot switch is roughened or bent, grasp the plunger button with the fingers or if necessary with the long nose pliers, and, while holding the hard rubber plunger securely with the fingers, turn the plunger rod in a counter-clockwise direction until the hard rubber plunger is free from the plunger rod. If the plunger rod is roughened or bent, or if flat spots are noted on the hard rubber plunger, replace the defective part with a new one.

M-9 At this time, clean the surfaces of the plunger springs nearest the hard rubber plunger with a toothpick which has been dipped in trichloroethylene. Do not use the same toothpick for more than one operation. Then wipe the springs as well as the hard rubber plunger with a clean dry KS-2423 cloth.

M-10 After the cleaning has been completed reassemble all parts of the key unit and check for plunger movement.

M-11 Before replacing the key, check the other requirements specified and make the necessary readjustments as covered in the subsequent adjusting procedures.

- 3.03 Contact Alignment (Rq.2.03)
- 3.04 Contact Separation (Rq.2.04)
- 3.05 Spring Clearance (Rq.2.05)
- 3.06 Contact Pressure (Rq.2.06)
- 3.07 Contact Follow (Rq.2.07)
- 3.08 Flexible Contact Spring Position (Rq.2.08)
- 3.09 Position of Plunger Springs with Relation to Plunger (Rq.2.09)
- 3.10 Plunger Spring Pressure (Rq.2.10)
- 3.11 Contact Sequence (Rq.2.11)

M-1 When making these adjustments consult the associated circuit drawing and circuit requirement table, and give proper consideration to the maintenance of any requirement for contact sequence which may be specified thereon. Do not straighten kinked springs unless the kink interferes with the proper adjustment of the key. Removing kinks tends to weaken the spring and shorten the life of the key. Adjust the springs so that there will be the specified clearance between springs designed never to make contact and between any spring and the frame in both the operated and unoperated positions of the key. Straightening the springs will usually rectify any trouble that may exist because of springs

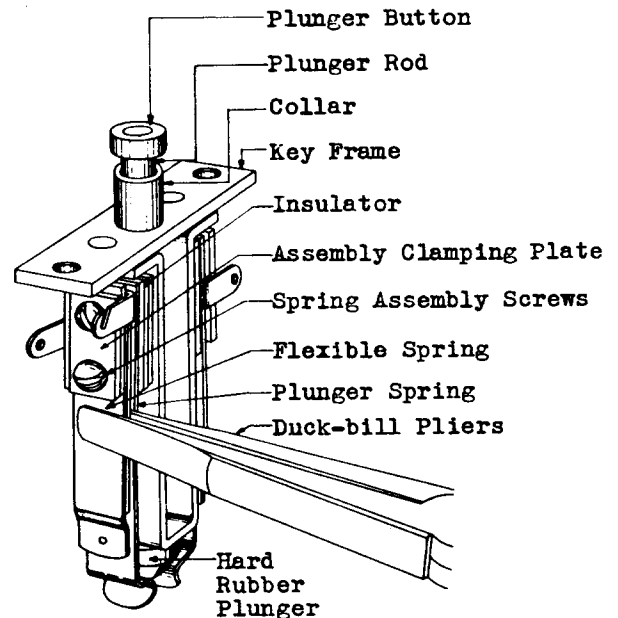


Fig. 6 - Method of Adjusting Contact Springs

touching each other which are designed to clear at all times.

M-2 Adjust the springs unless otherwise specified, near the point where the spring leaves the spring assembly clamping block or insulators with the duck-bill pliers, applied as shown in Fig. 6. In adjusting the spring exercise care to adjust them in line with their movement so as not to twist them off center.

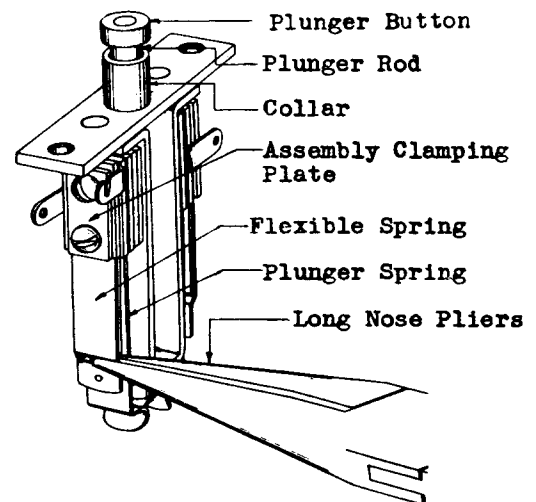


Fig. 7 - Method of Adjusting Tip of Flexible Spring for Contact Separation

**M-3 Contact Alignment** At the time the other spring adjustments are being made see that the contact point lies wholly within the boundary of the corresponding contact. If necessary, loosen the spring assembly screws with the 3-1/2" cabinet screw-driver and shift the springs so that the contacts are in proper alignment. Then tighten the assembly screws securely. When mounted the contacts should rest wholly within the boundary of the corresponding contact, preferably as near the center as possible.

**M-4 Spring Clearance** Failure to meet the specified clearance between springs designed never to make contact or between the springs and the helical spring, may be due to the springs being distorted or due to excessive follow. Straighten the springs or reduce the follow as required with the duck-bill pliers.

**M-5 Contact Pressure** Foreign matter wedged between the contact springs may prevent the springs from making contact when the plunger is operated. Remove the foreign matter with a toothpick which has been dipped in trichloroethylene. Do not use the same toothpick for more than one operation. If the contact pressure requirement is still not met readjust the springs as required as outlined in M-2.

**M-6 Contact Separation and Contact Follow** If the contact separation or contact follow requirement cannot be met by adjusting the springs close to the point where they leave the assembly clamping plates and insulators, the upper part of the spring just below the contact disc may be given a slight bend toward the plunger spring with the long nose pliers. This bend should not be enough, however, to make a visible kink in the spring. In the case of flexible contact springs, bend the spring slightly at the shoulder with long nose pliers as shown in Fig. 7.

**M-7 Flexible Contact Spring Position** (Nos. 4-B and 4-C Foot Switches Only) Note that the flexible contact springs rest flat against their stop springs when the plunger is operated to such a position as to break their contacts.

**M-8** If the flexible contact spring does not rest against its stop spring as specified, insert a piece of No. 22 bare tinned copper wire between the two springs near the point where they are held together. Then place the duck-bill pliers over both the stop spring and the flexible contact spring close to the wire as shown in Fig. 8 and pinch the two springs together with the pliers. It will be satisfactory to have a slight kink in the flexible contact spring near the point

where the springs are held together which may be introduced in making this adjustment.

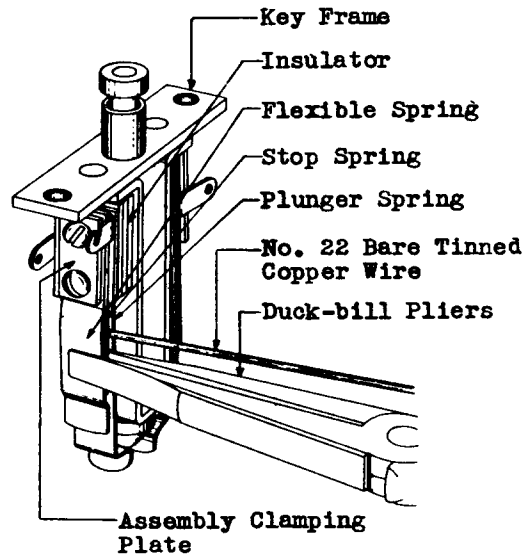


Fig. 8 - Method of Adjusting for Flexible Contact Spring Position

**M-9 Position of Plunger Springs** (Nos. 4-B and 4-C Foot Switches Only) When, with the plunger in the normal position, the plunger springs fail to rest against the hard rubber plunger, examine the springs to determine whether or not they are distorted. Adjust as required with the duck-bill pliers.

**M-10 Contact Sequence** To adjust for contact sequence, increase or decrease the contact separation, contact pressure, contact follow or spring clearance as required, as outlined in M-1 to M-6 inclusive.

### 3.12 Plunger Operate Pressure (Rq.2.12)

**M-1** If a plunger fails to meet the maximum plunger operate pressure requirement, examine the plunger springs to determine whether a gummy substance has formed on them. If necessary to clean the plunger springs of the No. 4-B or 4-C foot switch, remove the hard rubber plunger as described in procedure 3.02, M-8. Clean the surface of the spring nearest the plunger with a toothpick which has been dipped in trichloroethylene. Do not use the same toothpick for more than one operation. Wipe the plunger with a clean dry KS-2423 cloth.

**M-2** To clean the plunger and plunger springs of the No. 4-A foot switch proceed as outlined in M-1 except that it will not be necessary to remove the hard rubber plunger.

M-3 If after the trichloroethylene has dried off, the key still fails to meet the requirements, determine whether the plunger spring and contact spring tension is excessive and, if necessary, reduce the tension of the contact spring or plunger springs towards the minimum limit with the duck-bill pliers.

M-4 When readjusting a plunger spring see that the relationship of the plunger springs to the plunger is correct. See

that, in the case of the No. 4-B or 4-C foot switch, they do not rest against the plunger with excessive tension.

M-5 If the key fails to meet the minimum requirement, tension the springs as required with the duck-bill pliers as outlined in procedure 3.10, M-2.

M-6 Whenever the plunger springs are either tensioned or weakened, keep the tensions of the springs as nearly equal as possible.