

BELL SYSTEM PRACTICES
 Teletypewriter and Manual
 Telegraph Station and PBX
 Installation and Maintenance

SECTION P31.911
 Issue A, 7-23-37
 Long Lines Department

RELAYS

KS-3067, KS-5013, KS-5381, KS-5483, KS-6319

(SIGNAL ENGINEERING AND MANUFACTURING COMPANY'S RELAYS)

1. GENERAL

1.01 This section covers the KS-3067, KS-5013, KS-5381, KS-5483, and KS-6319 relays which correspond as follows to the manufacturer's designating number:

<u>KS List Number</u>	<u>Manufacturer's Number</u>
KS-3067	W-46
KS-5013	W-55
KS-5381 List No. 1	RS-806 ALU2
2	RS-800 ALU2
3	RS-801 DRJ-1
4	RS-802 R-1
5	RS-803 C-7-Z-1
6	RS-804 B-4
KS-5483 List No. 01	S-7
02	S-7
03	S-7
04	S-7
05	S-7
21	C-7
22	C-7
23	C-7
24	C-7
25	C-7
26	C-7
41	A-7
51	A-8
52	A-8
53	A-8

<u>KS List Number</u>	<u>Manufacturer's Number</u>
KS-5483 List 71	A-9
72	A-9
73	A-9
74	A-9
91	B-10
92	B-26
KS-6319	W-59
-	RX-270
-	DLJ-1

1.02 Reference shall be made to Section B400.001, (listed in Section P10.903), covering General Requirements and Definitions, for additional information necessary for the proper application of the requirements listed herein.

1.03 Operate. A relay is said to operate if, when current is connected to its winding, the armature moves sufficiently to cause at least one of the stop pins on the armature to touch the core.

1.04 Non-operate. A relay is said to non-operate if, when current is connected to its winding, the armature does not move sufficiently to close any front contact or to reduce the back contact pressure enough to cause an unreliable contact.

2. REQUIREMENTS

2.01 Cleaning. Contacts shall be cleaned when necessary in accordance with the section covering cleaning of relay contacts and parts.

2.02 Relay Mounting. The relay shall be fastened securely to its mounting. Gauge by feel.

2.03 Tightness of Assembly

(a) Spring assemblies of the type shown in Fig. 1 shall be fastened securely to the armature. Gauge by feel.

(b) Armature back stops of the type shown in Fig. 1 shall be fastened securely to the brass yoke at the base of the core. Gauge by feel.

2.04 Contact Pressure. Disconnect all power supply from the relay as covered in Paragraphs 3.04, 3.05, and 3.06 and operate the relay by hand so as to close the contacts. There shall be a pressure between all contacts when closed of:

(a) W-46, W-55, and W-59 Relays

Auxiliary contacts (carbon to copper) -
Min. 50 grams. Main contacts (silver to
silver) - Min. 80 grams. Use the 79-C gauge.

(b) RS-806 ALU2 and RS-800 ALU2 Relay Sets

Minimum 5 grams.
This requirement is considered as having
been met if there is a clearance between the back
stop and the armature.

Gauge by eye.

(c) RS-801 DRJ-1 and RS-802 R-1 Relay Sets - Min.
60 grams.

RS-803 C-7-Z-1 Relay Set

Minimum 50 grams.

RS-804 B-4 Relay Set

Minimum 10 grams.

(d) S-7 Relays - Min. 25 grams.

C-7 Relays - Min. 25 grams.

A-7, A-8, A-9, B-10, and B-26 Relays

Minimum 10 grams.

(e) RX-270 Relay - Min. 90 grams.

(f) DLJ-1 Relay - Min. 15 grams.

Auxiliary (Carbon to Copper) Contacts

A) —————

Main (Silver to Silver) Contacts

B) —————

Core

Upper Contact Spring

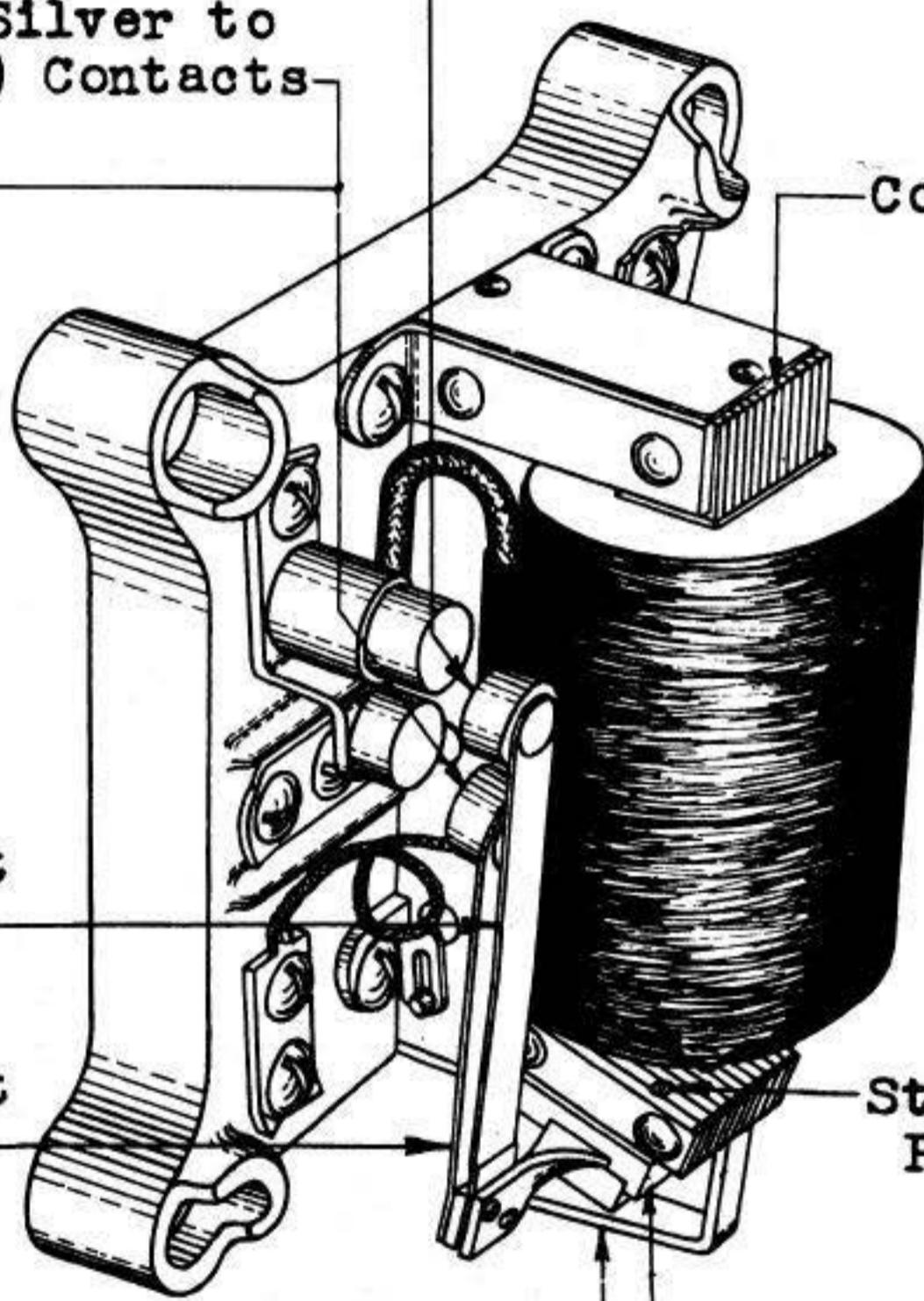
Lower Contact Spring

Stop Pin

Armature Back Stop

Armature

Fig. 1 - KS-5013 Relay



2.05 Contact Sequence

(a) Relays having an auxiliary (carbon to copper) and a main (silver to silver) set of contacts, one of each set on each side of the armature.

(1) The auxiliary (carbon to copper) contacts shall make before and break after the main (silver to silver) contacts make and break. Gauge by eye.

(2) The auxiliary (carbon to copper) contacts on each side of the armature shall make and break at approximately the same time and the main (silver to silver) contacts on each side of the armature shall make and break at approximately the same time. Gauge by eye.

(b) KS-5483 Relay and KS-5381 Relay Set, List No. 5 - Fig. 2 (A) - The contacts on the same side of the armature shall make and break at approximately the same time. Gauge by eye.

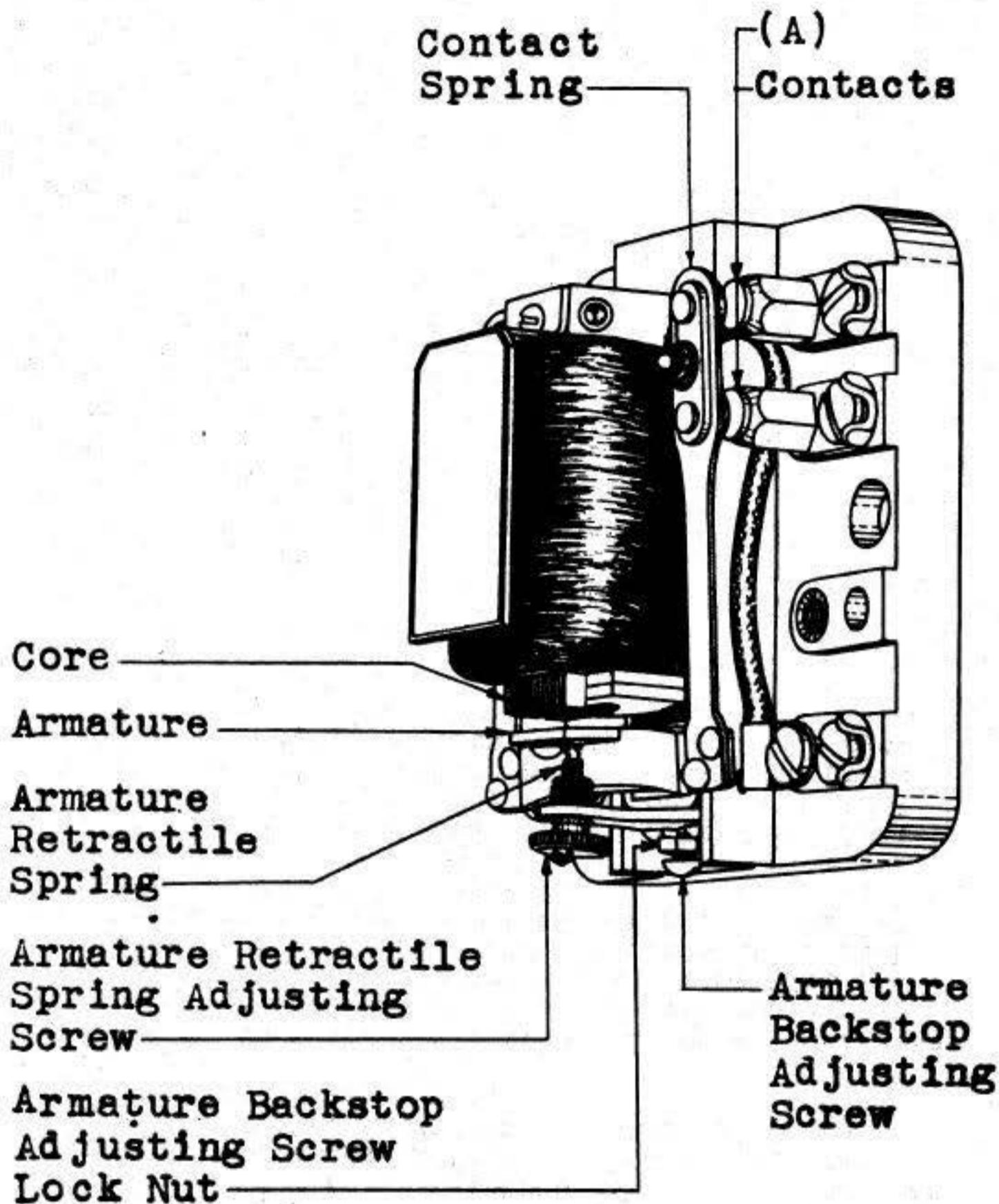


Fig. 2 - KS-5483 Relay Having Front Contacts Only

2.06 Electrical Requirements. The relay shall meet the electrical requirements specified on the Circuit Requirement Table.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges and Materials

Code No.

Description

Tools

46	3/8" Hex. Single End Socket Wrench
220	3/16" Hex. Single End Socket Wrench (Part of 221 Tool)
363	Spring Adjuster
-	Pliers, Duck-bill, per KS-6015
-	Pliers, P-Long Nose, 6-1/2"
-	Screw-driver, 3-1/2", per KS-6854 (Part of 221 Tool)
-	Screw-driver, Cabinet, 3-1/2"

Gauges

79C	0-200 Gram Push-Pull Tension Gauge
-----	------------------------------------

Materials

-	Toothpicks, Hardwood, Flat at One End and Pointed at the Other
---	---

3.01 Cleaning (Rq. 2.01)

(1) Clean the contacts and other parts in accordance with the section covering cleaning procedures for relay contacts and parts.

3.02 Relay Mounting (Rq. 2.02)

3.03 Tightness of Assembly (Rq. 2.03)

- (1) Tighten loose mounting or spring assembly mounting screws using the 3-1/2" cabinet screw-driver.
- (2) If riveted springs are loose, replace the spring assembly or armature assembly as required.

3.04 Contact Pressure (Rq. 2.04)

3.05 Contact Sequence (Rq. 2.05)

3.06 Electrical Requirements (Rq. 2.06)

- (1) In order to obtain access to various parts of the relay to adjust for contact pressure, contact sequence and electrical requirements as covered in (4) to (17) inclusive, it may be necessary to remove the relay from its mounting. To do this, proceed as follows. Disconnect all power supply from the relay winding and contact circuits by opening switches, if provided, or by removing the fuse or fuses. Then disconnect the leads from the relay terminals using the 3-1/2" cabinet screw-driver or No. 46 wrench. Remove the four relay mounting screws with the 3-1/2" cabinet screw-driver.
- (2) Do not straighten kinked springs unless the kink interferes with the proper adjustment of the spring assembly. Removing kinks tends to weaken the spring and shorten the life of the spring assembly.

Contact Pressure

- (3) Contact pressures are specified on a minimum basis and have a direct bearing on the electrical requirements. If the pressure is greatly in excess of the specified minimum limit, the relay may fail to meet its electrical requirements, in which case it will be necessary to reduce the spring tension. In readjusting, however, it is desirable to have as much tension as possible on the various springs consistent

with meeting other requirements. In adjusting the contact springs, tension the corresponding springs of the assemblies on both sides of the armature so that the tensions are approximately equal.

(4) Relays Equipped with Normally Open Contacts.

If the contact pressure between contacts is not satisfactory hold the armature against the back stop and increase the tension of the spring by adjusting it towards the contact by applying the KS-6015 duck-bill pliers close to the riveted base of the spring, as shown in Fig. 3. In adjusting the springs, exercise care not to twist them, since this will prevent the contacts from resting flat against each other.

(5) Relays Equipped with Normally Closed Contacts and No Retractable Springs.

If the contact pressure between normally closed contacts is not satisfactory, hold the armature against the core and grasp the spring to be adjusted with the duck-bill pliers close to the point where the spring is riveted to the armature and adjust the spring away from the base to increase the tension. To decrease the tension hold the armature against the backstop and adjust the spring toward the base with the duck-bill pliers. When a satisfactory adjustment cannot be obtained in this manner it is probably due to a bowed or kinked spring, in which case distribute the tension by adjusting the spring as follows.

(6) In case the spring is bowed, apply the duck-bill pliers at the far end of the bow and adjust the spring slightly in the opposite direction to the bow and then while applying only enough pressure to the spring to hold it away from any support, draw the pliers along 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. Repeat this operation until a satisfactory adjustment has been obtained.

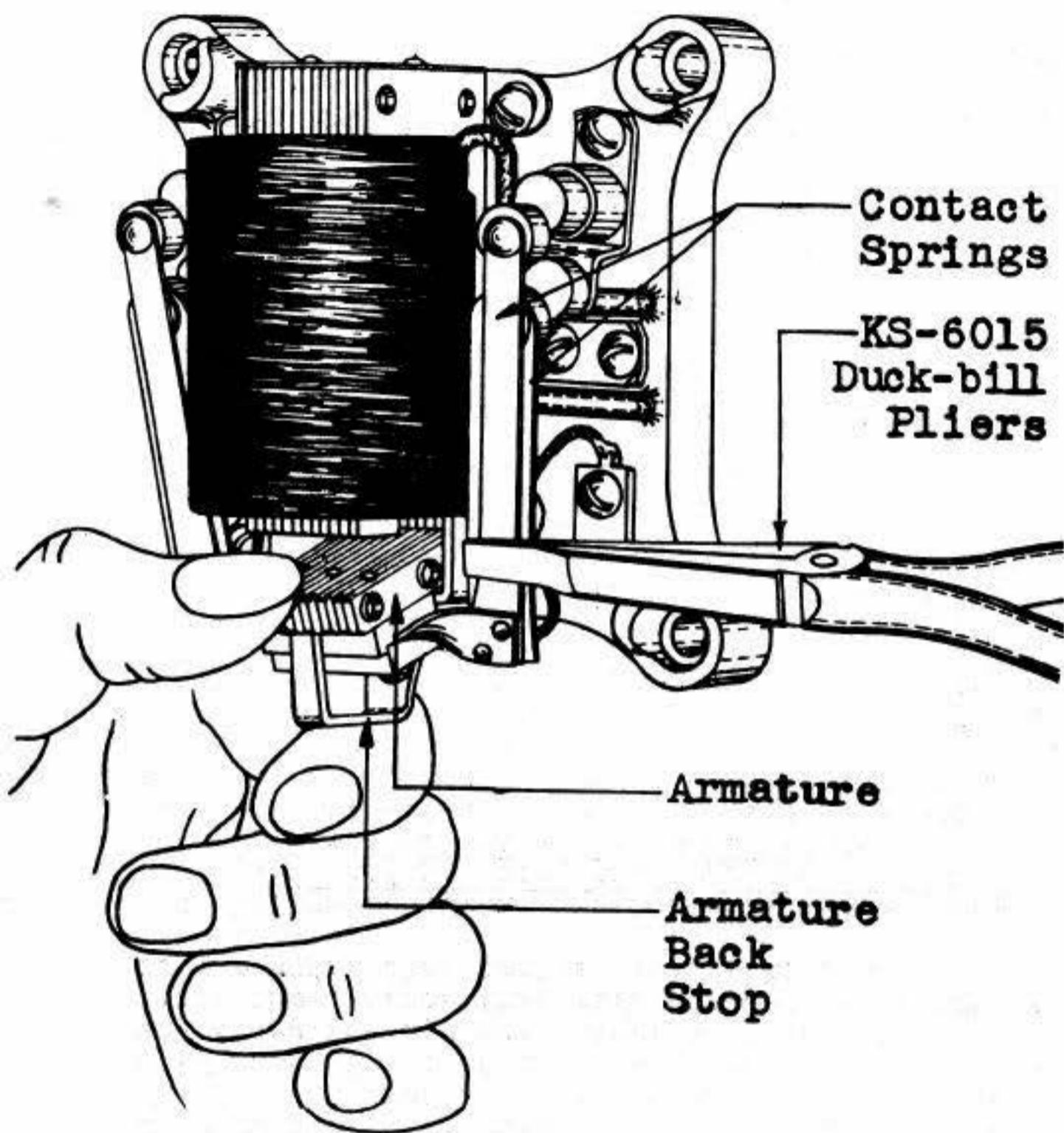


Fig. 3 - Method of Adjusting For Contact Pressure and Contact Sequence

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.

(7) Relays Equipped with Normally Closed Contacts And Armature Retractable Springs. If the pressure between contacts is not satisfactory the pressure between the normally closed contacts may be increased or decreased by turning the armature retractile spring adjusting screw in to decrease the pressure and out to increase the pressure.

(3) Relays Equipped with Split Contact Springs. If a satisfactory adjustment cannot be obtained as outlined in (5), (6) and (7), adjust as outlined in (10).

(9) Contact Sequence. To adjust for contact sequence, proceed as follows except for those relays equipped with split contact springs, in which case adjust as outlined in (10). Adjust the contact springs at fault by increasing or decreasing the contact separation as required with the duck-bill pliers. To do this, place the pliers at a point about $1/4$ " from the point where the spring is riveted to the armature as shown in Fig. 3 and adjust the spring at this point as required. When a satisfactory adjustment cannot be obtained in this manner, distribute the tension as outlined in (6). After a satisfactory adjustment is obtained, check that the contact pressure requirement is met.

(10) If the relay is equipped with split contact springs and the contact on the long spring does not close at the same time as the contact on the short spring the trouble may be due to an unsatisfactory position of either the long or short spring. If either leg of the long spring is bowed or bent, straighten it with the duck-bill pliers as outlined in (6) and adjust the short spring as follows: Place the No. 363 spring adjuster on the short spring in back of the contact. This may be facilitated by lifting the short spring with a toothpick. Slide the

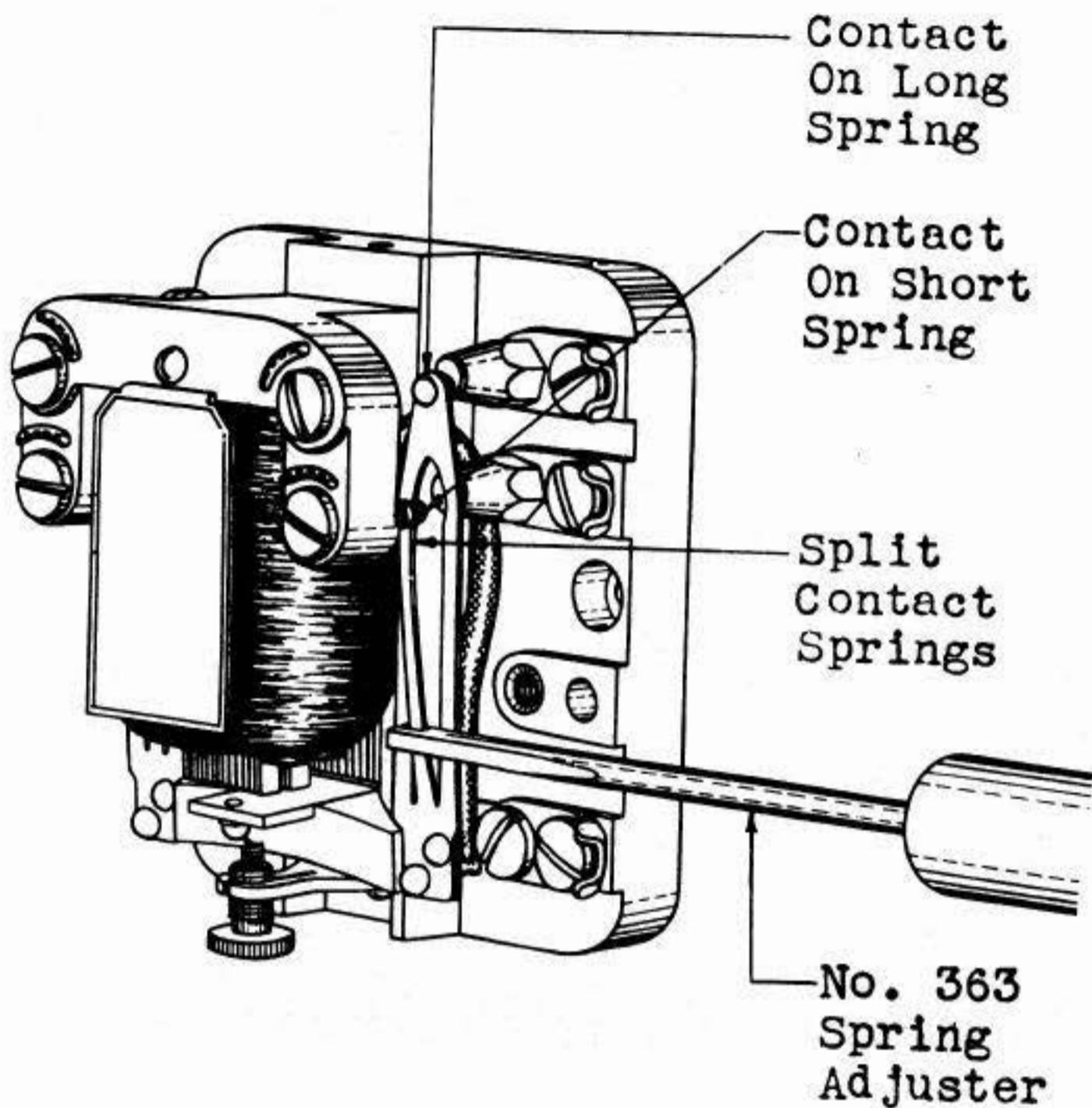


Fig. 4 - Method of Adjusting
for Contact Sequence
On Split Contact
Springs

adjuster back along the spring as far as possible without forcing as shown in Fig. 4. Adjust the spring as required. Take care when doing this as in general only slight adjustment of the spring is necessary. Slide the spring adjuster toward the free end of the spring and then withdraw it. If difficulty is experienced in obtaining simultaneous closure of contacts on both front and back contacts, give preference to the back contacts in making the adjustment as the movement of the armature will, in general, overcome any slight differences in the closure of the contact.

(11) Electrical Requirements. If the relay fails to meet its electrical requirements, it is probably due to the position of the armature with respect to the core, or to excessive or insufficient contact pressure. To change the position of the armature proceed as follows.

(12) On relays having the type of armature back stop shown in Fig. 5 apply the operate current and note whether or not the armature tends to move toward the core. If the armature does not move toward the core, the trouble is due to the armature air-gap being excessive. Correct this condition by adjusting the armature back stop toward the armature with the long nose pliers as shown in Fig. 5. If the relay tends to operate on a non-operate requirement, increase the air-gap by adjusting the armature back stop away from the armature with the long nose pliers as shown in Fig. 5.

(13) On relays having the type of armature back stop shown in Fig. 6 insert the blade of the 3-1/2" cabinet screw-driver between the armature back stop tang and the back stop frame. Using the screw-driver as a lever, bend the back stop tang toward the armature by pressing the screw-driver against the tang. If the armature air-gap is too small, correct it by inserting the screw-driver between the back stop tang and the frame as shown in Fig. 6. Using the screw-driver as a lever, pry the tang away from the

armature. Exercise care not to break the tang, which is short and somewhat brittle.

(14) On relays equipped with armature back stop adjusting screws as shown in Fig. 2, loosen the armature back stop adjusting screw lock nut with the No. 220 wrench and while holding the lock nut in position turn the adjusting screw in or out as required with the KS-6854 screw-driver to decrease or increase respectively the movement of the armature. After a satisfactory adjustment is obtained, tighten the lock nut securely.

(15) If the armature moves toward the core as the electrical operate current is applied, but fails to pull all the way up to the core, it is an indication of excessive contact pressure or excessive armature retractile spring tension. Reduce the contact pressure or spring tension as outlined in (4) to (8) inclusive, exercising care not to change the contact sequence. If the armature retractile spring tension is excessive, reduce the tension by turning the adjusting screw in a clockwise direction.

(16) If the relay fails to meet its non-operate requirement, increase the armature air-gap as covered in (12) or (13), or if the relay is equipped with an armature retractile spring, increase the tension by turning the adjusting screw in a counterclockwise direction. If a readjustment of the contact pressure is necessary, proceed as covered in (4) to (8) inclusive.

(17) After adjustments are completed remount the relay if it had been removed, reconnect the leads and recheck the electrical requirements.

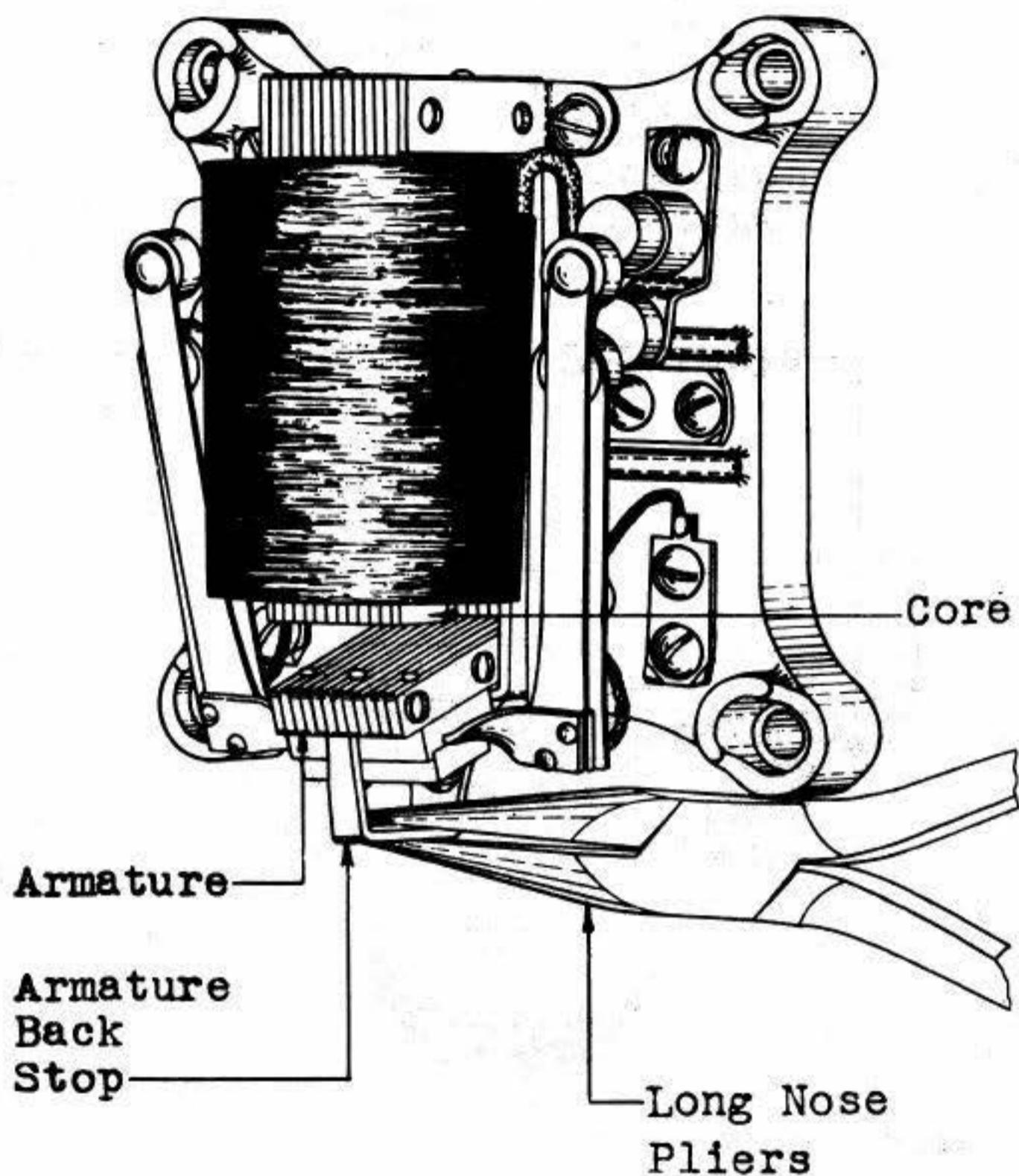


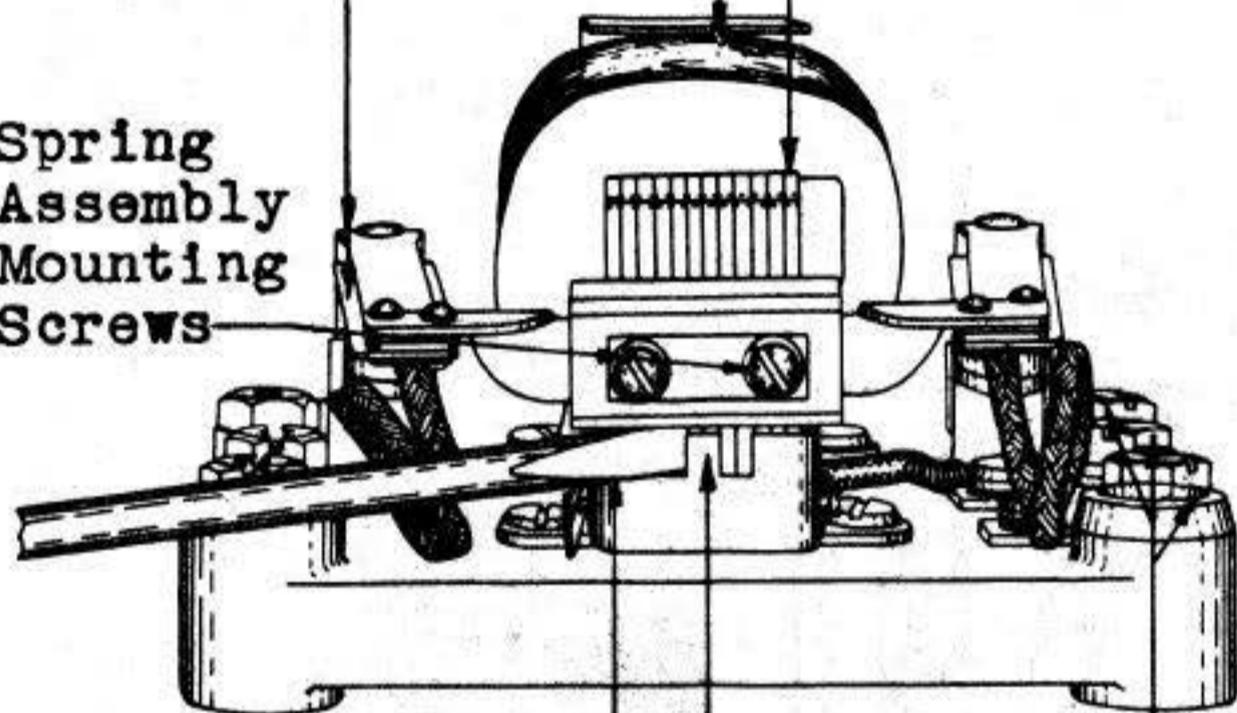
Fig. 5 - Method of Adjusting Armature Backstop, Using Long Nose Pliers

Contact
Springs

Coil

Armature

Spring
Assembly
Mounting
Screws



3-1/2" Cabinet
Screw-driver

Terminals

Armature
Back Stop
Tang

Fig. 6 - Method of Adjusting Armature
Back Stop Tang, Using 3-1/2"
Cabinet Screw-driver