

ELEVATOR APPARATUS

PANEL SELECTOR

1. GENERAL

1.01 This section covers panel district, office, incoming and final selector elevator apparatus (11 type and D-85387 multiple brushes, 2 and 9 type brush rods, 1 type trip rods, 4 type bearings, 8 type indicators and No. 1-A guides) and replaces specification X-70263-01, Issue 2-B and Addendum to Section A446.006, (X-70263-01, Issue 2-B).

1.02 Reference shall be made to Section A400.001 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 Multiple brush contact spring pressure is that which it is necessary to overcome to start a tripped brush contact spring away from its associated bank terminal when the gauge is applied at a point on the spring approximately 1/4" from the end of the spring.

1.05 Reference Terminal Alignment A visual inspection shall be made before checking or readjusting any multiple brush to insure that the reference terminal and the associated tip and ring terminals of the same circuit group of terminals by which the brush is to be set are correctly aligned horizontally and vertically with respect to the other terminals in the bank.

2. REQUIREMENTS

2.01 Lubrication

(a) Before the installer starts the operation test, the following points shall be lubricated with one application of Western Electric Lubricating Compound No. 3.

(1) On trip rod rotating levers and trip armature extensions, the surfaces of these parts where they come in contact with each other.

(2) On multiple brush reset levers, the underside of the lever for a distance of approximately 1/2" from the end.

(3) On reset (bearing) plates, the surface with which the reset lever comes in contact.

(b) Take care that none of the lubricant gets on the racks or the cork rolls of the drive.

(c) After turnover, trip rod rotating levers and trip armature extensions, reset levers and reset or bearing plates which show signs of wear and reset levers which stick when resetting, together with their associated reset or bearing plates, shall be lubricated at the discretion of the Telephone Company.

2.02 Rack Tongue Position - Fig. 1 (A) -

(a) The rack tongue shall have sufficient tension to hold it against the rack coupling pin. Gauge by feel.

(b) There shall be a perceptible (min. .005") clearance between the rack tongue and all sides of the slot in the brush rod. Gauge by eye.

2.03 Rack Coupling Pin Engagement - Fig. 1

(B) - The rack coupling pin shall be sufficiently free in the brush rod to allow the rod to rest on the rack bearing washer or the shoulder of the rack and to prevent any twisting motion of the rack within the limits permitted by 2.02 being transmitted to the rod. Gauge by eye.

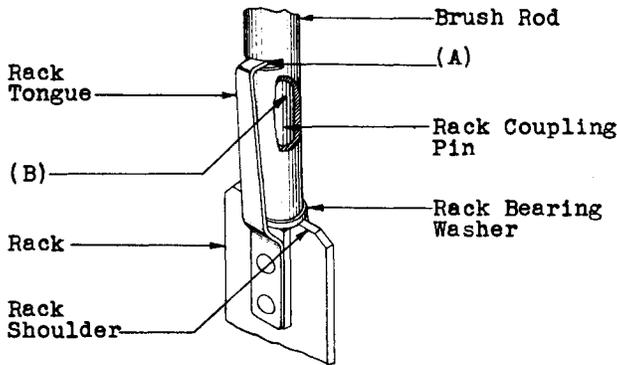


Fig. 1

2.04 No. 1-A Guide Location

(a) Fig. 2 (A) - Throughout the length of travel of the brush rod, the prongs of the No. 1-A guide may touch the front or the rear of the trip rod, but shall not bind at these points. Gauge by eye.

(b) Fig. 2 (B) - The closed side of the No. 1-A guide shall clear the trip rod reliably with any brush tripped throughout the length of travel but the trip rod shall be wholly within the prongs of the guide. Gauge by eye.

(c) With the up-stop collar located in accordance with requirement 2.29 and with all other brush rods in the normal (down) position, the No. 1-A guide shall clear the bearing parts when the associated brush rod is raised to its topmost position. Gauge by eye.

2.05 Freedom of Movement of Brush Rod -

Fig. 3 (A) - A brush rod shall be sufficiently free in its bearings to return to the normal (down) position due to its own

weight plus the weight of the rack when lowered slowly from any position except the brush restoring position with the pawl lifted and with any brush tripped. Gauge by eye and by feel.

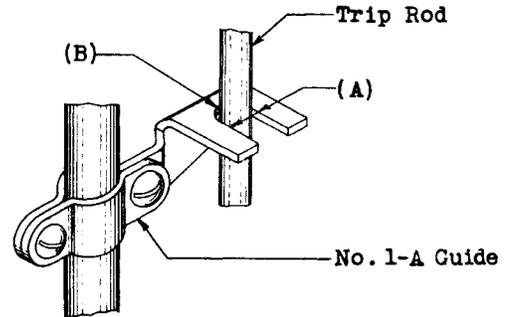


Fig. 2

2.06 Brush Rod Bearing Gap - Fig. 3 (B) -

The bearing halves of 4 type bearings shall be placed as closely together as possible without causing the brush rod to bind and the gap between the bearing halves at both front and rear of the bearing shall be Max. .005" Gauge by eye.

2.07 Brush Stud Gap - Fig. 4(A) - With the brush centered on the reference terminal of the bank, the stud gap shall be:

Test - Min. .005"
Readjust - Min. .008"

Use the No. 86 gauge.

The stud shall not touch the adjacent sleeve spring at any other terminal of the bank. Gauge by eye.

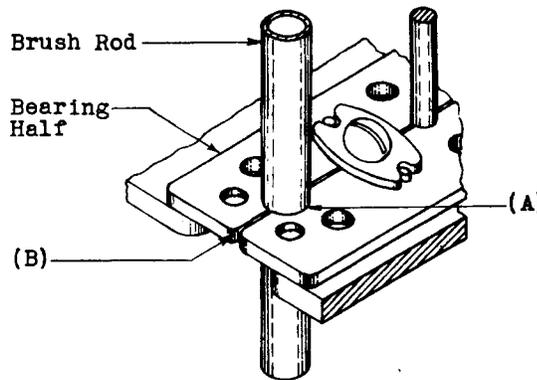


Fig. 3

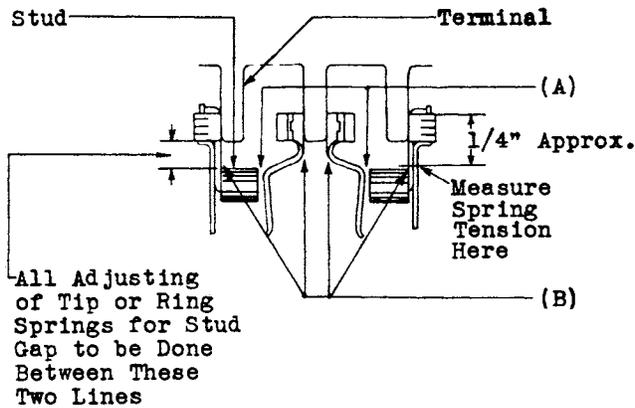


Fig. 4

or ring terminal, the clearance between either the tip or ring spring and its associated terminal shall be
 Min. $1/64$ "
 Gauge by eye.

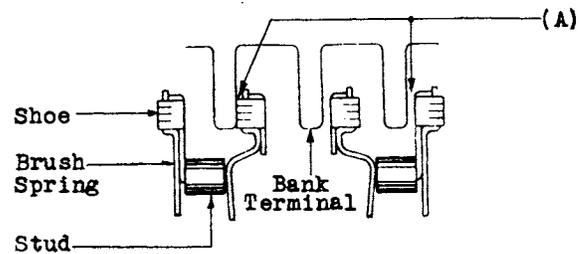


Fig. 6

2.08 Horizontal Centering of Multiple Brushes - Fig. 5 (A) - With the multiple brush in the reset position at the reference terminal of the bank, the clearance between the sleeve spring shoes and the tip and ring terminals shall be
 Min. $.010$ "
 Gauge by eye.

If one shoe touches its adjacent terminal, this requirement shall be considered as having been met if the minimum clearance can be obtained in the following manner. Move the springs of the brush to the left or right until the back of the other shoe touches its adjacent terminal. Then release the pressure slowly and allow the brush to assume its normal position.

2.09 Tip and Ring Spring Clearance - Fig. 6 (A) - With the brush in its reset position and with the rack resting on the pawl for any position of the bank, and with the brush held so that the back of the sleeve spring further from the tip or ring spring being tested is touching its adjacent tip

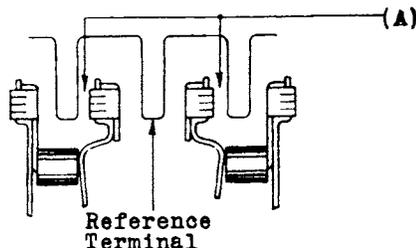


Fig. 5

2.10 Brush Spring Tension - Fig. 4 (B) - With the brush tripped and centered on the reference terminal of the bank, the tension of each spring shall be:

Test	- Min. 25 grams,
	Max. 50 grams
Readjust	- Min. 30 grams,
	Max. 45 grams

Use the No. 6B-B gauge.

2.11 Brush Intrusion - Fig. 7 (A) - When the brush is tripped on any terminal in the bank, the contacting surfaces of the springs shall project in from the end of the terminal not less than half and not more than the full width of the shoe. This requirement may be checked at the top, bottom and middle of the bank. It will be satisfactory if this requirement is slightly exceeded at the top or bottom of the bank in isolated cases, provided these cases are not due to any general misalignment of the bank. Gauge by eye.

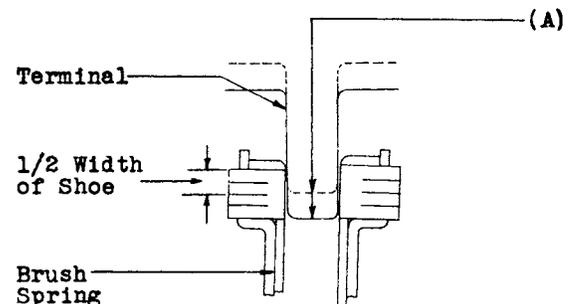


Fig. 7

2.12 Parallelism of Brush Springs - Fig. 8

(A) - When the brush is contacting with the reference terminal the deviation from parallel between the contacting surface of the spring and the contacting surface of the terminal shall be as small as possible. In any case this divergence from parallel, when the brush intrusion equals the full width of the shoe, shall be
 Max. .005"

If the brush intrusion is less than the full width of the shoe, the amount that the spring and terminal may be out of parallel is proportional to the amount of brush intrusion, being .0025" when the brush intrusion equals one half the width of the shoe. Gauge by eye.

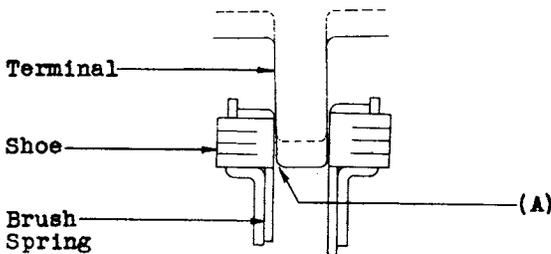


Fig. 8

2.13 Bridging Sleeve Spring Location

(a) Lower Spring With the brush rod raised so that the rack index number 49 shows just above the clutch sighting plate and with the weight of the brush rod assembly resting on the clutch pawl, the upward travel of the lower sleeve spring from the rest position to the point of break with the reference terminal shall be .075" ± .005".

(b) Higher Spring - Fig. 9 (A) - With the rack index number 52 showing just above the clutch sighting plate and with the weight of the brush rod assembly resting on the clutch pawl, the top edge "C" of the higher sleeve spring shall not be above the center line of terminal No. 53. Gauge by eye.

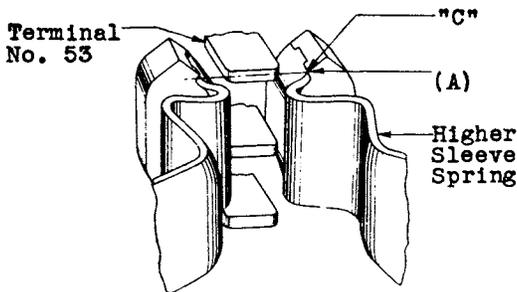


Fig. 9

2.14 Non-Bridging Sleeve Spring Location

(a) Nos. 11-B and 11-E Brushes - Fig. 10

(A) - With the weight of the brush rod assembly resting on the clutch pawl, the center line of the contact portion of the sleeve spring shall coincide with the center line of bank terminals 2, 49 (reference terminal) and 97 with the following tolerances.

Terminal	Rack Notch Number	Tolerances	
		Test	Readjust
2	2	± .015"	± .015"
49	49	± .010"	#coincides
97	97	± .015"	± .015"

Gauge by eye.

In cases where it is not possible to meet the readjust requirement both on the reference terminal and on terminals 2 and 97 it will be permissible to vary the adjustment on the reference terminal by not more than ± .010".

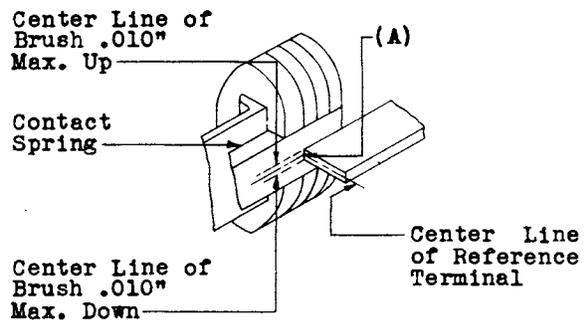


Fig. 10

(b) Nos. 11-C, 11-F, 11-G and D-85387 Brushes - Fig. 11 (A) - The requirements specified in (a) shall apply to both sleeve springs of these brushes.

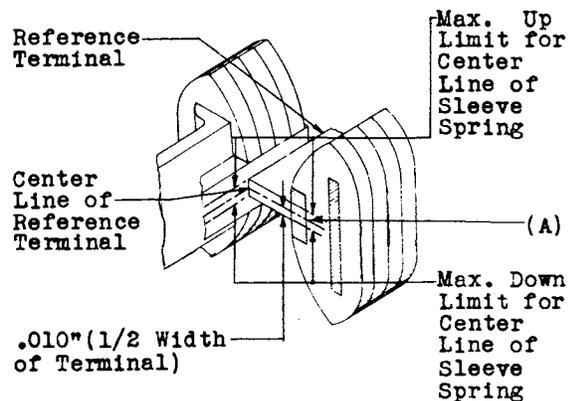


Fig. 11

2.15 Tip and Ring Spring Location - Fig. 12 (A)

(a) Test The upper edge of the contact portion of the spring shall not be below the upper edge of the terminal and the lower edge of the contact portion of the spring shall not be above the lower edge of the terminal when the weight of the brush rod assembly is resting on the clutch pawl for any position on the bank. Gauge by eye.

(b) Readjust With the pawl engaging the notch in the rack corresponding to the reference terminal and with the weight of the brush rod resting on the clutch pawl, the upper edge of the contact portion of the multiple brush spring shall be min. .015" (3/4 thickness of terminal) above the top edge of the reference terminal and the lower edge of the contact portion of the multiple brush spring shall be min. .015" below the bottom edge of the reference terminal. Gauge by eye.

2.16 Point of Contact Between Trip Armature Extension and Rotating Lever With the trip magnet armature in its normal position the point of engagement between the rounded surface of the tip of the trip armature extension and the rotating lever shall be

(a) Early Type (One Piece) Rotating Lever - Fig. 13 (A) - Inside the rounded corner at the front edge of the rotating lever. Gauge by eye.

(b) Later Type (Two Piece) Rotating Lever - Fig. 14 (A)
Test Inside the corner at the front edge of the rotating lever.
Readjust Min. 1/32" from the corner at the front edge of the rotating lever. Gauge by eye.

2.17 Clearance Between Rotating Lever and Top Clutch Locating Plate - Fig. 13(B) and Fig. 14 (B) - This clearance shall be Min. .020" Gauge by eye.

2.18 Vertical Location of Trip Armature Extension With Respect to Rotating Lever
 The tip of the trip armature extension shall not

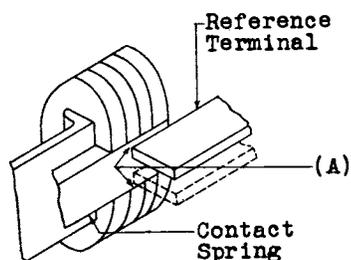


Fig. 12

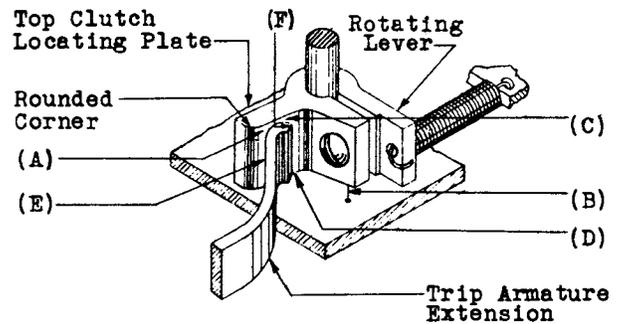


Fig. 13

(a) Fig. 13 (C) and Fig. 14 (C) - Project above the contacting surface of the rotating lever. Gauge by eye.

(b) Fig. 13 (D) - Project below the contacting surface of the one piece rotating lever. Gauge by eye.

(c) Fig. 14 (D) - Come in contact with the top surface of the horizontal section of the two piece rotating lever directly below it in any position of rotation of the rotating lever. Gauge by eye.

2.19 Parallelism of Contact Between Trip Armature Extension and Rotating Lever
 Fig. 13 (E) and Fig. 14 (E) - The deviation from parallel between the trip armature extension and the rotating lever surfaces where they come in contact with each other shall be

Max. .005"
 for the full width of the trip armature extension. Gauge by eye.

2.20 Location of Sharp Edge of Trip Armature Extension - Fig. 13 (F) and Fig. 14 (F)
 With the trip armature in its fully operated position, the sharp edge at the end of the rounded portion of the trip armature extension shall not come into contact with the rotating lever. Gauge by eye.

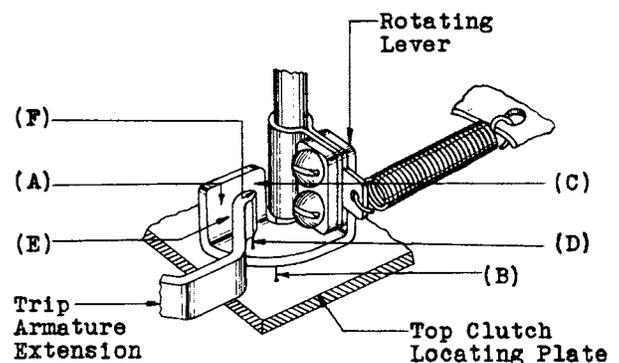


Fig. 14

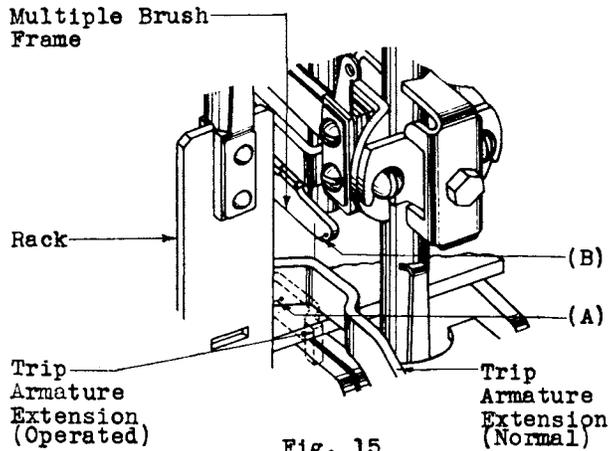


Fig. 15

2.21 Clearance Between Trip Armature Extension and Rack - Fig. 15 (A) - With the trip armature fully operated there shall be a reliable (min. 1/64") clearance between the trip armature extension and the rack for all positions of the rack. Gauge by eye.

2.22 Clearance Between Trip Armature Extension and Adjacent Multiple Brush Frames

(a) Fig. 15 (B) - With the trip armature in the normal position, the trip armature extension shall clear the frame of the multiple brush to the right of it. Gauge by eye.

(b) With the trip magnet fully operated, the trip armature extension shall clear the frame of the multiple brush directly above it. Gauge by eye.

2.23 Clearance Between End of Trip Finger and Sleeve Springs - Fig. 16 (A) - With the multiple brush in the normal (reset) position and with the trip finger in either the operated or the non-operated position, this clearance shall be

Min. 1/16".

Use the No. 89 gauge.

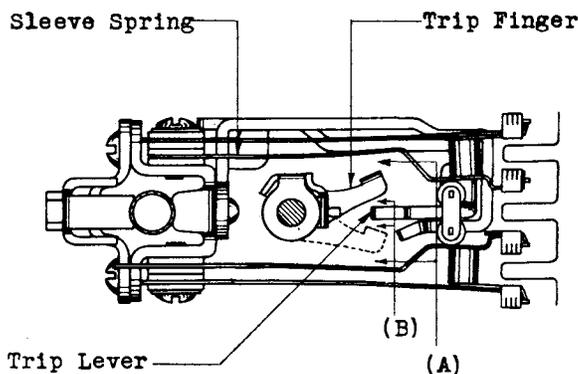


Fig. 16

2.24 Horizontal Clearance Between Trip Finger and Trip Lever - Fig. 16 (B) - With the trip finger in the operated or the non-operated position and with the brush in the normal (reset) position, the clearance between the trip finger and the associated multiple brush trip lever shall be

Min. 1/64"

Use the No. 89 gauge.

2.25 Trip Finger Return to Normal - Fig. 17 (A) - Trip fingers shall not be sluggish when allowed to return very slowly from the trip position to the normal position. Gauge by feel and by eye.

2.26 Freedom of Movement of Trip Rod There shall be no tendency for the trip rod to fail to operate or be sluggish in operation or in returning to its normal position when the trip magnet armature is slowly operated manually and slowly released. Gauge by eye and by feel.

2.27 Vertical Clearance Between Bottom of Horizontal Flange of Trip Finger and Trip Lever - Fig. 17 (B) - With the trip finger engaging the trip lever and with the trip rod down against the top channel of the friction roll drive, this clearance shall be:

Test - Min. 1/64",
Max. 5/64"

Readjust - Min. 1/64",
Max. 1/16"

Use the No. 89 gauge and gauge by eye.

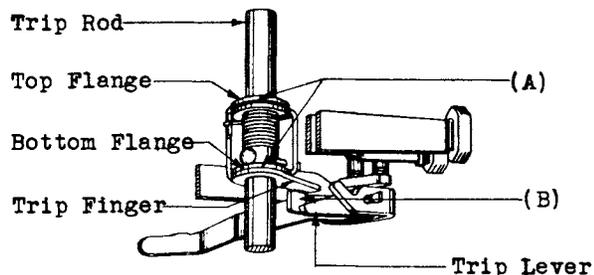


Fig. 17

2.28 Down Stop Collar Location

(a) Location of Down Stop Collars with Respect to Bearings The down stop collars shall rest upon the brush rod bearings when the brush rod is in the normal or lowest position.

(1) In the case of early type collars, Fig. 18 (A) - only one collar need rest on the brush rod bearing in the normal position but the clearance between the other collar and the bearing shall be:

Test - Max. .006"

Readjust - Max. .005"

Gauge by eye.

2.28 (Continued)

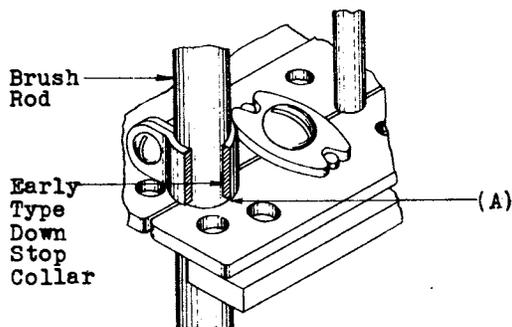


Fig. 18

(b) Multiple Brush Reset - Fig. 19 (A) -

When the brush rod is lowered under power, any tripped brush shall reset with a snap with a

Test - .010" (No. 85-B gauge)

Readjust - .020" (No. 85-C gauge)
placed below the nearest down stop collar.

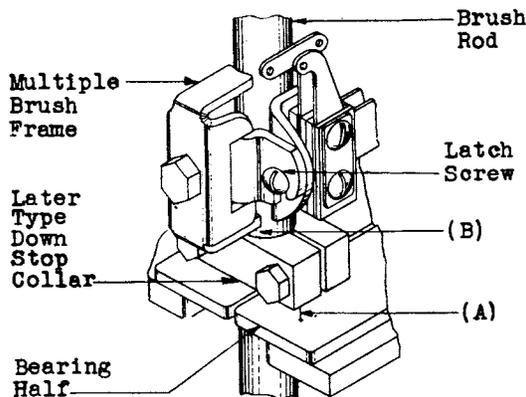


Fig. 19

(c) Down Stop Collar and Multiple Brush Frame Clearance This clearance shall be:(1) For early type collars

Test - Min. .004"

Readjust - Min. 1/64"
Max. 3/64"

(2) For later type collars - Fig. 19(B)

Test - Min. 1/64"

Readjust - Min. 1/16"
Max. 1/8"

Gauge by eye.

(d) "Y" Commutator Brush Spring Clearance

Fig. 20 (A) - With the brush rod in its normal (down) position, there shall be a clearance between the lower edge of the contact portion of each "Y" commutator brush spring and the top edge of the reference hole in the corresponding "Y" segment of

Test - Min. .015"

Readjust - Min. .020"

Gauge by eye.

(1) At time of turnover this clearance shall be checked with all brush rods in the normal (down) position.

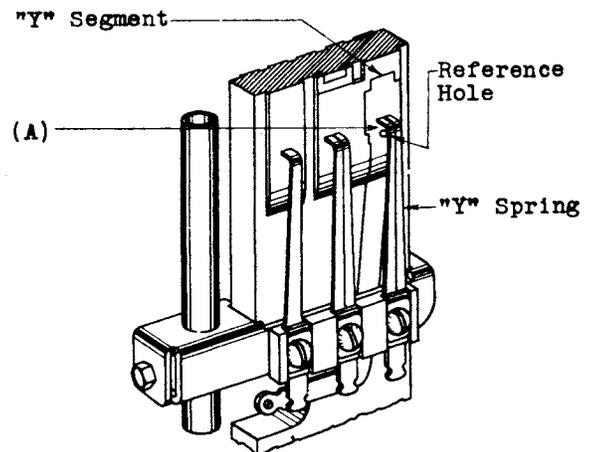


Fig. 20

(e) Clearance Between Each Multiple Brush Frame and Cross Member - Fig. 21 (A)

With the brush rod in its normal (down) position this clearance shall be:

Test - Perceptible (Min. .005")

Readjust - Min. 1/64"

Gauge by eye.

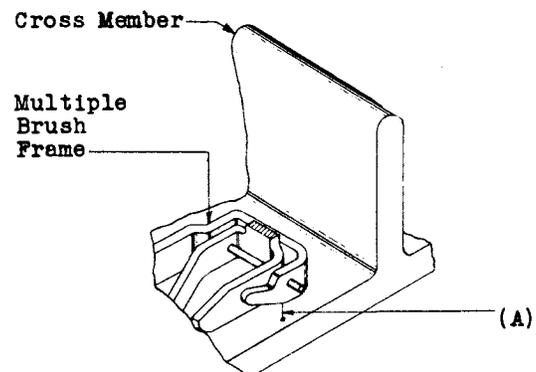


Fig. 21

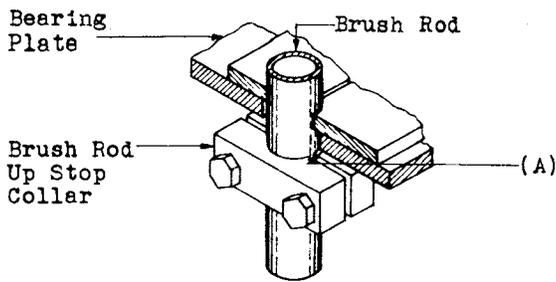


Fig. 22

2.29 Clearance Between Brush Rod Up Stop Collars and Bottom of Bearing Plate -
 Fig. 22 (A) - With the weight of the brush rod assembly resting on the clutch pawl and with the rack index number "101" showing just above the clutch sighting plate, this clearance shall be
 Min. $1/32''$
 Max. $1/16''$
 Gauge by eye.

2.30 Clearance Between Trip Rod Stop Collar and Bottom of Bearing Plate -
 Fig. 23 (A) - This clearance shall be
 Test - Min. $.008''$, Max. $.025''$
 Readjust - Min. $.010''$, Max. $.020''$
 Gauge by eye.

2.31 Clearance Between Multiple Brush Frame and Bank Terminals - Fig. 24 (A) - With the rack index numbers 10 and 40 respectively, showing just above the clutch sighting plate and with the rack resting on the clutch pawl, this clearance on No. 0 banks shall be
 Min. $1/32''$
 On old type frames only which do not have a bearing plate above the No. 4 bank, this clearance shall also be met at the top terminal of the No. 4 bank when the brush rod is raised so that the rack index number 99 shows just above the clutch sighting plate and the rack rests upon the clutch pawl.
 Gauge by eye.

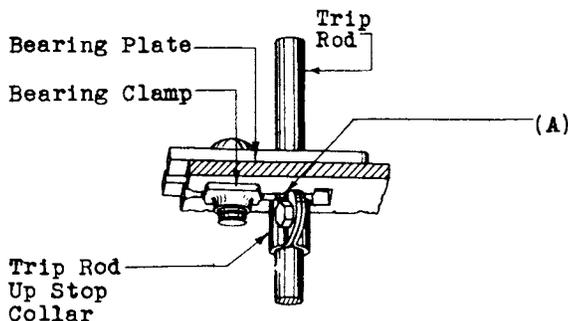


Fig. 23

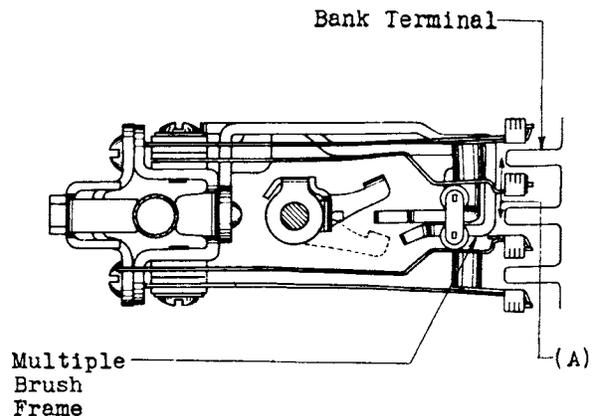


Fig. 24

2.32 Smooth Brush Travel With the brush tripped and as the selector travels up and down in normal operation, each brush shall meet the following condition:
 (a) It shall run smoothly over the bank terminals without chattering.
 (b) It shall not snag against the bank terminals.
 (c) It shall not ride off the bank terminals.

2.33 Location of No. 8-A Indicator on Final Frames With the rack index number 49 showing just above the clutch sighting plate and with the rack resting on the pawl, the indicator pointer shall line up within $\pm 1/64''$ of the mark on the indicator strip between Nos. 48 and 50. Gauge by eye.

REASONS FOR ISSUE - CHANGES IN REQUIREMENTS

1. To change the requirement covering 1-A Guide Location (2.04). (Previously covered by addendum to Section A446.006 (X-70263-01, Issue 2-B)).
2. To change the maximum test limit of the requirement covering brush spring tension (2.10). (Information for W.E.Co. covered by CO-127405).
3. To change the requirement covering Non-bridging Sleeve Spring Location (2.14). (Previously covered by Addendum to Section A446.006 (X-70263-01, Issue 2-B)).
4. To change the requirement covering Tip and Ring Spring Location (2.15). (Previously covered by Addendum to Section A446.006 (X-70263-01, Issue 2-B)).
5. To add a requirement covering the point of contact between the trip armature extension and the two piece rotating lever. (2.16).
6. To add a requirement covering the vertical location of the Trip Armature extension with respect to the two piece rotating lever. (2.18).
7. To change the requirement covering Down Stop Collar Location. (2.28).

3. ADJUSTING PROCEDURES3.001 List of Tools, Gauges, Materials and Test Apparatus

<u>Code No.</u>	<u>Description</u>
<u>Tools</u>	
38-B	Lamp Socket With 802 Cord
206	Screw-driver - 30 Degree Offset
207	Screw-driver - 90 Degree Offset
220	Wrench 3/16" Hex. Socket
325-B (or the replaced 325)	Adjuster
326-B (or the replaced 326)	Adjuster
327	Adjuster
328	1-A Guide Adjuster
329	1-A Guide Holder
331	Spring Adjuster
376-A	Dental Mirror
380-A	Brush Spring Adjuster
396-A	Rack Locator
KS-2631	Screw-driver - 4-1/2"
KS-2632	Reading Glass
KS-6320	Orange Stick
KS-6854	Screw-driver - 3-1/2"
-	Bell System Cabinet Screw-driver - 3-1/2" per A.T.&T.Co. Drawing 46-X-40
-	Bell System Cabinet Screw-driver - 6-1/2" 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
-	No. 4 Artist's Sable Rigger Brush
<u>Gauges</u>	
68-B (or the replaced 68)	70-0-70 Gram Gauge
80-B (or the replaced 80)	.010"- .020"- .030" and .015"- .035" Double End Thickness Gauge
85-B	.010" Thickness Gauge
85-C	.020" Thickness Gauge

<u>Code No.</u>	<u>Description</u>
86	.005" and .008" Double-end Right Angle Offset Thickness Gauge
89	1/16" and 1/64" Round Thickness Gauge
<u>Materials</u>	
D-89026	Cloth
KS-2423	Cloth
KS-6815	C.P. Carbon Tetrachloride
-	Western Electric Lubricating Compound No. 3
-	Wedge
<u>Test Apparatus</u>	
E-1 (2 Required)	Lamps
13 (2 Required)	Lamp Sockets
357 (2 Required)	Tool (Spring Contact Clip)
365	Tool (Suspender Clip)
893	Cord (Equipped with No. 360 Tool at Both Ends)
-	Dry Cells (4 Required)

3.002 Use of Reading Glass and Dental Mirror The KS-2632 reading glass and the 376-A dental mirror may be used in connection with the visual inspection specified in Part 2 - Requirements and the corresponding adjusting procedures.

3.003 Make-Busy Information Before making any of the inspections or readjustments covered in this section, make the associated selector circuit busy in the approved manner.

3.004 Location of Tip and Ring Springs Selector multiple brushes on standard coded banks and the front side of "D" specification banks have their tip springs on the left-hand side of the brush assembly. Brushes used on the rear of "D" specification banks have their tip springs on the right-hand side and their ring springs on the left-hand side of the brush assembly.

3.01 Lubrication (Rq.2.01)

M-1 Lubrication of Trip Rod Rotating Levers and Trip Armature Extensions
Raise the brush rod associated with the trip rod rotating lever to be lubricated so that it is in position

3.01 (Continued)

to trip the lowest brush on the selector.

M-2 Operate the trip rod manually so as to open up a space between the rotating lever and the trip armature extension. Dip the No. 4 artist's sable rigger brush into Western Electric Lubricating Compound No. 3, removing the excess lubricant from the brush before withdrawing it from the container, and apply it to the trip rod rotating lever and the trip armature extension as shown in Fig. 25.

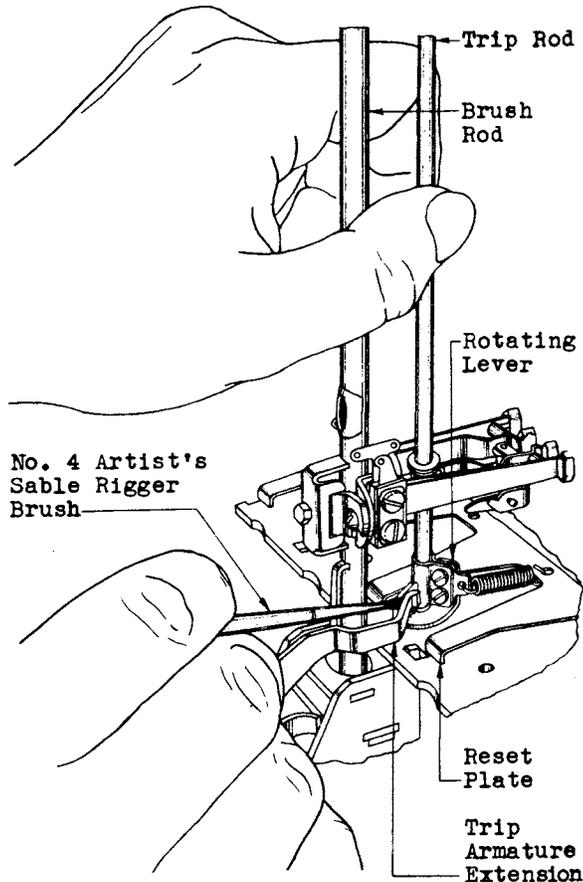


Fig. 25 - Method of Lubricating Trip Rod Rotating Levers and Trip Armature Extensions

M-3 Take care that the lubricant does not get on the racks or cork rolls of the drive. After applying the lubricant it is advisable, if service conditions permit, to allow the parts lubricated to remain idle for approximately 15 minutes to permit the carbon tetrachloride to evaporate.

M-4 Lubrication of Reset Levers, and Reset or Bearing Plates If the reset lever, or the reset or bearing plate with

which it comes in contact shows signs of wear or if the reset lever snags against the reset or bearing plate as the multiple brush restores to its normal position, apply Western Electric Lubricating Compound No. 3 to the surface of the reset or bearing plate where the reset lever comes in contact with it and 1/2" of the under surface of the reset lever at the end of the lever where it comes in contact with the reset or bearing plate as follows:

M-5 Dip the No. 4 artist's sable rigger brush into the container holding the lubricant and making sure to remove the excess lubricant from the brush before withdrawing the brush from the container, apply the lubricant to the surfaces referred to in M-4. After applying the lubricant it is advisable, if service conditions permit, to keep the reset lever from rubbing on the reset plate for 15 minutes to allow the carbon tetrachloride to evaporate.

M-6 If necessary, clean the surfaces referred to in M-4 with a dry KS-2423 cloth. If it is found that due to the presence of a gummy or sticky deposit the surfaces cannot be cleaned with a dry cloth, the cloth may be saturated with C.P. carbon tetrachloride. If it is found necessary to use C.P. carbon tetrachloride for cleaning purposes, do not apply the lubricant until the cleaning fluid has evaporated.

3.02 Rack Tongue Position (Rq.2.02)

M-1 If the rack tongue does not assume its correct position in the brush rod, it is either distorted or the brush rod is twisted. If the rack tongue is distorted, straighten it with a pair of long-nose pliers. If the brush rod is twisted, loosen the multiple brushes and the commutator brush with the No. 220 wrench and turn the rod to its correct position; then relocate the multiple and commutator brushes in accordance with the requirements for this apparatus specified herein or in the section covering panel selector commutators and commutator brushes.

3.03 Rack Coupling Pin Engagement (Rq.2.03)

M-1 With the brush rod coupled to the rack, raise the rod away from the rack as far as permitted by the play of the rack tongue in its slot, and notice that the rod, when released, drops back against the shoulder of the rack or the rack bearing washer due to its own weight. When checking for this requirement, make sure that no multiple brush is tripped.

M-2 If the rod appears to bind on the rack coupling pin; that is, if the rod does not return to the shoulder of the rack or the rack bearing washer when

3.03 (Continued)

raised and released as specified in M-1 above, first make certain that this is not caused by a binding or bowed brush rod. (See procedure 3.05). If the brush rod is not binding or bowed uncouple the rack and examine the coupling pin to see that it is not bent; also see that there are no short bends in the lower end of the brush rod. Check to see that there are no burrs or dirt in the hole in the brush rod, and that the hole is large enough to permit the rack coupling pin to enter freely.

M-3 If the brush rod is worn at the bottom so that it does not twist freely on the rack shoulder, it will be necessary to recondition the brush rod as covered in the section covering piece part data and replacement procedures for panel selector elevator apparatus.

3.04 No. 1-A Guide Location (Rq.2.04)

M-1 To adjust a brush rod guide which binds against the trip rod in the ascent or descent of the brush rod, bend the guide with a No. 328 adjuster, placing the No. 329 holder with its slot down over the back end of the guide and over the rod to secure it firmly as shown in Fig. 26.

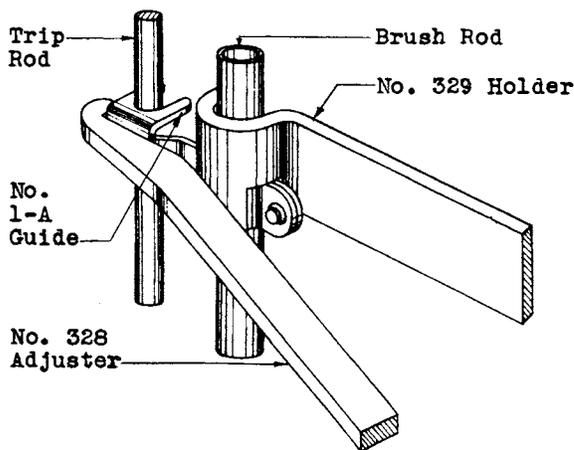


Fig. 26 - Method of Adjusting No. 1-A Guide

M-2 Should the trip rod appear bent so as to cause the guide to bind in only one or two points, straighten the trip rod at these points.

M-3 If it is found that the guide comes in contact with any of the bearing parts when at the topmost limit of its travel, loosen the clamping screws which hold it to the brush rod with the 6 1/2" cabinet screw-driver, and lower the guide assembly so that it clears the bearing parts. Tighten the clamping screws, making sure that requirements 2.04 (a) and (b) are met.

3.05 Freedom of Movement of Brush Rod (Rq.2.05)

3.06 Brush Rod Bearing Gap (Rq.2.06)

M-1 Check to see that there is no interference caused by the commutator brush local cable form coming in contact with a commutator or the form snagging on an adjacent brush frame.

M-2 Binding of the brush rod may be caused by dirt on the rod or mechanical adjustment. To clean the rod, use D-89026 cloth. Take the cloths out of the container from the center of a roll one at a time and as required. Fold the cloth crosswise to three thicknesses and then fold double. Use a fresh side of the cloth when necessary as determined by experience.

M-3 With the rod in the normal position, rub the cloth over it several times, taking care to keep on that portion of the rod at least 1" from the multiple brushes and the bearings. Repeat this operation for each section of the rod. Then rub the rod dry with a dry KS-2423 cloth, taking care to cover the accessible portions of the rod. This guards against oil being deposited on the brushes or on the bearings.

M-4 As soon as the cloths become dirty, place them in the metal container approved for discarded oily materials.

M-5 If the brush rod still fails to meet requirement 3.05 (Freedom of Movement of Brush Rod) proceed as follows.

M-6 To check the freedom of movement of the brush rod, first raise the brush rod to its highest position, that is, with an up stop collar touching the under side of its associated bearing locating plate, and trip one multiple brush. Exercise care when raising a brush rod which has a tendency to bind. Do not force the rod upward, but first check to see that the bind is not caused by a multiple brush being tripped below its normal tripping position. If all the brushes are reset and still the brush rod binds, correct as covered in the following methods. Failure to observe this warning may result in either bending the

3.05-3.06 (Continued)

trip finger out of alignment or bending or breaking the hard rubber roller on the trip lever assembly. It may also result in injury to the brush rod.

M-7 Hold back the pawl of the associated clutch with a KS-6320 orange stick and at the same time place a finger under the frame of the lowest multiple brush below the mounting screw so as to support the brush rod in its descent.

M-8 Lower the brush rod slowly and evenly. See that the brush rod follows the movement of the finger without sticking or binding during its entire travel; that is, until the reset lever of a tripped brush touches the associated reset or bearing plate. It is not necessary that the tripped brush be reset by the combined weight of the rod and rack alone. (See Requirement 2.28 (b), for brush reset requirement.)

M-9 If a bind sufficient to prevent the brush rod from meeting this requirement occurs at or near the top of the brush rod travel, the cause may be a misaligned clutch, or a binding No. 1-A guide, or both. To determine the true cause, uncouple the rack and raise the brush rod as high as it will go. If the bind is still present, it may be caused by the No. 1-A guide, in which case inspect it, and if it is found to be out of adjustment correct as specified in procedure 3.04. If the bind has been removed, it may have been caused by a misaligned clutch or a bowed brush rod. A visual check will generally serve to determine whether the clutch or the rod is at fault.

M-10 If the clutch appears to be out of alignment, refer to the section covering the particular type of clutch involved. If it is found necessary to realign the clutch, do so, and then recheck the commutator brush and all the multiple brushes on the rod for height, and recheck the brushes on the No. 0 and No. 1 banks for horizontal centering, as the adjustment for alignment will have changed the position of the clutch. Also recheck the requirements covering the horizontal location of the trip finger and those covering the location of the trip armature extension with respect to the rotating lever.

M-11 If the brush rod binds only in spots throughout its travel, the binding may be caused by interference between the bearings, and bumps or spots of paint or shellac on the brush rod. Stop the rod on one of the binding spots and check each bearing, in turn, for play in a straight front to rear direction by grasping the rod in the fingers directly below the bearing and moving it backwards and forwards

and then from side to side. If the bearing does not show a perceptible play, examine the rod carefully to determine the cause of the bind. Spots of paint or shellac may be removed by scraping the rod with the side of a screw-driver blade taking care not to nick the rod. If the bind is still present see that the bearings meet requirement 2.06 (Brush Rod Bearing Gap).

M-12 Before separating the halves of a bearing, make sure that the bind is not caused by misalignment of the bearing halves. To check for it, move the rod first from side to side and then from front to rear. Such misalignment is generally due to the front and rear displacement of one-half of the bearing with respect to the other half. Correct by lightly tapping the bearing halves with the screw-driver handle.

M-13 Close bearings open more than the permissible amount by tapping the bearing half into the correct position with the 3-1/2" cabinet screw-driver. Always dress the bearing halves to the left and to the rear. Do not pry against the adjacent bearing. A lamp held just below the bearing locating plate will be found of considerable help in checking for open bearings.

M-14 What may seem to be a uniform bind throughout the travel of the brush rod is probably caused by excessive multiple brush or commutator brush spring tension. Check the tensions of the multiple brush springs and the commutator brush springs and where they are found to be excessive or close to the maximum requirements reduce them slightly. Try to apportion the adjustment so as to set each spring approximately at its mean requirements rather than to reduce any one spring to its minimum requirements. Refer to procedure 3.10 and to the section covering panel selector commutators and commutator brushes when it is necessary to make the above check or adjustment.

M-15 Such binds as are caused by kinks and bends in the brush rod will also be noticed as occurring only in certain spots during the travel of the rod. If there is front to rear play in every bearing, and if there is no bind due to heavy brush tension, interference with the No. 1-A guide or a misaligned clutch, examine the rod carefully to ascertain whether it is straight throughout its entire length. If kinks or bends are located, straighten the rod by grasping it in the fingers above and below the bent portion and bowing the rod in a direction to correct the bend. Be careful to leave the rod straight and not to produce any kinks in it. After straightening the rod check for requirement 3.08, (Horizontal Centering of Multiple Brushes),

3.05-3.06 (Continued)

3.11 (Brush Intrusion), 3.13 (Bridging Sleeve Spring Location), 3.14 (Non-bridging Sleeve Spring Location), 3.15 (Tip and Ring Spring Location) and 3.31 (Clearance Between Multiple Brush Frames and Bank Terminals). If the fault cannot be discovered in any other way, remove one pair of bearings at a time and replace them. With a bearing removed in this manner, that part of the rod that is bowed will be plainly shown by its position with respect to the bearing supporting plate.

3.07 Brush Stud Gap (Rq.2.07)

M-1 The stud gap may be checked with the No. 86 gauge or visually by pushing the inner spring outward with the KS-6320 orange stick and noting the amount of travel of the inner spring before the outer spring starts to move.

M-2 Unless the sleeve springs are distorted, adjust the stud gap, adjusting the outside springs as shown in Fig. 27, using the No. 331 adjuster. Use extreme care in making the necessary corrections. Make an effort to restore the spring to its correct condition as shown in Fig. 4.

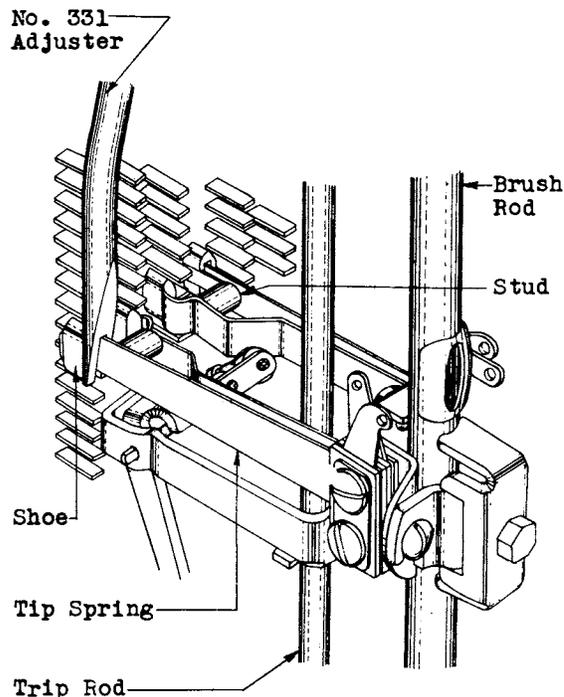


Fig. 27 - Method of Adjusting for Brush Rod Stud Gap

3.08 Horizontal Centering of Multiple Brushes (Rq.2.08)

M-1 If there is no clearance between the back of one sleeve shoe and a tip or ring terminal, and a large clearance between the back of the other sleeve shoe and its associated tip or ring terminal; this condition will usually be caused by the whole brush assembly being twisted sideways. To correct this, loosen the multiple brush clamping screw slightly with the No. 220 wrench and twist the brush assembly so that both sleeve springs will be approximately equidistant from the adjacent sleeve terminal. Then retighten the multiple brush clamping screw.

M-2 If it is found impossible to obtain the desired clearance by following M-1 and either or both of the sleeve spring shoes still make contact with the tip or ring terminals it will generally be found that the gap between the sleeve spring at fault and the adjacent tip or ring spring at the first bend of the sleeve spring will be much greater than the normal one. To correct this condition, apply the 380-A adjuster to the sleeve spring close to its base and push it toward the contact end of the spring while exerting a slight twisting pressure that will bow the spring outward. It may be necessary to repeat this operation to obtain the perceptible clearance.

3.09 Tip and Ring Spring Clearance (Rq.2.09)

M-1 To check for this clearance, raise the brush rod until the brush is in line with the reference terminal and press the brush first to the right and then to the left until the back of the sleeve spring touches the tip or ring terminal and observe the clearance between the tip and ring springs and their associated terminals. In checking on the reference terminal to insure a 1/64" clearance on any other terminal in the bank, make allowance for any lateral offset of the bank terminals.

M-2 To adjust for this clearance, examine the brush to see if it is in accordance with Fig. 28 for the purpose of determining what condition is responsible for this lack of clearance and the necessary means to be used in correcting it. Pay particular attention to the clearance between the sleeve springs and the outside springs at the point where the first bend occurs on a sleeve spring.

M-3 If the tip, ring or sleeve springs are not distorted but the stud gap is larger than required, reduce it toward the specified readjust limit covered in requirement 2.07, by bending the tip or ring spring using a No. 331 spring adjuster as shown in Fig. 27.

3.09 (Continued)

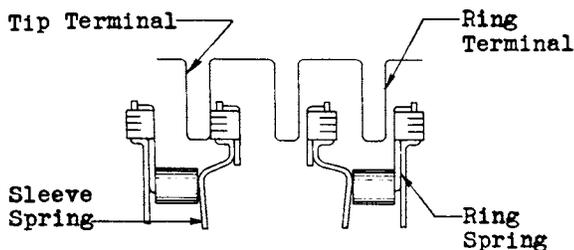


Fig. 28 - Showing That a Clearance Should Still Exist Between the Ring Spring and its Associated Terminal, When the Brush Springs Are Pressed to the Left Until the Back of the Sleeve Spring Makes Contact with the Tip Terminal.

M-4 After adjusting for this requirement, check and readjust if necessary, for brush stud gap, horizontal centering, parallel contact and other features that may have been disturbed.

3.10 Brush Spring Tension (Rq.2.10)

M-1 Readjust the spring tension with the No. 380-A adjuster close to the point where the spring leaves the assembly clamping plates and insulators. The No. 68-B gauge may be used in checking this tension as shown in Fig. 29.

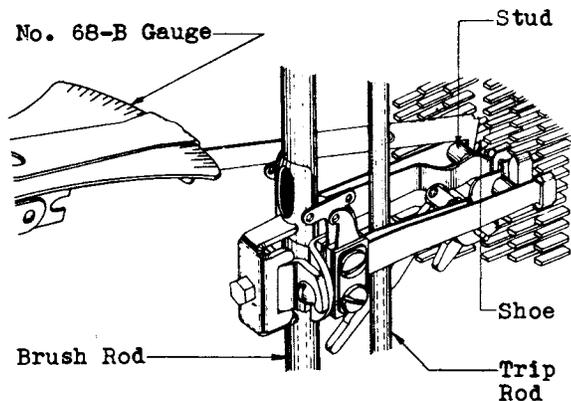


Fig. 29 - Method of Checking Brush Spring Tension Using No. 68-B Gauge

M-3 When making any adjustment of brush springs, exercise care not to reduce the clearance between the sleeve springs and the hard rubber rollers and also to prevent any distortion or kinking of the springs, thereby affecting

their relation with the corresponding terminals. Note that with the multiple brush tripped the hard rubber rollers do not touch the sleeve springs.

3.11 Brush Intrusion (Rq.2.11)

M-1 If failure to meet the brush intrusion requirement is common to several adjacent brushes on one bank, it is an indication that the bank is out of alignment. Where the cases of failure are isolated, make a check to see whether or not the brush rod is bent in or out and if so, straighten the brush rod. If, however, the brush rod is straight and this condition exists, do not bend the brush rod to correct it. It is sometimes possible to correct the above conditions by moving the brush rod bearings. Since the multiple brush itself is not involved in this adjustment, do not readjust it to meet this requirement. If, however, any of the adjustments covered above are made, check the multiple brushes for requirements 2.08 (Horizontal Centering of Multiple Brushes), 2.09 (Tip and Ring Spring Clearance), 2.10 (Brush Spring Tension), 2.13 (Bridging Sleeve Spring Location), 2.14 (Non-Bridging Sleeve Spring Location), 2.15 (Tip and Ring Spring Location) and 2.31 (Clearance Between Multiple Brush Frames and Bank Terminals). It is satisfactory if in isolated cases a brush only approximately meets the requirement at the top or bottom of the bank provided it meets it at the reference terminal and provided a check is made with other brushes to insure that the failure to meet the requirement is not due to misalignment of the bank.

3.12 Parallelism of Brush Springs (Rq.2.12)

M-1 To aid in determining whether or not the contacting surfaces of the multiple brush springs are parallel to the contact surfaces of the bank terminals, use the No. 38-B lamp or a regular 110 volt extension lamp. Hold the lamp so that the light shines upward from beneath the terminal. By looking down on the terminal, the amount that the brush spring may be out of parallel with the terminal can be easily discerned.

M-2 To bring the brush springs within the limits specified for parallelism adjust them at a point in front of the rubber studs with the No. 331 adjuster. Correct any distorted spring at this time.

3.13 Bridging Sleeve Spring Location (Rq.2.13)

M-1 If this requirement is not met, and the brush rod is coupled to a No. 1-A or No. 2-A rack, first ascertain that the brush rod is not worn excessively at the bottom where it rests on the shoulder of the rack. If necessary, recondition the lower end of the brush rod as covered

3.13 (Continued)

in the section covering piece part data and replacement procedures for panel selector elevator apparatus.

M-2 To adjust for the bridging sleeve spring location make busy the circuit associated with the brush rod on which the brush to be adjusted is mounted as well as the circuits associated with those brush rods immediately adjacent to it.

M-3 Raise the brush rod until the multiple brush under test is approximately two-thirds of the way up the bank, and make sure that the weight of the brush rod assembly rests on the clutch pawl.

M-4 With the brush in this position, make sure that the contacting surface of either sleeve spring is not tilted from the vertical plane of the contacting portion of the bank terminal enough to interfere with the proper bridging of the brush springs. A tilted brush spring is shown in Fig. 30. If any springs are found tilted away from the terminals in this manner, straighten them with the 380-A adjuster, and then recheck them for requirement 2.12 (Parallelism of Brush Springs).

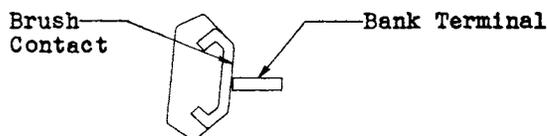


Fig. 30 - Tilted Brush Condition

Lower Sleeve Spring

M-5 Insert the spring of the No. 396-A tool into the rack notch corresponding to rack index number 45. With the tool in the position shown in Fig. 31, exert a slight downward pressure on the horizontal arm to snap the stud into its associated notch. Lower the brush rod until the shoulder of the tool rests tightly down against the clutch pawl.

M-6 If the adjustment is to be made on an individual brush only, raise a brush rod adjacent to the one being worked on, so that the rack index number 49 shows just above the clutch sighting plate. If the adjustment is to be applied on a number of brush rods, or if it is more convenient, make the circuit busy and raise an end selector to this position instead of raising the one adjacent to the selector containing the brush under test.

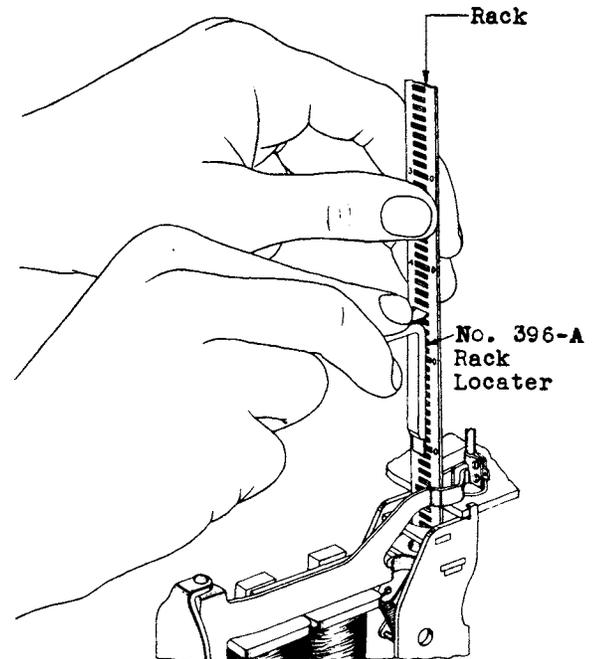
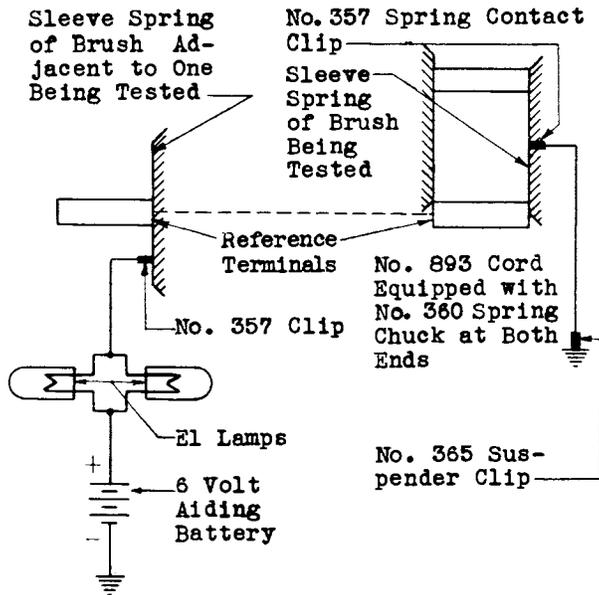


Fig. 31 - Method of Inserting the No. 396-A Rack Locator into the Rack

M-7 With the rod raised to the position referred to in M-5, trip the brush associated with the same bank as the brush under test. In accordance with the wiring of the testing circuit as shown in Fig. 32, connect the negative side of the test battery to ground and connect the No. 357 clip to the sleeve spring of the brush just tripped. This is done for the purpose of making the reference terminal busy to any hunting selector. If the lamps light, it is an indication that the reference terminal is busy. Break the circuit by removing the clip and test the terminal from time to time until the terminal is idle. Then securely attach the No. 357 clip. If the reference terminal is permanently made busy, it will be necessary first to attach the No. 357 clip to the sleeve spring and then remove the strap wire from the terminal at the distributing frame which is associated with the reference terminal. Connect the end of the No. 893 cord equipped with the No. 365 tool to ground and with the No. 357 tool connect the other end of the cord to the sleeve spring of one of the other brushes on the same rod as the one being adjusted. If the brush being adjusted makes contact with the reference terminal, the lamps will light.

M-8 To determine whether or not the sleeve spring is set within the limits specified raise or depress the spring by means of the KS-6320 orange stick

3.13 (Continued)



This circuit when connected as shown, automatically makes the reference terminal busy

Fig. 32 - Lamp Circuit to be Used with the No. 396-A Rack Locator when Adjusting the Lower Bridging Sleeve Spring

approximately .005", depending on whether the lamps do or do not light, respectively. If the lamps go out when the spring is raised or light when the spring is depressed this distance, it is an indication that the spring is in adjustment. Fig. 33 shows how the spring may be raised in this manner. If the spring is found to be outside the limits specified as determined by the above test it will be necessary to adjust it as covered by the following methods.

M-9 Adjustment of No. 11-D Brush The No. 11-D brush is manufactured with the correct relation between the sleeve springs and the tip and ring springs to permit making the adjustment for the .075" contact travel without raising or lowering an individual spring in the spring assembly. Accordingly, if the brush is not in adjustment, loosen the multiple brush clamping screw with the No. 220 wrench sufficiently to permit the adjustment to be made. Tap the shank of the wrench up or down as required until the sleeve spring just makes or breaks contact with the reference terminal as indicated by the flickering of the test lamps, at the same time centering the brush as accurately as possible in its horizontal position. Due to the greater forward and backward movement permissible in the brush rods at the No. 0 and No. 4 banks, take care when adjusting

the brushes on these banks to hold the brush rod as near as possible to its normal vertical position in order not to affect the height of the brush setting. Do not tap the frame of the brush in making this adjustment as this will be likely to mar the finish or distort some part of the brush assembly.

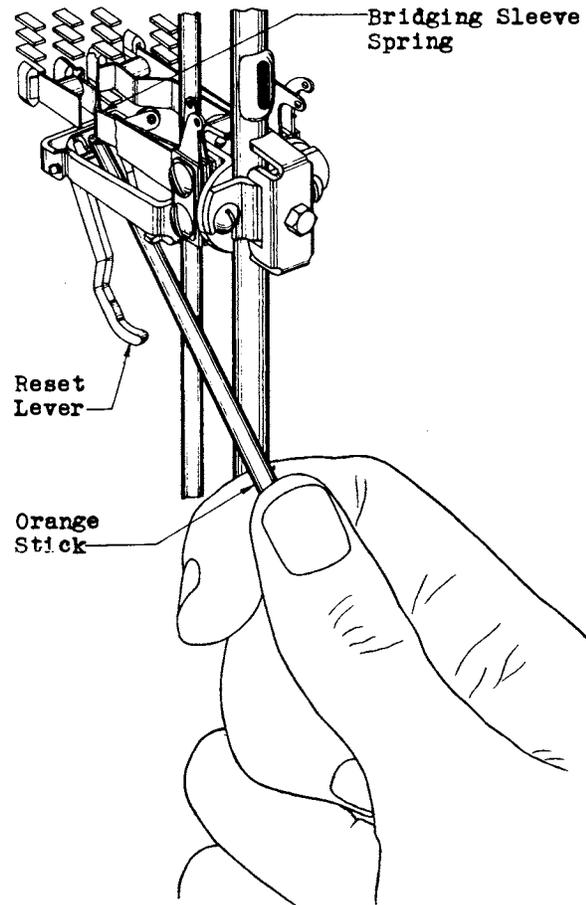


Fig. 33 - Method of Raising Bridging Sleeve Spring to Check Vertical Adjustment

M-10 Adjustment of No. 11-A Brush This brush has been replaced by the No. 11-D brush and the relation between its sleeve springs and the tip and ring springs makes it necessary in adjusting for the .075" contact travel to raise or lower sleeve spring as follows. Determine the lower sleeve spring by eye and loosen the lower screw associated with the spring assembly containing the spring, with the No. 206 or No. 207 screwdriver. Lower or raise the spring with the No. 380-A adjuster until it just makes or breaks contact with the terminal as shown by the flickering of the test lamp.

3.13 (Continued)

M-11 If the tip or ring spring associated with this assembly has been thrown out of adjustment by this operation, check it approximately at this time by noting that the top edge of the contact portion of the tip or ring spring lines up approximately with the bottom edge of the respective tip or ring terminal above the reference terminal. If the spring does not line up with the terminal in this manner, make it do so by adjusting it with the No. 380-A adjuster, taking care not to throw out the sleeve spring adjustment.

M-12 Tighten the spring assembly clamping screws.

M-13 Recheck the sleeve spring adjustment since the tightening of the screws may change the location of the springs slightly. If necessary, readjust as covered in M-8 for the No. 11-D brush.

Higher Sleeve Spring

M-14 Adjustment of No. 11-A and 11-D Brushes Raise the brush rod until the rack index number 52 shows just above the clutch sighting plate, making sure that the weight of the brush rod assembly rests on the clutch pawl. Check to see that the top edge "C" of the contacting portion of the higher sleeve spring does not extend above the centerline of terminal No. 53. If the top edge "C" of the contact portion of the higher sleeve spring extends above the center of the terminal, loosen the lower spring assembly clamping screw with the No. 206 or No. 207 screw-driver and lower the sleeve spring as required with the No. 380-A adjuster. Check the tip or ring spring associated with the assembly to see if it has been thrown out of adjustment by this operation. If it is, center it approximately on the No. 52 terminal using the method similar to that covered above.

M-15 Tighten the spring assembly clamping screws.

M-16 If it is found necessary to remove a strap wire to make the reference terminal idle solder this wire to the proper terminal before disconnecting the lamp circuit.

M-17 Remove the No. 396-A tool from the rack, disconnect the lamp circuit and lower to the normal position all brush rods which were raised in making this adjustment.

M-18 Remove the busy condition imposed on the selector circuits specified in M-2.

3.14 Non-Bridging Sleeve Spring Location
(Rq.2.14)

M-1 If this requirement is not met, and the brush rod is coupled to a No. 1-A or No. 2-A rack, first ascertain that the brush rod is not worn excessively at the bottom where it rests on the shoulder of the rack. If necessary, recondition the lower end of the brush rod as covered in the section covering piece part data and replacement procedures for panel selector elevator apparatus.

M-2 Raise the brush rod until the rack index number 49 shows just above the clutch sighting plate, making sure that the weight of the brush rod assembly rests on the clutch pawl.

M-3 Nos. 11-B and 11-E Brushes To locate the sleeve springs of these brushes in accordance with the requirement, loosen the multiple brush clamping screw with the No. 220 wrench and move the brush as a whole on the brush rod as covered in procedure 3.13, M-9, until the sleeve spring centers on the reference terminal.

M-4 After making sure that the tip and ring springs meet their requirements and that the brush is located as accurately as possible horizontally, tighten the multiple brush clamping screw. Where either the tip or the ring spring fails to meet the requirement, raise or lower the spring at fault by loosening the lower clamping screw of the spring assembly with the No. 206 or 207 screw-driver. Raise or lower the spring as required with the No. 380-A adjuster and tighten the clamping screw.

M-5 Then check that the requirement specified for terminals 2 and 97 is met. If the requirement is not met, it will be permissible to vary the adjustment on the reference terminal by not more than $\pm .010$ ". Recheck the tip and ring spring settings and tighten the multiple brush clamping screw. If the brush still fails to meet the requirement specified for terminals 2 and 97, it is an indication that the multiple bank terminal spacing is unsatisfactory. In this event, refer the matter to a supervisor for further action.

M-6 Nos. 11-C, 11-F, 11-G and D-85387 Brushes (Double Contact Sleeve Springs) To locate the sleeve springs of these brushes in accordance with the requirement, loosen the multiple brush clamping screw with the No. 220 wrench and raise or lower the brush as a whole as covered in procedure 3.13, M-9, until the sleeve springs center on the reference terminal.

M-7 If this method will not permit the brush to meet the requirement for both sleeve springs, locate the brush

3.14 (Continued)

on the rod so that one of the sleeve springs centers on the reference terminal. In selecting which sleeve spring, give consideration to the spring which will afford the best adjustment for the tip and ring springs. Raise or lower the other sleeve spring individually to bring it into the specified position, by loosening the lower clamping screw of the spring assembly with the No. 206 or 207 screw-driver and raising or lowering the sleeve spring as required with the No. 380-A adjuster.

M-8 Check the location of the tip or ring spring in this same assembly in accordance with the requirement for the location of tip and ring springs. If adjustments are required, shift the spring with the No. 380-A adjuster.

M-9 Retighten the assembly clamping screws and again recheck the location of the sleeve spring to see that it is in the required position on the reference terminal.

M-10 Check that the requirement specified for terminals 2 and 97 is met and if necessary readjust in accordance with M-5.

3.15 Tip and Ring Spring Location (Rq.2.15)

M-1 If this requirement is not met, and the brush rod is coupled to a No. 1-A or No. 2-A rack, first ascertain that the brush rod is not worn excessively at the bottom where it rests on the shoulder of the rack. If necessary, recondition the lower end of the brush rod as covered in the section covering piece part data and replacement procedures for panel selector elevator apparatus.

M-2 To check for this requirement see that the brush rod is in such a position that the rack index number 49 shows just above the clutch sighting plate with the weight of the brush rod assembly resting on the clutch pawl. Note the setting of the tip and ring springs. If the upper edge of the contact portion of the springs shows at least .015" (three-quarters thickness of terminal), above the upper edge of the terminal, and the lower edge of the contact portion of the spring shows at least .015" (three-quarters thickness of terminal) below the lower edge of the terminal, the adjustment may be assumed to be satisfactory for any terminal in the bank.

M-3 Before adjusting for this requirement, first determine that the sleeve springs have their correct setting. If this setting is incorrect, readjust the sleeve springs as covered in procedures 3.13 and 3.14. If, after this adjustment, it is found that the tip and ring springs fail to meet the limits specified in M-2, adjust the springs at fault as follows:

M-4 Loosen the lower assembly screw with the No. 206 or No. 207 screw-driver and raise or lower the spring with the No. 380-A adjuster until there is at least .015" contact metal of the spring showing above or below the reference terminal. Tighten the assembly screw if it has been loosened. After making this adjustment, check to see that requirement 2.15 (a) is met at other points on the bank. If the brush fails to meet this requirement it is probably due to a displacement of the bank terminals. In this event, refer the matter to a supervisor for further action. Check the adjustment of the sleeve spring in the same assembly and readjust it, if necessary.

- 3.16 Point of Contact Between Trip Armature Extension and Rotating Lever (Rq.2.16)
- 3.17 Clearance Between Rotating Lever and Top Clutch Locating Plate (Rq. 2.17)
- 3.18 Vertical Location of Trip Armature Extension with Respect to Rotating Lever (Rq.2.18)
- 3.19 Parallelism of Contact Between Trip Armature Extension and Rotating Lever (Rq.2.19)
- 3.20 Location of Sharp Edge of Trip Armature Extension (Rq.2.20)
- 3.21 Clearance Between Trip Armature Extension and Rack (Rq.2.21)
- 3.22 Clearance Between Trip Armature Extension and Adjacent Multiple Brush Frames (Rq.2.22)

M-1 In adjusting for requirements 3.16, 3.18, 3.19, 3.20, 3.21, and 3.22 bend the trip armature extension with the No. 325-B adjuster while holding it with the No. 326-B adjuster as outlined in 3.23, M-2, taking care that requirements 2.23 and 2.24 can still be met.

M-2 In adjusting to meet requirement 2.18, above, it may also be necessary to raise or lower the rotating lever. To do this, slightly loosen the clamping screws with the 3-1/2" cabinet screw-driver and shift the rotating lever up or down, making sure that requirement 2.17 can be met. Exercise care when shifting the rotating lever not to move it in a rotary direction about the trip rod, since this would affect the requirements governing the adjustment of the

3.16-3.22 (Continued)

trip fingers and the trip armature extension of the clutch. In resetting the rotating lever see that it is nearly horizontal with the retractile spring as possible.

M-3 See that the retractile spring has sufficient tension to restore the rotating lever firmly back to normal and check the operation of the retractile spring by manually operating and releasing the trip magnet armature.

3.23 Clearance Between End of Trip Finger and Sleeve Springs (Rq.2.23)

M-1 To check for this clearance, locate the brush rod so that the trip lever of the associated brush is just below the trip finger being checked. Operate the trip armature electrically when gauging the operated clearance. Make use of the No. 89 gauge in checking for this requirement.

M-2 To change the position and the angular travel of all the trip fingers on a trip rod to meet this requirement, one or a combination of the methods given in M-3 to M-6, inclusive, may be used.

M-3 Adjust the trip armature extension as shown in Figs. 34 and 35 so as to engage the rotating lever nearer to its center and thus increase the swing of the lever.

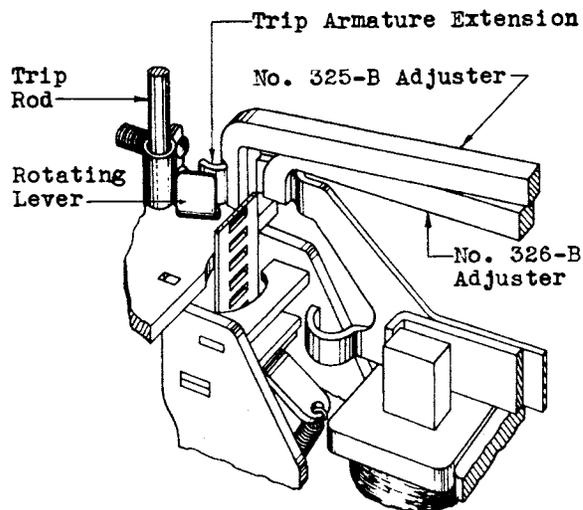


Fig. 34 - Method of Adjusting Trip Armature Extension

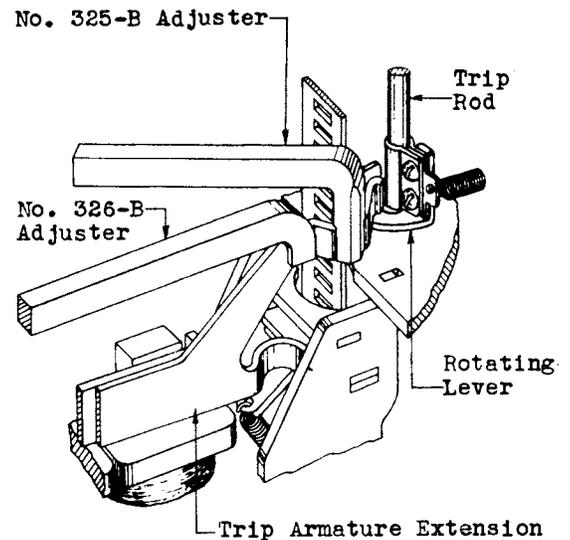


Fig. 35 - Method of Adjusting Trip Armature Extension

M-4 Adjust the trip armature extension directly over the semi-circular stop to change the position of the trip finger swing without changing the amount of swing as shown in Fig. 36. Use the No. 326-B adjuster for holding the trip magnet armature while adjusting it with a No. 325-B adjuster.

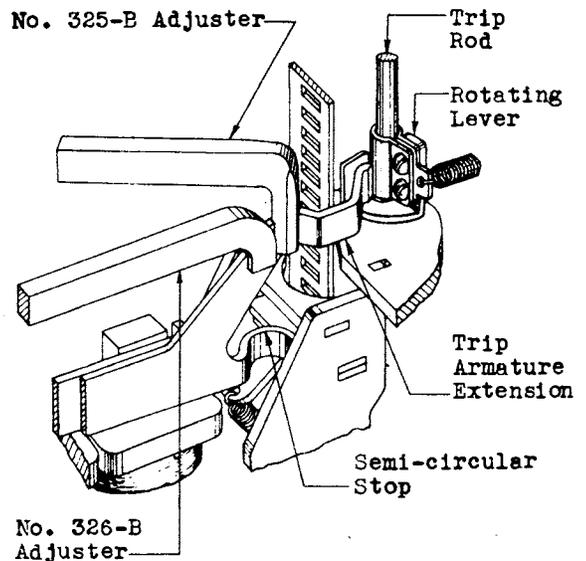


Fig. 36 - Method of Adjusting Trip Armature Extension

3.23 (Continued)

M-5 Adjust the semi-circular portion of the trip armature extension as necessary with long nose pliers as shown in Fig. 37, taking care not to adjust it to such an extent as to cause interference between the trip armature extension and the rack or the reset lever of the adjacent multiple brush.

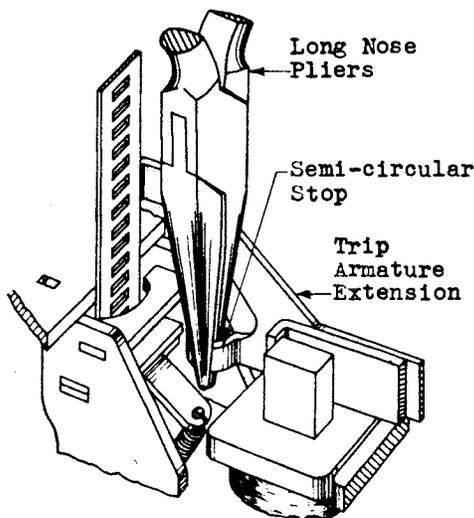


Fig. 37 - Method of Adjusting Semi-circular Stop of Trip Armature Extension

M-6 When the rotating lever is not located on the trip rod in a position to allow the proper swing of the trip lever, loosen the rotating lever clamping screw slightly with the 3-1/2" cabinet screw-driver and relocate the rotating lever on the trip rod. Tighten the clamping screw after relocating the rotating lever.

M-7 If the normal position of one trip finger is out with respect to the others, adjust the trip finger back stop. The back stop may be adjusted to the right by means of the blade of the 3-1/2" cabinet screw-driver placed between it and the trip rod as shown in Fig. 38. Adjust it forward with a pair of long nose pliers as shown in Fig. 39. Exercise care in making this adjustment to prevent injury to the trip finger.

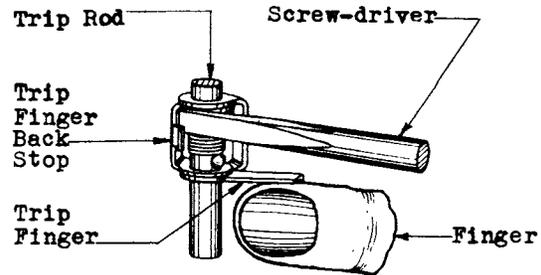


Fig. 38 - Method of Adjusting Trip Finger Back Stops

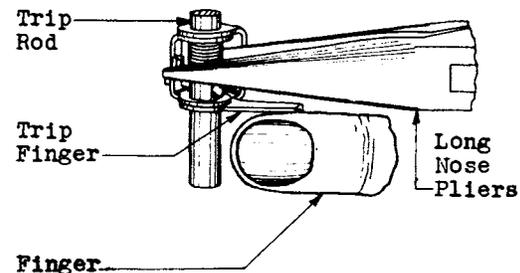


Fig. 39 - Method of Adjusting Trip Finger Back Stops

3.24 Horizontal Clearance Between Trip Finger and Trip Lever (Rq.2.24)

M-1 With the trip rod in its normal position raise the brush rod until the brush is in the position in which the trip lever of the associated brush would be engaged by the trip finger if the trip finger were operated. Then note the clearance between the trip finger in its normal position and the trip lever of the brush. Gauge the gap with a No. 89 gauge.

M-2 Next lower the brush rod sufficiently to permit the trip rod to be fully operated and then raise the brush rod to the position referred to in M-1 and again note the clearance between the trip finger and the brush trip lever.

M-3 If readjustment is necessary and the trouble is found to exist on all of the trip fingers of the trip rod, change

3.24 (Continued)

the position or the angular travel of all the trip fingers as outlined in 3.23, M-2, taking care to see that the requirement covering the clearance between the end of the trip fingers and the sleeve springs can still be met.

M-4 If the trouble is not due to a general misalignment of all the trip fingers, check the location of the multiple brush to see that it meets requirement 2.08 (Horizontal Centering of Multiple Brushes). If the brush is set correctly, change the normal position of the individual trip finger in question as outlined in 3.23, M-3. After making this adjustment, see that requirement 2.23 can be met.

3.25 Trip Finger Return to Normal (Rq.2.25)

M-1 To check for the trip finger return to normal, pull the trip finger back about 30° and allow it to return very slowly to normal.

M-2 Adjust a trip finger which binds by inserting the edge of the KS-6854 screw-driver between the horizontal flanges of the trip finger frame and yoke, either top or bottom, and then twisting the screw-driver slightly as shown in Fig. 40. Where it is found necessary to free the trip fingers in this manner, take care not to adjust the trip finger frame or yoke to such an extent as to cause excessive end play, because of its effect on trip finger height adjustments.

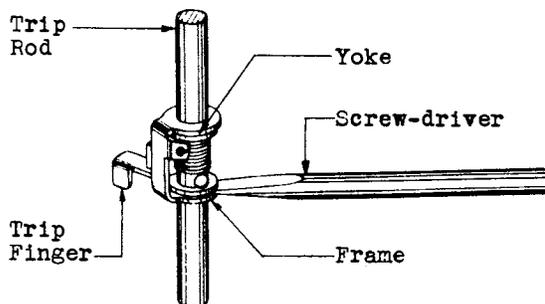


Fig. 40 - Method of Adjusting Binding Trip Finger

M-3 If the top and bottom flanges are spread too far, causing a bind, pinch them together with a pair of long-nose pliers as shown in Fig. 41.

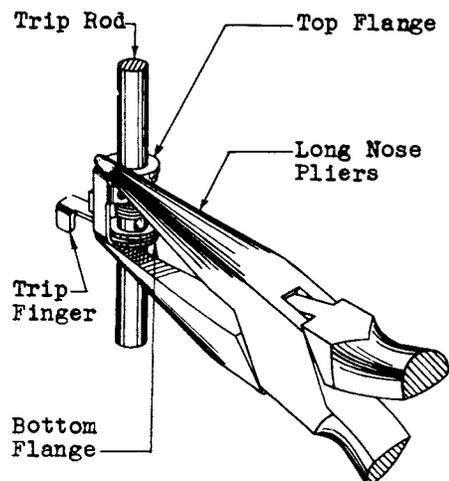


Fig. 41 - Method of Adjusting Binding Trip Finger

3.26 Freedom of Movement of Trip Rod (Rq.2.26)

M-1 To check for the freedom of movement of the trip rod, operate the trip magnet manually by grasping the trip magnet armature and the core further from the fulcrum between the thumb and fore-finger, squeezing them together and then allowing the armature to release slowly under pressure.

M-2 If it is noted that the trip rod is sluggish when operated and released in this manner first make sure that requirements 2.16 (Point of Contact Between Trip Armature Extension and Rotating Lever), 2.18 (Clearance Between Rotating Lever and Top Clutch Locating Plate), 2.20 (Location of Sharp Edge of Trip Armature Extension) and 2.30 (Clearance Between Trip Rod Stop Collar and Bottom of Bearing Plate) have been met, then check the freedom of movement of the bearings and make sure that the trip rod does not bind at its lower end due to dirt in the mounting hole. Loosen the stop collar with the 3-1/2" cabinet screw-driver, lift out the trip rod and clean out the trip rod mounting hole in the top clutch locating plate when the bind is due to dirt as this point. After the hole has been cleaned out replace the trip rod and adjust the stop collar as covered in procedure 3.30.

M-3 If the cause of the sluggish return of the trip rod is a weak retractile spring, replace the spring.

3.27 Vertical Clearance Between Bottom of Horizontal Flange of Trip Finger and Trip Lever (Rq.2.27)

M-1 To obtain this clearance, adjust the trip finger very slightly up or down as required with a No. 327 adjuster as shown in Fig. 42.

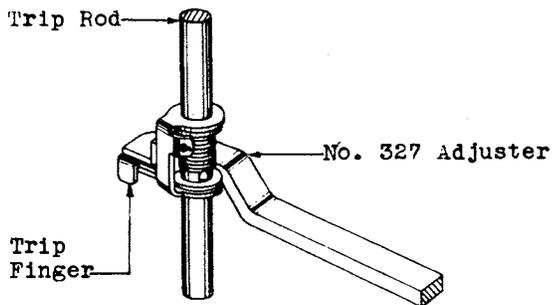


Fig. 42 - Method of Adjusting Clearance Between Bottom of Trip Finger Flange and Trip Lever

M-2 Take care that this adjustment does not throw the horizontal flange out of square with the trip rod.

M-3 At the time this requirement is being checked make a visual check for excessive trip finger end play, that is, excessive gap between the top or bottom horizontal flange of the trip finger frame and the yoke. If the trip finger is adjusted near the minimum or maximum height adjustment, see that the requirement is met with the end play of the trip finger taken up in either direction.

3.28 Down Stop Collar Location (Rq.2.28)

M-1 The stop collars now in use are of two types; the early type of which two up and two down stop collars are used for each brush rod, and the later type of which only one up and one down stop collar are required. The procedure used in adjusting stop collars of either type is essentially the same.

M-2 First make sure that the commutator brush springs are in the correct adjustment as specified in the section covering this apparatus.

M-3 "Y" Commutator Brush Spring Clearance
Make an effort to adjust for this clearance during periods of light load in order that the weight of as many selectors as possible shall be resting on the cross members. Loosen the down stop collar clamping screws (if one of the later type) with the No. 220 wrench. If the rod is equipped with early type down

stop collars, loosen the clamping screws with the KS-2631 screw-driver or the wrench. Raise the brush rod approximately 1/8" and push the down stop collar or collars down on the bearings. Then tighten the clamping screws just sufficiently to support the weight of the brush rod. Grasp the brush rod just below the commutator brush frame and tap the down stop collar or collars up by carefully raising and lowering the brush rod until the bottom edge of the "Y" commutator brush spring clears the top edge of the reference hole in the "Y" commutator segment by the specified amount. With the down stop collar or collars in this position, tighten the clamping screws sufficiently to prevent the collar or collars from slipping on the brush rod. Scribe a line on the brush rod at the top of the down stop collar and, in subsequent adjustments, make sure that the top of the down stop collar is not raised above the scribed line.

M-4 Multiple Brush Reset If the multiple brush will not reset under the conditions specified in the requirement, loosen the multiple brush clamping screw with the No. 220 wrench and lower the multiple brush, taking care that there is the specified clearance between the multiple brush frame and the top of the down stop collar. If it is found necessary to lower the multiple brush, relocate the brush springs as required as covered in procedures 3.08, 3.13, 3.14 and 3.15. If the multiple brush resets properly under the conditions specified, and there is not the specified clearance between the down stop collar and the multiple brush frame, lower the down stop collar or collars. When checking to see that the reset lever restores with a snap with the proper gauge inserted between the down stop collar and the bearing plate, make sure that the reset lever does not ride off of the side of the bearing or reset plates when the brush resets.

M-5 If the reset lever is sluggish or fails to restore fully to its normal position, this may be caused by friction between the rollers and the connecting plate on the trip lever assembly. To remedy this condition, lubricate the surfaces of the rollers which come in contact with the connecting plate with W.E. lubricating compound No. 3. To do this, raise the brush rod and trip the multiple brush. Dip a No. 4 Artist's sable rigger brush in the lubricant, remove the excess lubricant from the brush before withdrawing the brush from the container and apply the lubricant as shown in Fig. 43. After the lubricant has been applied restore and trip the multiple brush a few times manually to insure that the lubricant will reach the entire surfaces of the rollers where they come in contact with the connecting plate.

M-6 If the reset lever snags against its

3.28 (Continued)

associated reset or bearing plate when the brush restores lubricate the reset lever and the reset or bearing plate as covered in 3.01, M-4.

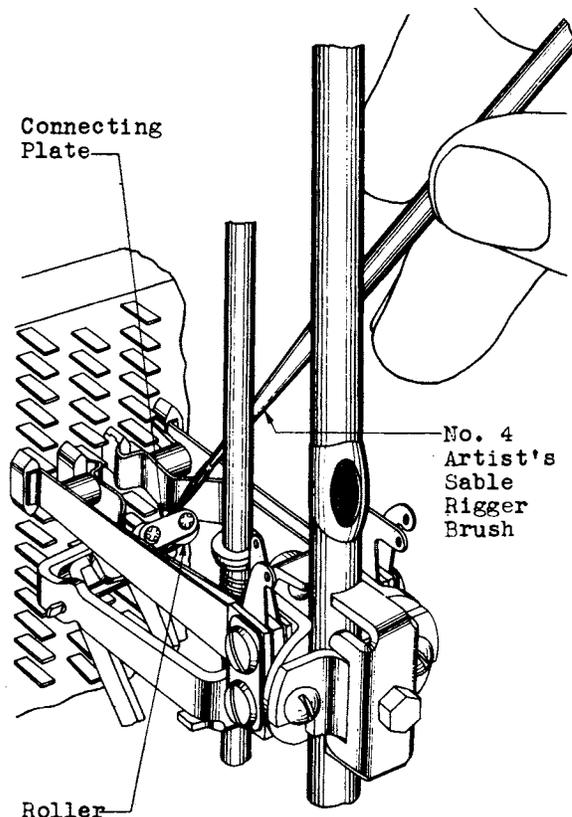


Fig. 43 - Method of Lubricating the Connecting Plate and Rollers on the Trip Lever Assembly

M-7 Clearance Between Each Multiple Brush Frame and Cross-Member

If the lack of clearance is general for all brushes on the rod, correct by lowering the down stop collar or collars. If the lack of clearance is not general, raise the brush and lower the springs as covered in M-4. In any case, if an adjustment is necessary, recheck for the brush reset and adjust for it, if necessary.

M-8 Location of One Early Type Down Stop Collar with Respect to Bearing

When the final location of the early type down stop collars has been obtained as outlined above, lower the brush rod until one of the down stop collars rests against the bearing plate. Loosen the clamping screw of the other down stop collar, slide it down snugly against its associated bearing and fasten it in place.

M-9 See that the clamping screws of all the down stop collars are securely tightened.

3.29 Clearance Between Brush Rod Up Stop Collars and Bottom of Bearing Plate (Rq.2.29)

M-1 To make the adjustment, raise the brush rod until the rack index number 101 shows just above the clutch sighting plate, making sure that the weight of the brush rod assembly rests on the clutch pawl.

M-2 With the brush rod in this position, if a later type up stop collar is used, check to see that the top surface of the collar is within the required limits.

M-3 To adjust the later type up stop collars shift them on the rod as required using the No. 220 wrench to loosen and tighten the clamping screw.

M-4 If the early type up stop collars are used, see that one of the collars is the same distance away from the bearing plate as set forth above for the new style collar.

M-5 To adjust the early type up stop collars, shift one of them on the rod as required using the KS-2631 screw-driver or the No. 220 wrench to loosen and tighten the stop collar clamping screw. Raise the brush rod until the adjusted collar touches against the underside of the bearing plate. Then, securely fasten the other early type up stop collar so that its top surface fits snugly against the underside of the associated bearing plate. Check the setting by lowering the brush rod and raising it under power as far as it will go. See that with one stop collar resting against the bearing plate, the gap between the other stop collar and its associated bearing plate is not more than approximately .005". Remove the up drive power and notice that the rack index number 101 shows just above the clutch sighting plate with the weight of the brush rod assembly on the clutch pawl. With the rod in this position, raise the rod by hand and note that the specified travel exists in the rod before the stop collars engage with the bearing plate.

3.30 Clearance Between Trip Rod Stop Collar and Bottom of Bearing Plate (Rq.2.30)

M-1 To adjust for this clearance, slacken the stop collar clamping screw with the KS-2631 screw-driver if the clamping screw is of the early type; or with a No. 220 wrench if the clamping screw is of the later type, and insert the .015" step of the No. 80-B gauge between the bearing plate and the top edge of the collar. Raise the collar until the gauge is snug against the under

3.30 (Continued)

side of the plate, then secure the collar.

M-2 The adjustment should insure the collar sufficient clearance from the bearing plate, so that the rod will be free to turn in its bearings and will not be great enough to disturb the trip finger adjustment when the rod is lifted while the brush is being tripped. Note that with the trip rod in its normal position, the stop collar does not touch the bearing clamp and when the trip rod is allowed to return to normal slowly after being operated and raised, that the stop collar does not catch in the slot in the bearing plate.

3.31 Clearance Between Multiple Brush Frames and Bank Terminals (Rq.2.31)

M-1 If it is found that the requirement is not being met, determine if this condition is caused by a bowed rack.

M-2 If it is, straighten it, by following the procedures outlined in the section covering the particular type of clutch involved.

M-3 Replace the rack and recouple it to the brush rod.

M-4 If the necessary clearance is not now visible, inspect the brush rod for kinks, bows or a bent condition at the rack tongue slot. Remove any bowing or kinking of the rod as covered in procedure 3.05. If the required clearance is still unobtainable, move the bearing closest to the faulty part of the rod so as to obtain the required clearance. Take care, however, not to move the bearing enough to prevent the brush from meeting requirements 2.11 (Brush Intrusion) and 2.05 (Freedom of Movement of Brush Rod).

M-5 If the required clearance cannot be met on the No. 4 banks on old frames which are not equipped with a bearing plate between the No. 4 bank and the commutators, the trouble is due to a bent or bowed brush rod. Correct this condition as outlined in procedure 3.05.

3.32 Smooth Brush Travel (Rq.2.32)

M-1 See that the brushes are so centered that they reliably clear all the terminals of the banks when in a reset condition, as the selector travels up and down.

M-2 Trip and brush and run it to its top-most position under power. Watch the brush reset lever and if it jiggles or

vibrates, check the brush in question further. Trip it and run it up and down slowly by hand and note if any of the spring contacts catch slightly on the terminals at any part of the bank. A heavy tension on the clutch pawl spring will sometimes cause the zero brush reset lever to vibrate. This can be eliminated by holding the down-drive armature operated enough to remove the pawl while the rod is being driven up.

M-3 Correct chattering or snagging by adjusting the springs causing the trouble so that their contact surfaces are within the parallelism requirement. Use the No. 380-A spring adjuster for this purpose. At this time, check the correct location of the multiple bank terminals in accordance with the section covering panel multiple banks.

M-4 If the brush still chatters or snags, remove and replace it in accordance with the section covering piece part data and replacement procedures for selector elevator apparatus.

3.33 Location of No. 8-A Indicator on Final Frames (Rq.2.33)

M-1 To adjust an indicator which is not within the required limits, loosen one of the screws on the pointer with the KS-2631 screw-driver and raise or lower the pointer as required.

M-2 After the desired adjustment has been obtained securely tighten the pointer mounting screws.

REASONS FOR ISSUE - CHANGES IN ADJUSTING PROCEDURES

1. To revise the list of tools, gauges, materials and test apparatus.
2. To add to the adjusting procedures for No. 1-A Guide Location (3.04).
3. To add methods to cover brush rod cleaning (3.05).
4. To add to the adjusting procedures for Bridging Sleeve Spring Location (3.13).
5. To change the adjusting procedures for Non-Bridging Sleeve Spring Location (3.14).
6. To change the adjusting procedures for Tip and Ring Spring Location (3.15).
7. To revise the adjusting procedures for Down Stop Collar Location (3.28).
8. To omit the procedures covering multiple brush replacement.

APPROVED:

Bell Telephone Laboratories, Inc. FAC 3-10-31
Department of Development and Research GWK 3-24-31