

KEYS STROMBERG-CARLSON 319 AND 320 TYPES REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers Stromberg-Carlson 319 and 320 type keys.

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.

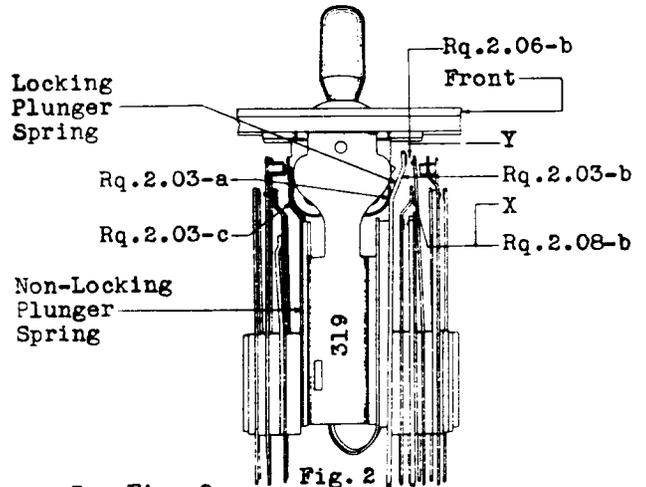
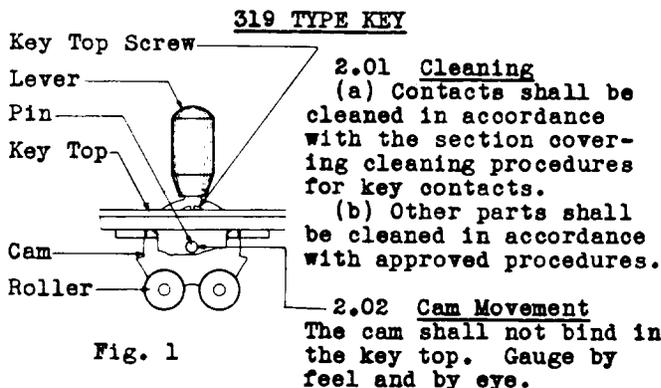
1.03 Part 1, "General" and Part 2, "Requirements" form part of the Western Electric Co. Inc. Installation Department handbook.

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

1.05 The normal or unoperated position of a lever is that position in which the lever is perpendicular to the key top with the normally open contacts open and the normally closed contacts closed.

1.06 The operated or locked position of a lever is that position in which the lever is thrown either to the extreme front or rear with all normally open contacts of the associated spring assembly closed and all associated normally closed contacts open.

2. REQUIREMENTS



See Fig. 2

*2.03 Relation of the Plunger Springs to the Rollers

(a) The plunger springs of the locking spring combinations shall rest against the rollers and the buffer spring shall rest against the opposite side of the rollers so that in the normal position the lever will be held in a vertical position. Gauge by eye.

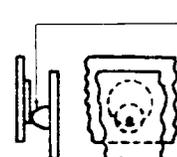
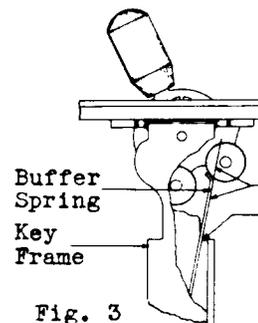
(b) The locking plunger springs shall be heavily tensioned (approximately 735 grams) against the rollers to prevent overthrow of the lever to the locking position when allowed to release with a snap from the non-locking position. Gauge by feel.

(c) The non-locking plunger springs shall be firmly tensioned (approximately 145 grams) against the rollers to prevent opening their back contacts when the lever is allowed to release with a snap from the locked to the normal position. Gauge by feel.

*2.04 Relation of the Buffer Spring to the Key Frame and Rollers

(a) The buffer spring shall clear the sides of the key frame. Gauge by eye.

(b) With lever in the operated position, the buffer spring shall meet the rollers approximately at the point shown in Fig. 3. Gauge by eye.



***2.05 Contact Alignment**
The contacts shall line up so that the point of contact falls wholly within the circumference of the opposing contact disc. Gauge by eye.

SECTION 032-790-702

***2.06 Contact Separation**

(a) Unless otherwise specified the separation between open contacts shall be:

- Test - Min. .012"
- Readjust - Min. .015"

Gauge by eye.

See Fig. 2

(b) The separation between contacts at "Y" shall be approximately ($\pm .010$ ") 1/32". Gauge by eye.

See Figs. 5 and 6

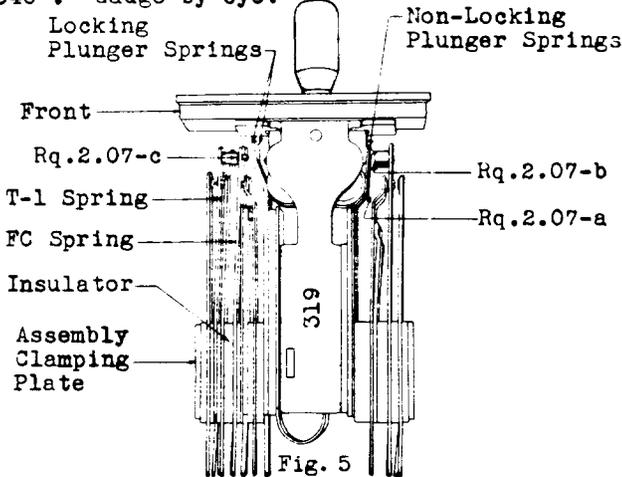
***2.07 Spring Clearance**

(a) There shall be a clearance between springs designed never to make contact and between any spring and the frame whether in the operated or unoperated position of the key of:

- Test - Min. .012"
- Readjust - Min. .015"

Gauge by eye.

(b) There shall be a clearance between the non-locking plunger springs and the rubber separators on the traveling springs of min. .040". Gauge by eye.



(c) There shall be a clearance between the right hand FC spring and the separator on the T-1 spring of min. .010". Gauge by eye.

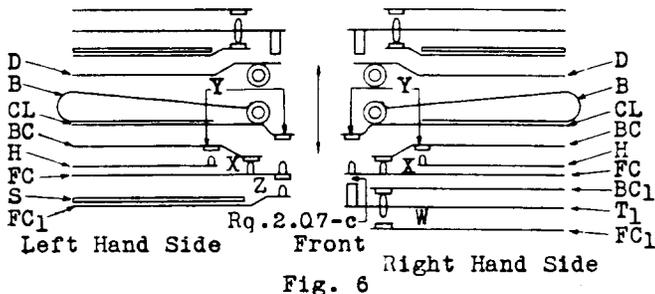
See Fig. 2

***2.08 Contact Pressure**

(a) Unless otherwise specified the pressure shall be:

- Test - Min. 50 grams
- Readjust - Min. 55 grams

Use the No. 68-B gauge.



(b) With the lever in the normal position the contacts at "X" shall have heavy pressure (approximately 225 grams). Use the No. 62-B gauge.

***2.09 Contact Follow** There shall be a contact follow on all contacts of:

- Test - Min. .008"
- Readjust - Min. .010"

Gauge by eye.

***2.10 Contact Sequence**

(a) When the lever is thrown to the operated position "Y" contacts shall make before "X" contacts break by:

- Test - Min. .005"
- Readjust - Min. .006"

Gauge by eye.

(a1) "X" contacts shall break and "W" contacts shall make before "Z" contacts make by:

- Test - Min. .005"
- Readjust - Min. .006"

Gauge by eye.

(b) When the lever is thrown to the non-locking position the normally closed contacts shall break before the normally open contacts make by:

- Test - Min. .005"
- Readjust - Min. .006"

Gauge by eye.

2.11 Non-Click When the lever is restored unrestrained from the operated position to the normal position the normally closed contacts of the opposite side and the "X" contacts of the same side shall not break.

2.12 Lever Release

(a) The pressure required to restore the lever from the locked position shall be:

- Test - Min. 50 grams
- Readjust - Min. 55 grams

Use the No. 68-B gauge. (b) In checking this requirement the pressure shall be applied at the top portion of the handle, and perpendicularly to it. The lever shall return unaided from the locked position before

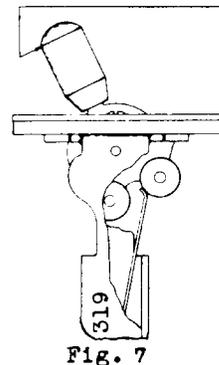


Fig. 7

the lever has traveled 10 degrees (a movement of the top of the handle of about 1/2 of the diameter of the rubber handle) from the extreme locked position.

320 TYPE KEY

2.13 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.

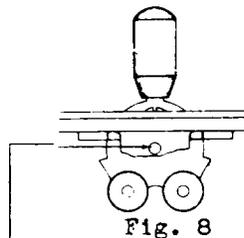


Fig. 8

2.14 Cam Movement The cam shall not bind in the key top. Gauge by feel and by eye.

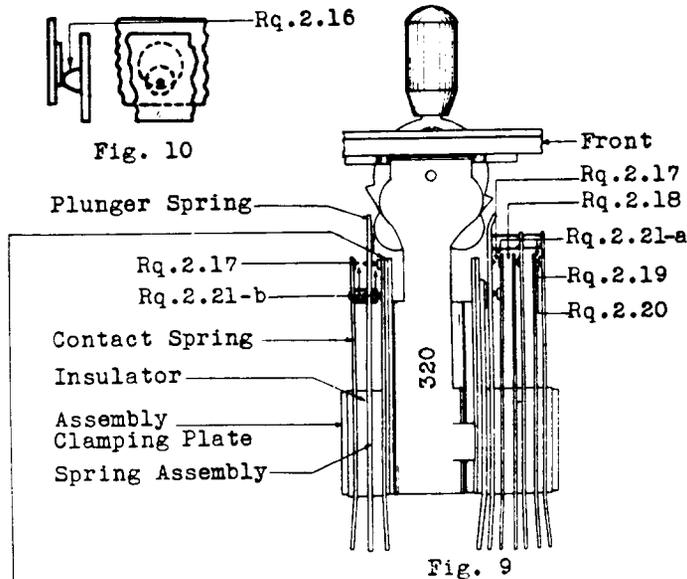


Fig. 10

Fig. 9

*2.15 Relation of the Plunger Springs to the Rollers The plunger springs shall rest against the back contacts and allow a very slight gap between the rollers and the springs, and in the normal position the lever shall be held in a vertical position. Gauge by eye.

See Fig. 10

*2.16 Contact Alignment The contacts shall line up so that the point of contact falls wholly within the circumference of the opposing contact disc. Gauge by eye.

See Fig. 9

*2.17 Contact Separation There shall be a separation between all open contacts of:

Test - Min. .013"
Readjust - Min. .015"

except on the make-before-make spring combination in which case the separation shall be:

Test - Min. .008"
Readjust - Min. .010"

Gauge by eye.

See Fig. 9

*2.18 Spring Clearance There shall be a clearance between spring designed never to make contact and between any spring and the frame whether in the operated or unoperated position of the key of:

Test - Min. .010"
Readjust - Min. .012"

Gauge by eye.

See Fig. 9

*2.19 Contact Pressure

(a) There shall be a pressure between all closed contacts of:

Test - Min. 50 grams
Readjust - Min. 55 grams

Use the No. 68-B gauge.

(b) This requirement shall be met except in the case of the plunger springs (CR and CL)

which shall be firmly tensioned (approximately 350 grams) against their respective back contacts (BC) to prevent excessive overthrow of the lever on release from the locking or the non-locking position. Use the No. 62-B gauge.

See Fig. 9

*2.20 Contact Follow There shall be a follow on all contacts except on the heavy (BC) spring of the make-before-break spring combination of:

Test - Min. .013"
Readjust - Min. .015"

Gauge by eye.

See Fig. 9

*2.21 Contact Sequence

(a) When the lever is thrown to the locked position, all normally open contacts shall make before the normally closed contacts break by:

Test - Min. .004"
Readjust - Min. .005"

Gauge by eye.

(b) When the lever is thrown to the non-locking position, all normally closed contacts shall break before the normally open contacts make by:

Test - Min. .004"
Readjust - Min. .005"

Gauge by eye.

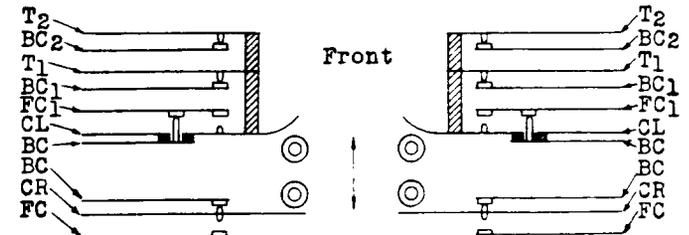


Fig. 11

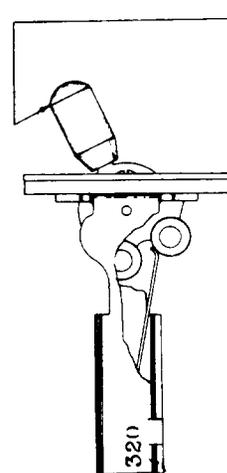


Fig. 12

*2.22 Lever Release

(a) The pressure required to restore the lever from the locked position shall be:

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

(b) In checking this requirement, the pressure shall be applied at the top portion of the handle, and perpendicularly to it. The lever shall return unaided from the locked position before it has traveled 10 degrees (a movement of the top of the handle of about 1/2 of the diameter of the rubber handle) from the extreme locked position.

3. ADJUSTING PROCEDURESTOOLS

<u>Code No.</u>	<u>Description</u>
35	Screw-driver - 3-1/2"
KS-2993	Cleaning Brush
KS-6015	Duck-bill Pliers
-	Bell System Cabinet Screw-driver - 3-1/2" per A. T. & T. Co. Drawing 46-X-40

GAUGES

62-B (or the replaced 62)	0-700 Gram Gauge
68-B (or the replaced 68 gauge)	70-0-70 Gram Gauge

MATERIALS

-	KS-7860 Petroleum Spirits
-	Toothpicks - Hardwood Flat at One End and Pointed at Other

NO. 319 TYPE KEY3.01 CLEANING (Rq.2.01)

M-1 Clean the contacts in accordance with the section covering cleaning procedures for cleaning key contacts. Clean other parts in accordance with procedures 3.02, M-3 and 3.08, M-4.

3.02 CAM MOVEMENT (Rq.2.02)

M-1 Cracked, warped or broken key tops may cause the levers to bind and thus prevent or delay the release of the lever. In this case replace the key top.

M-2 Loose or missing screws in the key top may cause it to move and bind the lever. Replace missing screws and tighten all screws with the No. 35 screw-driver.

M-3 If the bind is not removed by the above procedures, it may be corrected as follows: Unscrew the lever handles, remove the key top mounting screws with the No. 35 screw-driver, and the mounting bracket screws with the 3-1/2" cabinet screw-driver. If the key

top is not readily removable, push it up from the bottom with the screw-driver. Examine the cam and the slots in the key frame and key base for dirt. Clean the parts if necessary with the KS-2993 brush.

M-4 If the cam binds in the slot, remove the key top mounting screws with the No. 35 screw-driver, remove the key top, and slightly enlarge the slot in the key top.

3.03 RELATION OF THE PLUNGER SPRINGS TO THE ROLLERS (Rq.2.03)3.04 RELATION OF THE BUFFER SPRING TO THE KEY FRAME AND ROLLERS (Rq.2.04)

M-1 If the pressure of the plunger springs against the rollers on the locking spring combination is unsatisfactory, it will prevent the lever restoring to the vertical position. To correct this condition operate the lever to the operated position and apply the duck-bill pliers to the locking plunger springs as close as possible to the base of the spring as shown in Fig. 13.

Release the lever and adjust the springs as required. A uniform adjustment should be placed on both locking plunger springs.

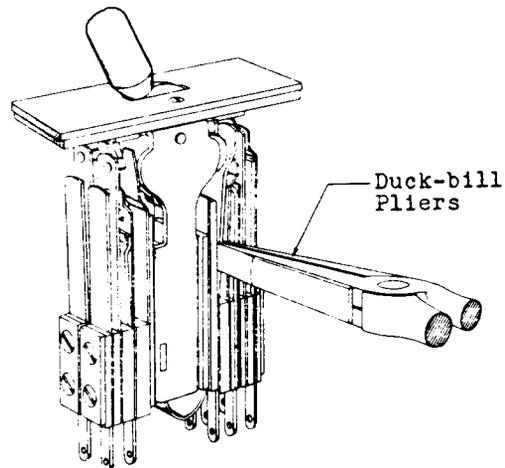


Fig. 13 - Method of Adjusting Locking Plunger Springs for Tension

M-2 If the tension of the non-locking plunger springs is insufficient, throw the lever to the non-locking operated position and insert a toothpick between the spring and the insulator as close as possible to the base of the spring. Restore the lever to the normal position and force the spring toward the insulator by applying the duck-bill pliers near the base of the spring as shown in Fig. 14 and working them up toward the end of the spring.

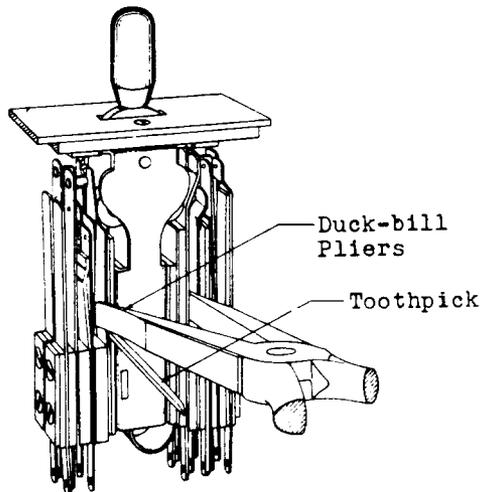


Fig. 14 - Method of Adjusting Non-Locking Plunger Springs for Tension

M-3 If the lever still fails to restore to the vertical position, operate it to the locked position to see whether or not the bronze buffer spring is in the correct relation to the roller as shown in Fig. 15. In this position tension the bronze buffer spring against the rollers.

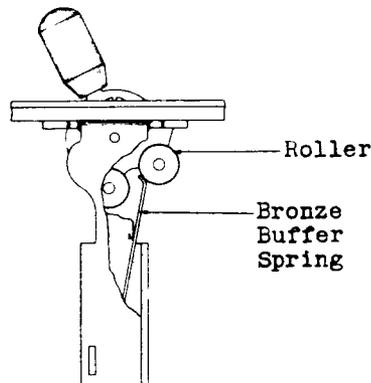


Fig. 15 - Position of Bronze Buffer Spring

Failure of the bronze buffer spring to rest properly against the rollers will prevent the lever restoring to the vertical position. If this condition exists correct as follows:

M-4 Restore the lever to the normal position and then loosen the locking spring assembly screws slightly with the No. 35 screw-driver. The bronze buffer spring being provided with elongated holes can be raised or lowered with respect to the rollers. Raise or lower it by forcing the rounded portion of the buffer spring with the upper portion of the blade of a screw-driver. Before tightening the spring assembly screws operate the lever to the locked position to determine whether or not the spring is set properly. When the bronze buffer spring has been set in the correct relation

to the rollers tighten the spring assembly screws firmly, seeing that none of the springs touch, which are designed never to make contact.

M-5 If the bronze buffer spring is not in correct relationship to the key frame, that is, fails to clear the sides of the key frame, correct this condition by loosening the spring assembly screws slightly as indicated in M-4, force the phosphor bronze spring to the desired position, and tighten the spring assembly screws securely.

M-6 If the lever fails to assume a vertical position due to the impossibility of setting the bronze buffer spring in the correct relationship to the rollers by shifting the spring as outlined in paragraphs M-3 and M-4, it is due to the bronze buffer spring being distorted. In this case replace the buffer spring. Do not attempt to increase or decrease the tension of this spring.

3.05	<u>CONTACT ALIGNMENT</u>	(Rq.2.05)
3.06	<u>CONTACT SEPARATION</u>	(Rq.2.06)
3.07	<u>SPRING CLEARANCE</u>	(Rq.2.07)
3.08	<u>CONTACT PRESSURE</u>	(Rq.2.08)
3.09	<u>CONTACT FOLLOW</u>	(Rq.2.09)
3.10	<u>CONTACT SEQUENCE</u>	(Rq.2.10)
3.11	<u>NON-CLICK</u>	(Rq.2.11)

M-1 In 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. Unless otherwise specified, adjust the springs close to the point where they leave the clamping plates and insulators, using the duck-bill pliers as shown in Fig. 16. In adjusting the springs take care not to kink them. Kinked springs should not be straightened unless the kink interferes with the proper adjustment of the key. An effort should be made in adjusting to keep the heavy spring "H" perfectly straight.

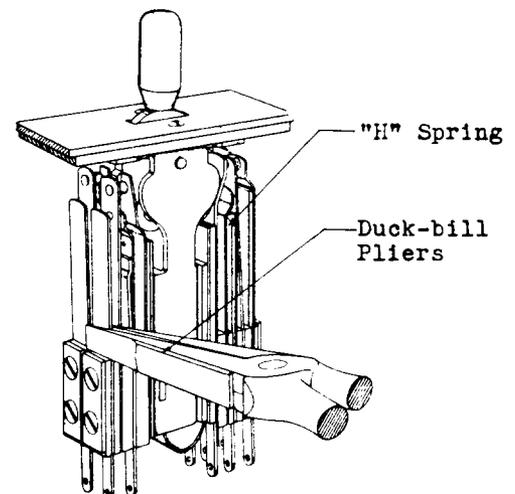


Fig. 16 - Method of Adjusting for Contact Pressure, Contact Separation, Spring Clearance, Contact Follow and Contact Sequence

M-2 At the time the other spring adjustments are being made see that the edges of all of the springs are in approximate alignment, and that the contact points lie wholly within the periphery of the corresponding discs. If necessary to shift the springs, loosen the spring assembly screws with the No. 35 screw-driver on that side of the key where the springs are out of alignment. Then shift the springs so that they are all in alignment with the contacts resting wholly within the corresponding discs and as near the center as possible. Then tighten the screws securely. If the springs are out of alignment on that side of the key where the No. 35 screw-driver cannot be used directly remove the unit from the frame as follows: Remove the key top screws with the No. 35 screw-driver, unscrew the two lever handles and remove the key mounting screws with the 3-1/2" cabinet screw-driver. Then remove the key top and remove the unit mounting screws with the 3-1/2" cabinet screw-driver and remove the unit. Loosen the spring assembly screws and shift the springs as described above.

M-3 Contact Pressure It may be necessary in adjusting springs which have stops, in order to provide sufficient contact pressure, to insert a toothpick at the base of the spring between the spring and the stop and squeeze the spring against the stop by applying the duck-bill pliers at the base and drawing them toward the contact end of the spring in a manner similar to that covered in procedure 3.04, M-2.

M-4 Foreign matter wedged between the contact springs may prevent springs from making contact when the lever is operated. Remove the foreign matter with a toothpick which has been dipped in petroleum spirits.

M-5 Spring Clearance Trouble due to springs touching each other which are designed never to make contact is caused either by springs being kinked or due to excessive follow. Straighten the springs or reduce the follow, if excessive, as required with the duck-bill pliers.

M-6 Contact Follow If the 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 may be given a slight bend toward the moving spring with the duck-bill pliers. This bend however should not be enough to make a visible kink in the spring.

M-7 Contact Sequence To adjust the "Y" contacts to make before the "X" contacts break increase the tension on the "FC" spring and increase the follow of the "Y" contacts. To adjust the "X" contacts to break and "W" contacts to make before the "Z" contacts make, adjust the "FC" spring and associated back stop as required.

M-8 Non-Click If a click is detected on the non-locking side increase the gap between rubber separators and plunger springs to the

maximum permitted by the adjustment of the associated contact springs. Check the tension of the non-locking plunger springs against the rollers and if the tension is below the minimum value adjust as required with the duck-bill pliers. Also check the tension of the locking plunger springs and reduce the tension making corrections for the normal position of the lever, as required. If a click is noted at the "X" contacts increase the tension of the "BC" springs or slightly reduce the tension in the "FC" springs, depending on the amount of tension which these springs already have. If possible, increase the tension of the "BC" springs first.

3.12 LEVER RELEASE (Rq.2.12)

M-1 When making a check for the lever release pressure apply the pressure to the top of the straight portion of the handle and perpendicularly to it.

M-2 If the lever restores from the locked position when a pressure of less than the specified value is applied, tension the plunger springs on the locking side with the duck-bill pliers against the rollers so that the rollers will have a greater drag on the spring.

M-3 If the key still fails to meet the requirements, adjust the offset portion of the nickel silver plunger spring very slightly with the duck-bill pliers as shown in Fig. 17, so as to cause a greater drag on the lever roller when returning to normal. This drag however should not be great enough to prevent the lever from returning unaided from the locked position before the lever has travelled 10 degrees (a movement of the top of the handle of about 1/2 of the diameter of the rubber handle) from the extreme locked position when the pressure is applied at the top portion of the handle and perpendicularly to it. No lubricant should be used on the key roller to facilitate this adjustment.

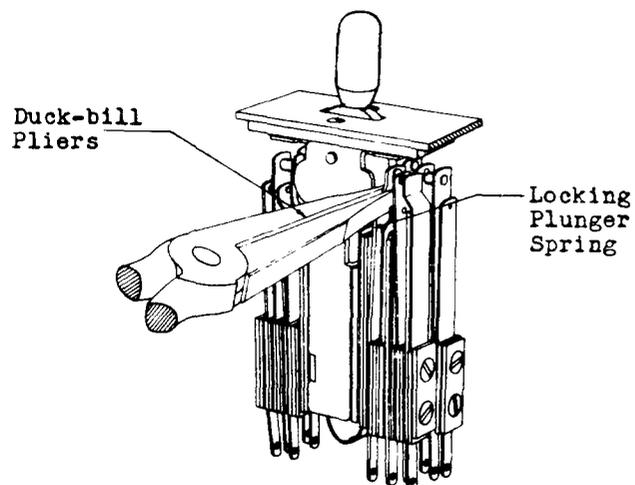


Fig. 17 - Method of Adjusting Locking Plunger Spring to Produce Greater Drag on Rollers

M-4 If it is necessary to adjust the plunger springs in order to meet this requirement, recheck all the previous adjustments.

NO. 320 KEY

3.13 CLEANING (Rq.2.13)

M-1 Clean the contacts in accordance with the section covering cleaning procedures for cleaning key contacts. Clean the other parts in accordance with procedures 3.14, M-3 and 3.21, M-10.

3.14 CAM MOVEMENT (Rq.2.14)

M-1 Cracked, warped or broken key tops may cause the lever to bind and thus prevent or delay the release of the lever. In this case replace the key top.

M-2 Loose or missing screws in the key top may cause it to move and bind the lever. Replace missing screws and tighten all screws with the No. 35 screw-driver.

M-3 If the bind is not removed by the above procedures, it may be corrected as follows: Unscrew the lever handles, remove the key top mounting screws with the No. 35 screw-driver and the bracket mounting screws with the 3-1/2" cabinet screw-driver. If the key top is not readily removable push it up from the bottom with the screw-driver. Examine the cam and the slots in the key frame and key base for dirt. Clean the parts if necessary with the KS-2993 brush.

M-4 If the cam binds in the slot, loosen the key top mounting screws with the No. 35 screw-driver, remove the key top and slightly enlarge the slot in the key top.

3.15 RELATION OF THE PLUNGER SPRINGS TO THE ROLLERS (Rq.2.15)

M-1 If the position of the plunger spring of any spring combination is unsatisfactory, adjust the spring close to the point where it leaves the clamping plate and insulators using the duck-bill pliers. It is advisable to keep the clearance between the plunger springs and the rollers as near the minimum as possible as any increase in the clearance will decrease the amount of movement available for the spring movement. It may be necessary, in some cases, to bend the upper portion of the plunger springs just above the contact. In this case, take care not to kink the spring.

- 3.16 CONTACT ALIGNMENT (Rq.2.16)
- 3.17 CONTACT SEPARATION (Rq.2.17)
- 3.18 SPRING CLEARANCE (Rq.2.18)
- 3.19 CONTACT PRESSURE (Rq.2.19)
- 3.20 CONTACT FOLLOW (Rq.2.20)
- 3.21 CONTACT SEQUENCE (Rq.2.21)

M-1 In making these adjustments, consult the associated circuit drawing and circuit re-

quirement table and give proper consideration to the maintenance of any requirement for contact sequence which may be specified thereon. Unless otherwise specified adjust the spring close to the point where they leave the clamping plates and insulators, using the duck-bill pliers.

M-2 At the time the other spring adjustments are being made, see that the edges of all of the springs are in approximate alignment and that the contact points lie wholly within the periphery of the corresponding discs. If necessary to shift the springs, loosen the spring assembly screws with the No. 35 screw-driver on that side of the key where the springs are out of alignment. Then shift the springs so that they are all in alignment with the contacts resting wholly within the corresponding discs and as near the center as possible. Then tighten the screws securely. If the springs are out of alignment on that side of the key where the No. 35 screw-driver cannot be used directly, remove the unit from the base as follows: Remove the key top screws with the No. 35 screw-driver, unscrew the two lever handles and remove the key mounting screws with the 3-1/2" cabinet screw-driver. Then remove the key top and remove the unit mounting screws with the 3-1/2" cabinet screw-driver and remove the unit. Loosen the spring assembly screws and shift the springs as described above. If the unit is removed from the key base, it is advisable to make all the following checks and readjustments before remounting the unit.

M-3 Tension the plunger springs (CL) of the locking spring combinations with the duck-bill pliers so that they will rest firmly against the separating washers (W). In tensioning these springs take care to keep the tension approximately equal and not to tension the springs against the hard rubber rollers.

M-4 See that the front contacts (FC), that is, the outside springs of the make-before-break combinations, have a fairly heavy tension against the long contact point on the back contact springs (BC). If the tension is not satisfactory, adjust the springs with the duck-bill pliers.

M-5 Now tension the traveling springs (T1) sufficiently so that they will rest firmly against the rubber studs (F) and against the back contacts (BC).

M-6 Then tension the traveling springs (T2) so that the rubber studs will be held firmly by the combined tensions of the (T1) and (T2) springs.

M-7 Next adjust the contact separation between the plunger springs (CL) and the front contact springs (FC) to min. .010". It is advisable to keep this contact separation as close to .010" as possible as any increase in the separation will decrease the amount of movement available for the make-before-break spring combination. This can be accomplished by adjusting the back contact springs (BC) of the make-before-break combinations or by

slightly bending the front contact springs (FC) close to the point of contact.

M-8 Operate the lever to the locking position and adjust the contact separation between the traveling springs (T1) and the back contact springs (BC1) and between the traveling springs (T2) and the back contact springs (BC2), and adjust the front contact springs (FC1) so that the contact separation is min. .015". This will insure full opening of the break contacts of this portion of the combination when the key is operated and at the same time will insure sufficient follow.

M-9 Now operate the lever to the locking position and observe whether the break contact of the make-before-break spring combination opens min. .010". If the springs have been correctly tensioned all these contact adjustments will be provided.

M-10 Foreign matter wedged between the contact springs may prevent springs from making contact when the lever is operated. Remove the foreign matter with a toothpick which has been dipped in petroleum spirits.

M-11 Adjust the non-locking side of this key by first adjusting the plunger springs (CR) so as to provide a slight clearance between the rollers and the plunger springs. When making this adjustment be sure that both rollers strike the plunger spring (CR) at the same time. If one is ahead of the other, that side will open contact easily when the key is snapped from the locking position to the non-locking position.

M-12 See that the back contact springs (BC) on the non-locking side have a follow of min. .015". If this follow is not sufficient there will be a greater tendency for the contacts to open when the lever is snapped from the locking position. On the other hand, if the follow is too great, there is danger in having the plunger springs (CR) make contact with the front contact springs (FC) before the

back contacts (BC) are open. In order to prevent this happening, be sure that there is min. .010" separation between the contacts of the plunger springs (CR) and the front contact springs (FC) when the back contacts (BC) are just breaking.

M-13 Check the previous adjustments by operating the lever to the non-locking position and observe whether the front contact springs (FC) have sufficient follow to insure a reliable contact.

3.22 LEVER RELEASE (Rq.2.22)

M-1 When making a check for the lever release pressure apply the pressure to the top of the straight portion of the handle and perpendicularly to it.

M-2 Should the lever restore from the locked position when a pressure of less than the specified value is applied, tension the plunger springs on the locking side with the duck-bill pliers against the rollers so that the rollers will have a greater drag on spring.

M-3 If the key still fails to meet the requirements, adjust the offset portion of the nickel silver plunger spring very slightly with the duck-bill pliers so as to cause a greater drag on the lever roller when returning to normal. This drag however should not be great enough to prevent the lever from returning unaided from the locked position before the lever has traveled not more than 10 degrees (a movement of the top of the handle of about 1/2 of the diameter of the rubber handle) from the extreme locked position when the pressure is applied at the top portion of the handle and perpendicularly to it. No lubricant should be used on the key roller to facilitate this adjustment.

M-4 If it is necessary to adjust the plunger springs in order to meet this requirement, a recheck should be made of all the previous adjustments.