

ELEVATOR APPARATUS

PANEL LINE FINDER

1. GENERAL

- 1.01 This section covers panel line finder elevator apparatus (13 type multiple brushes; 3, 8, 10 and 12 type brush rods; 4 type trip rods; 1 type trip magnets and 1 type compensators) and replaces specification X-70285-01, 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 Operated Position of Trip Magnet A trip magnet and its associated trip rod are in the operated position when the non-freezing disc on the armature further from the fulcrum is pressing against the associated pole piece.
- 1.05 Normal or Unoperated Position of Trip Magnet A trip magnet armature and its associated trip rod are in the normal or unoperated position when the trip magnet armature is pressing against the back stop.
- 1.06 Trip Magnet Release This means that when the specified operate current is reduced to the specified release values the armature shall return to its normal or unoperated position.
- 1.07 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.
- 1.08 Compensator Spring Tension is that which it is necessary to overcome to start the compensator wheel from its normal (down) position when the gauge is applied against the screw holding the tape on the wheel, tangent to the wheel except in cases where the compensators are installed in low ceiling offices, when it is applied to the tape on the wheel.
- 1.09 The Pressure of a Trip Finger Against Its Back Stop is that which it is necessary to overcome to start the

trip finger away from its back stop when the gauge is applied at the point where the trip finger lip is bent back.

- 1.10 One Drop of Lubricant for the purpose of this section, is the amount of lubricant that may be released from a piece of No. 22 bare tinned copper wire after it has been dipped into the lubricant to a depth of 1/2" and slowly removed.
- 1.11 Reference Terminal Alignment A visual inspection shall be made before checking or readjusting any multiple brush to insure that the reference sleeve terminal and the associated tip, ring and hunt 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) Rotating Levers and Trip Magnet Armature Extensions - Fig. 1 (A)  
Before the installer starts the operation test, one coat of Western Electric Lubricating Compound No. 3 shall be applied to the surfaces of the rotating levers and the trip magnet armature extensions where they come in contact with each other. Care shall be taken that none of the lubricant gets on adjacent apparatus or on the racks or the cork rolls of the drive.

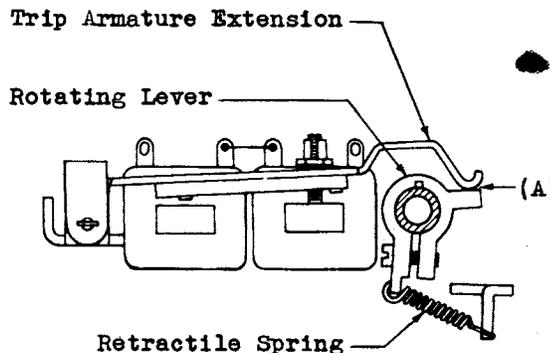
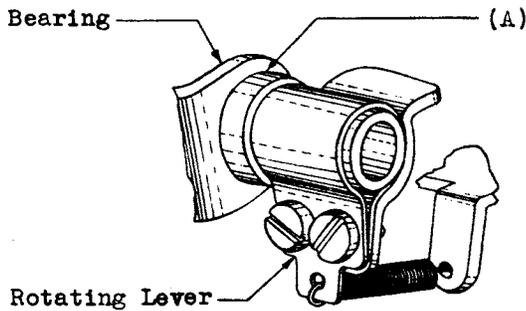


Fig. 1

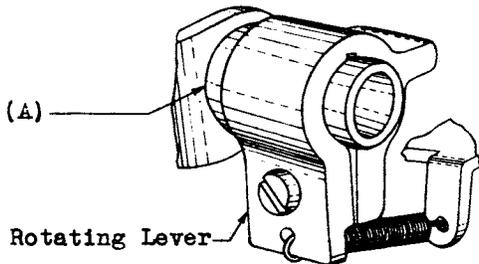
## 2.01 (Continued)

- (b) Trip Rod Bearings - Fig. 2 (A) or Fig. 3 (A) - Immediately before the installer starts the operation test, one drop of KS-2832 oil dag mixture or KS-2245 oil shall be applied to the trip rod bearings. Care shall be taken that the lubricant is applied to the bearing point only.



New Style Rotating Lever

Fig. 2



Old Style Rotating Lever

Fig. 3

- (c) After turnover the trip rod bearings which show signs of wear or bind, and rotating levers and trip armature extensions which show signs of wear shall be lubricated at the discretion of the Telephone Company.

2.02 Compensator Tape Protection - Fig. 4 (A) - Shortly after the compensators are mounted, the installer shall grease the tapes with a thin coating of Veedol medium cup grease. They shall be greased thereafter at the discretion of the Telephone Company. Grease shall not be applied to the compensator bearings.

2.03 Compensator Bracket Location - Fig. 4 (B) and 4 (C) - The bracket shall be clamped securely on the brush rod in

such a way that the tape is not twisted, and shall be so located that the further downward travel of the tape, when the brush rod is in the normal (down) position, shall be:

Test - Min. 1/16"

Readjust - Min. 1/8"

Gauge by eye.

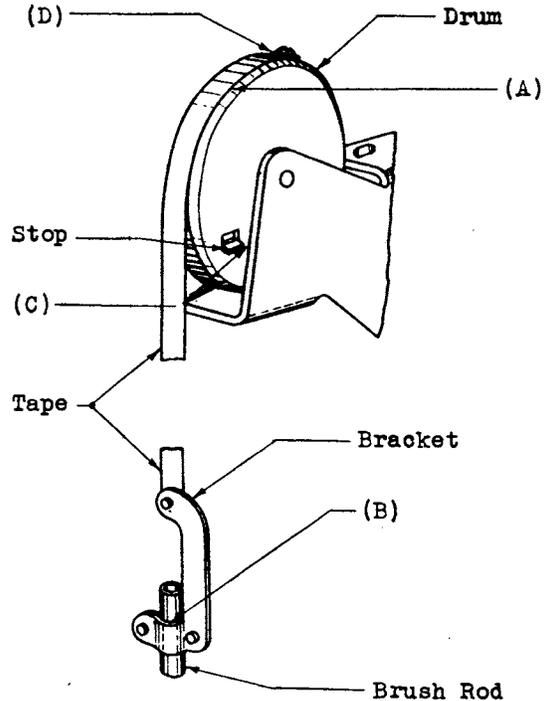


Fig. 4

2.04 Compensator Spring Tension - Fig. 4 (D) -

When the compensator spring is extended to the position it will have when the brush rod is in the normal (down) position, it shall have, for a brush rod equipped with 15 brushes, a tension of

Min. 300 grams

Max. 400 grams

If the brush rod is only partially equipped with brushes, a reduction of 40 grams shall be made for each brush less than the full equipment of 15 brushes. Use the No. 79-B gauge.

2.05 Compensator Alignment - Fig. 4 (A) - The compensator shall be in alignment with the brush rod and the relation between the tape and the drum shall be such that:

Test - The tape shall not overrun the edge of the drum more than 1/16".

Readjust - The tape shall not overrun the edge of the drum.

Gauge by eye.

- 2.06 Compensator Spring Adjusting Nut Position - Fig. 5 (A) - At the time of turnover to the Telephone Company, with the compensator adjusted to meet the requirement for spring tension and alignment, there shall be min. approximately ten threads (1/4") left above the adjusting nut, available for further tensioning of the spring. Gauge by eye.

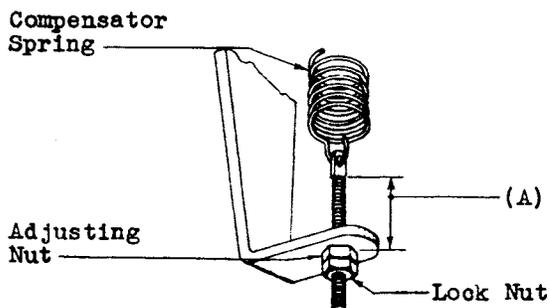


Fig. 5

- 2.07 Rack Tongue Position - Fig. 6 (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.

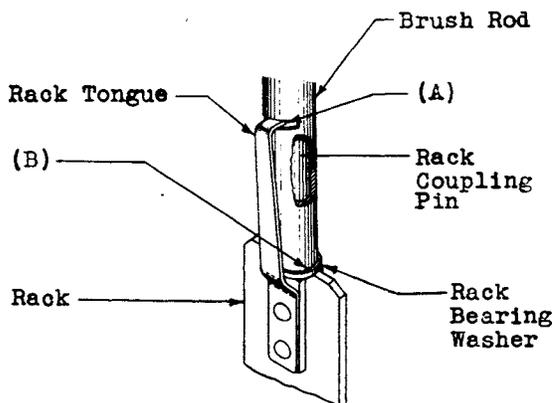


Fig. 6

- 2.08 Rack Coupling Pin Engagement - Fig. 6 (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 requirement 2.07 being transmitted to the rod. Gauge by eye.

- 2.09 Freedom of Movement of Brush Rod - Fig. 7 (A) - A brush rod shall be sufficiently free in its bearings to return to normal 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 multiple brush tripped. On 300 point line finders this requirement shall be met with the compensator attached. Gauge by eye.

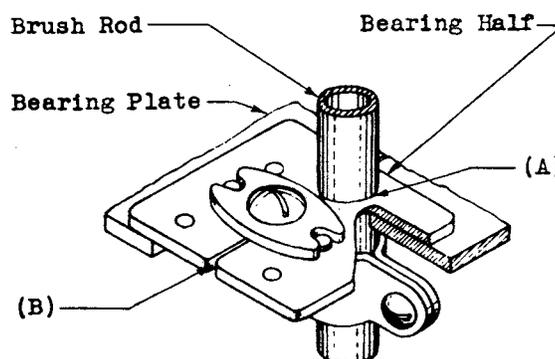


Fig. 7

- 2.10 Brush Rod Bearing Gap - Fig. 7 (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.

- 2.11 Armature Gap With Trip Magnet Normal - Fig. 8 (A) - The gap between the non-freezing disc and the pole-piece further from the fulcrum with the trip magnet unoperated shall be:

Test - Max. .045"

Readjust - Max. .040"

Use the Nos. 87-A and 87-B gauges.

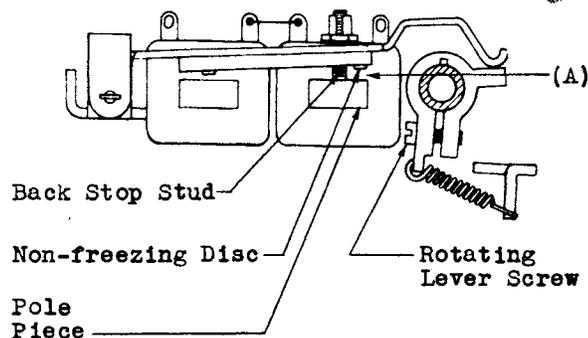


Fig. 8

2.12 Armature Gap with Trip Magnet Operated Manually - Fig. 9 (A) - The gap between the non-freezing disc and the pole-piece nearer the fulcrum with the armature operated manually shall be:

Min. .003"  
Max. .012"

Use the No. 74-D gauge.

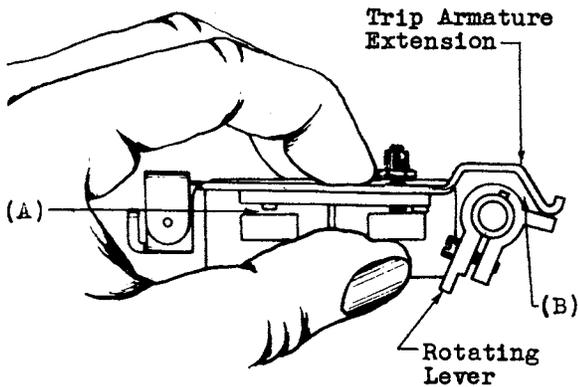


Fig. 9

2.13 Clearance Between Trip Armature Extension and Hub of Rotating Lever - Fig. 9 (B) - With the trip magnet operated electrically this clearance shall be:

Min. .003"

Gauge by eye.

2.14 Engagement of Trip Armature Extension with Rotating Lever - Fig. 10 (A) - The sides of the trip armature extension shall not project beyond the sides of the rotating lever. Gauge by eye.

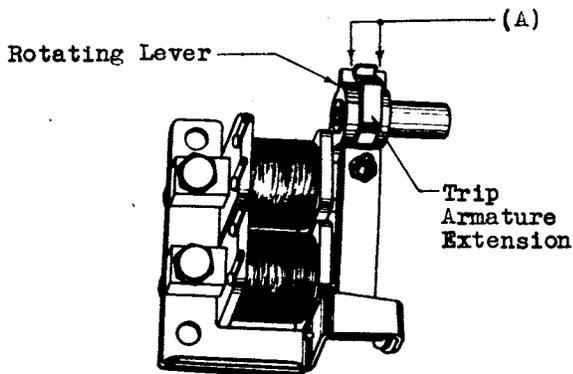


Fig. 10

2.15 Trip Rod End Play - Fig. 11 (A) - This shall be:

Test - Min. .003", Max. .012"  
Readjust - Min. .005", Max. .010"

Gauge by eye.

2.16 Freedom of Movement of Trip Rod - Fig. 11 (B) - The trip rod shall not bind in its bearings through its normal travel. Gauge by feel.

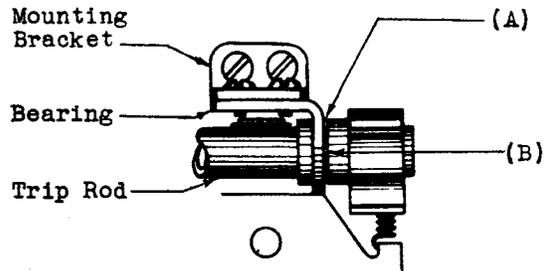


Fig. 11

2.17 Brush Stud Gap - Fig. 12 (A) -

(a) With the brush tripped and centered on the reference terminal of the bank, the stud gap shall be:

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

Use the No. 86 gauge.

(b) The stud shall not touch the adjacent sleeve or hunt spring at any other terminal of the bank. Gauge by eye.

All Adjusting of Tip or Ring Springs for Stud Gap to be done Between These Two Lines

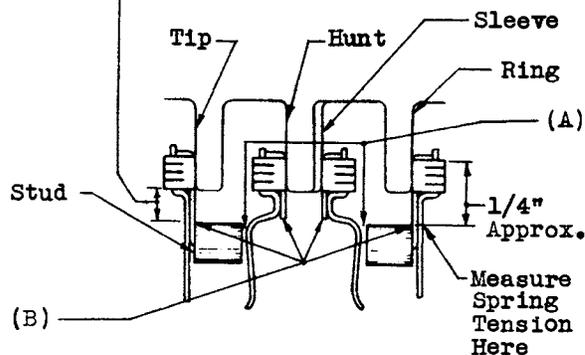


Fig. 12

2.18 Horizontal Centering of Multiple Brushes

Fig. 13 (A) - With the rack index number "9" for the 20 line banks or the index number "20" for the 40 line banks showing just above the clutch sighting plate and with the weight of the brush rod assembly on the pawl and with the multiple brush in the reset position, the clearance between the hunt and sleeve spring shoes and the tip and ring terminals shall be

Min. .003"

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.

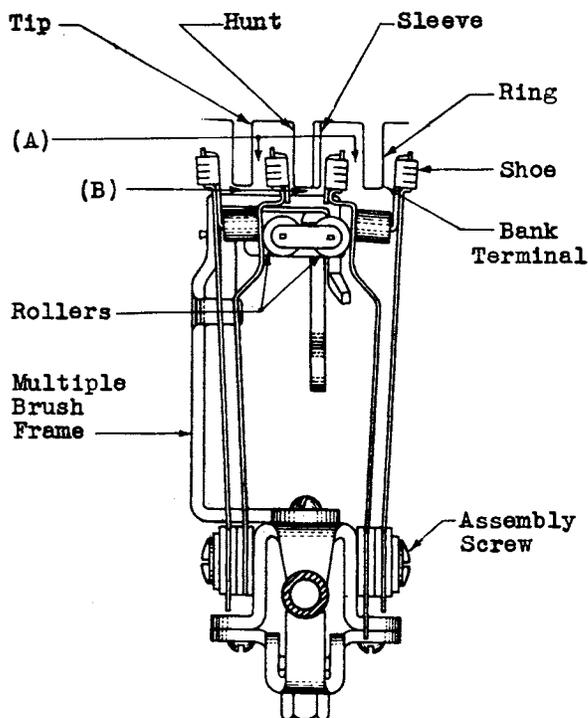


Fig. 13

- 2.19 Brush Spring Tension - Fig. 12 (B) - With the brush tripped and centered on the reference terminal of the bank the tension of each spring shall be:

<u>Test</u>	- Min. 25 grams,
	Max. 50 grams
<u>Readjust</u>	- Min. 30 grams,
	Max. 45 grams

Use the No. 68-B gauge.

- 2.20 Clearance Between Multiple Brush Frame and Bank Terminals - Fig. 13 (B) - With the rack index number "10" showing just above the clutch sighting plate and with the weight of the brush rod assembly resting on the clutch pawl, this clearance shall be

Min.  $1/32$ "

on No. 0 banks. On old type 300 point frames which do not have bearing plates above the top bank, this clearance shall also be met at the top terminal of the top bank when the brush rod is raised so that the rack index number "19" shows just above the clutch sighting plate and the weight of the brush rod assembly rests on the clutch pawl. Gauge by eye.

- 2.21 Brush Intrusion - Fig. 14 (A) - When the brush is contacting with 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. Gauge by eye.

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.

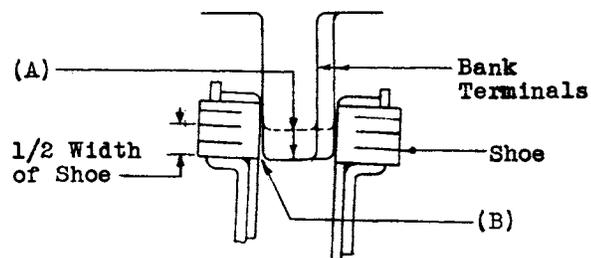


Fig. 14

- 2.22 Parallelism of Brush Springs - Fig. 14 (B) - 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 shall be

Max. .005"

when the brush intrusion equals the full width of the shoe. 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.

- 2.23 Hunt Spring Location - Fig. 15 (A) - With the index number "9" for the 20 line banks or the index number "20" for the 40 line banks showing just above the clutch sighting plate and with the weight of the brush rod assembly on the pawl, the center of the spring must not be more than .010" above nor more than .010" below the center of the reference terminal. Gauge by eye.

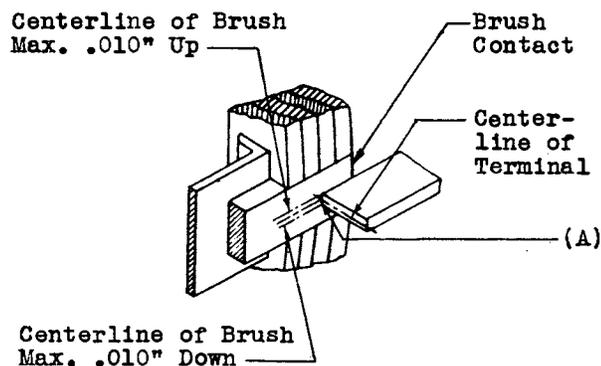


Fig. 15

2.24 Tip, Ring and Sleeve Spring Location - Fig. 16 (A)

**Test** The top edge of the contact portion of the spring shall not be below the top edge of the terminal and the bottom edge of the contact portion of the spring shall not be above the bottom edge of the terminal when the rack is resting on the pawl for any position on the bank. Gauge by eye.

**Readjust** With the pawl engaging the notch in the rack corresponding to the reference terminal, the top 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 bottom 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.

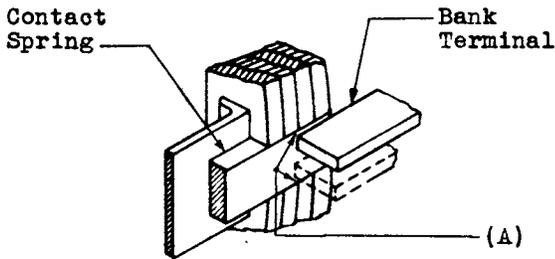


Fig. 16

2.25 Down Stop Collar Location - Fig. 17 (A)

- (a) The down stop collar shall rest on the top clutch locating plate when the brush rod is in the normal or lowest position. Gauge by eye.
- (b) It shall also be placed so that any tripped brush will reset with a snap when the brush rod is lowered under power with a .010" gauge placed below the down stop collar. Use the No. 85-B gauge.

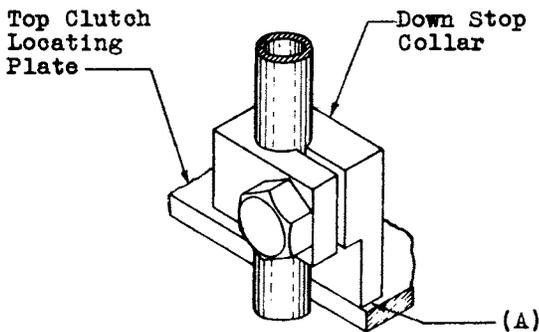


Fig. 17

2.26 Clearance Between Trip Lever and Trip Rod - Fig. 18 (A) - With the brush rod in the normal position, this clearance shall be:

- Test** - Min. .005"
- Readjust** - Min. .010"

Gauge by eye.

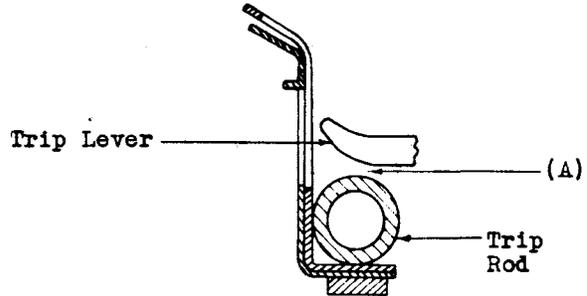


Fig. 18

2.27 Clearance Between Trip Finger and End of Brush Trip Lever - Fig. 19 (A) - With the trip rod operated and the brush rod normal this clearance shall be:

- Min. .003"

Gauge by eye.

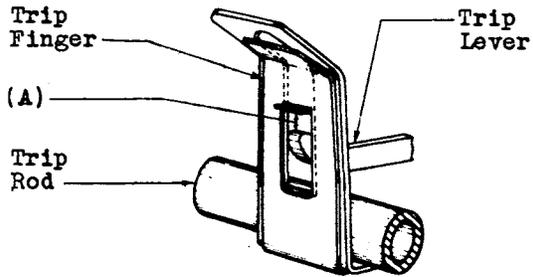


Fig. 19

2.28 Clearance Between Multiple Brush Frame and Trip Rod Bearings - Fig. 20 (A) - With the down stop collar resting on the bearing this clearance shall be:

- Min. .003"

Gauge by eye.

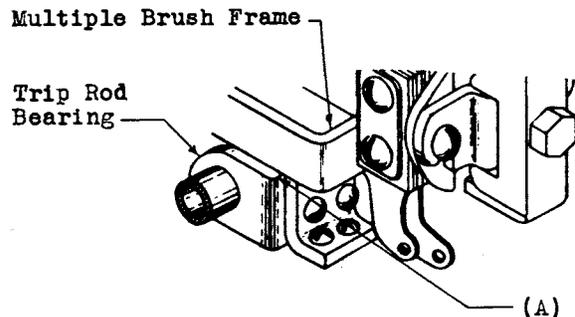


Fig. 20

- 2.29 Clearance Between Up Stop Collar and Bottom of Bearing Plate - Fig. 21 (A) - With the index number "20" for the 20 line bank, or "41" for the 40 line bank showing just above the clutch sighting plate and with the weight of the brush rod assembly on the pawl, this clearance shall be:
- Min.  $5/64"$   
Max.  $7/64"$   
Gauge by eye.

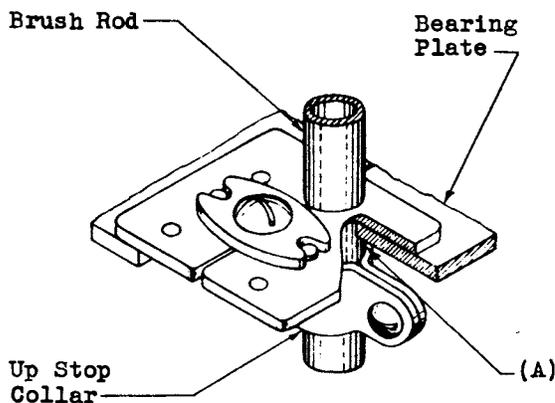


Fig. 21

- 2.30 Clearance Between Sides of Slots in Trip Finger and Trip Lever - Fig. 22 (A) - With the trip rod dressed to extreme left or right, this clearance shall be:
- Min.  $.003"$   
Gauge by eye.

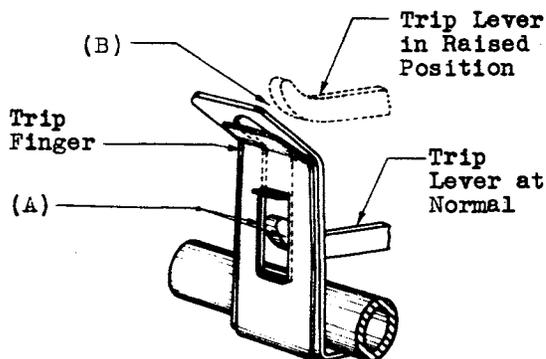


Fig. 22

- 2.31 Clearance Between Trip Lever and Trip Finger - Fig. 23 (A) - With the trip rod in the normal position and the brush rod raised, this clearance shall be:

Test - Min.  $.003"$ ,  
Max.  $.012"$   
Readjust - Min.  $.005"$ ,  
Max.  $.010"$

Gauge by eye.

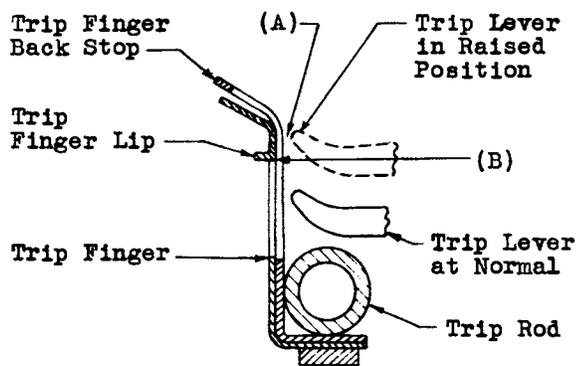


Fig. 23

- 2.32 Location of Trip Finger Back Stop with Respect to Trip Lever - Fig. 22 (B) - With the trip magnet operated and the brush reset, there shall be a clearance of

Min.  $.003"$

between the top edge of the slot in the trip finger back stop and the end of the trip lever as the trip lever passes the trip finger back stop. Gauge by eye.

- 2.33 Pressure of Trip Fingers Against Their Back Stops - Fig. 23 (B) - This shall be:

Test - Min. 20 grams,  
Max. 70 grams  
Readjust - Min. 30 grams,  
Max. 60 grams

Use the No. 79-C gauge.

- 2.34 Retractable Spring Tension - Fig. 24 (A) - The tension of the rotating lever retractile spring shall be sufficient to restore the trip rod to its normal position and press the trip magnet armature against its back stop. Gauge by eye and by feel.

Note In checking for tension, see that the spring is in the side of the lug nearest to the elevator rod.

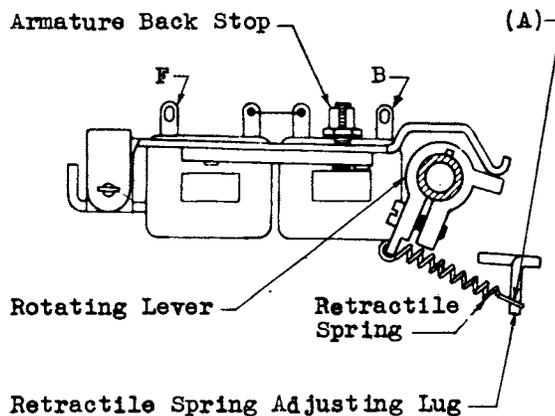


Fig. 24

2.35 Trip Magnet Operate and Release

(a) The trip magnet shall operate and release on the following current values:

Test - Operate, .160 amps.,  
Release, .035 amps.  
Readjust - Operate, .150 amps.,  
Release, .040 amps.

- (b) When two trip magnets are wired in parallel, they shall operate and release on twice the values specified above.  
(c) When four trip magnets are wired in parallel, they shall operate and release on four times the values specified above.  
(d) The trip magnet shall operate on the specified current at the rate of approximately two times a second.  
(e) With the trip magnet fully operated, there shall be  
Min. .003"  
further travel of the trip rod without bind. Gauge by eye and by feel.

2.36 Multiple Brush Tripping Test - Fig. 25

(A) - The multiple brushes shall not fail to trip when the trip magnet is energized with a:

Test - .010"  
Readjust - .012"

gauge placed between the pole piece and the non-freezing disc on the armature further from the fulcrum and the brush rod is raised by means of the clutch up drive. Use the No. 102-A gauge.

2.37 Smooth Brush Travel With the brush tripped, and, as the selector travels up and down in normal operation, each brush shall meet the following conditions:

- (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.

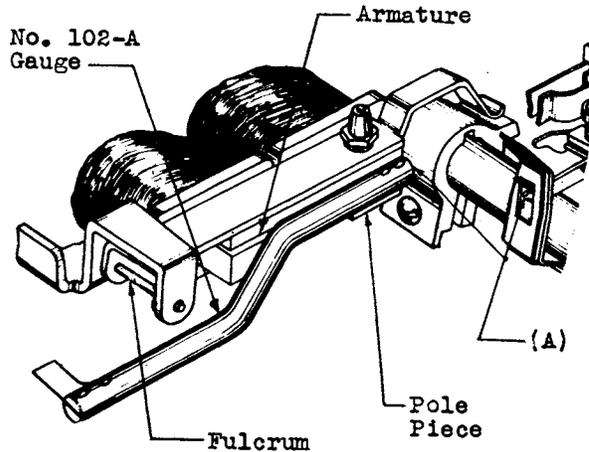


Fig. 25

REASON FOR ISSUE - CHANGES IN REQUIREMENTS

1. To revise requirement for Rack Coupling Pin Engagement (2.08).
2. To revise the requirement covering Brush Spring Tension (2.19).
3. To revise the requirement for Tip, Ring and Sleeve Spring Location (2.24).

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

<u>Code No.</u>	<u>Description</u>	<u>Code No.</u>	<u>Description</u>
		-	Bell System Regular Screw-driver - 4" per A.T.&T.Co. drawing 46-X-34
		-	Bell System Regular Screw-driver - 5" per A.T.&T.Co. drawing 46-X-34
38-B	Lamp Socket with 802 Cord	-	Bell System P-Long Nose Pliers - 6-1/2" per A.T.&T. Co. drawing 46-X-56
48	Wrench - 7/32" and 1/4" Hex. Socket Double-end and Screw-driver	-	Spring Clothes Pin
206	Screw-driver 30° Offset	-	No. 4 Artist's Sable Rigger Brush
207	Screw-driver 90° Offset		
220	Wrench - 3/16" Hex. Socket	<u>Gauges</u>	
245	Wrench - 3/8" and 7/16" Hex. Open - Double-End Flat	68-B (or the replaced 68)	70-0-70 Gram Gauge
246 (or the replaced R-1536)	Wrench - 1/2" Sq. Open-end Flat	74-D	Thickness Gauge Nest
310 (2 Req'd)	Wrench - 9/32" Hex. - Open - Double-end Offset	79-B	0-1000 Gram Push-Pull Tension Gauge
325-B (or the replaced 325)	Adjuster	79-C	C-200 Gram Push-Pull Tension Gauge
330-B (2 Req'd)	Trip Finger and Back Stop Adjuster	85-B	.010" Thickness Gauge
331	Spring Adjuster	86	.005" and .008" Double-end Right Angle Offset Thickness Gauge
332	Adjuster	87-A	.022" and .040" Double-end Thickness Gauge
344	Screw-driver - Offset	87-B	.030" and .045" Double-end Thickness Gauge
376-A	Dental Mirror	102-A	.010" and .012" Thickness Gauge
380-A	Brush Spring Adjuster	<u>Materials</u>	
382-A	Trip Rod Holder	KS-2245	Oil
417-A (or the replaced 306)	Wrench - 1/4" and 3/8" Hex. Open Double-end Flat	KS-2423	Cloth
KS-2630	Wrench - 5/16" Hex. Socket - Offset	KS-2832	Oil Dag Mixture
KS-2631	Screw-driver 4-1/2"	D-89026	Cloth
KS-2632	Reading Glass	-	Western Electric Lubricating Compound No. 3
KS-6015	Duck-bill Pliers	-	Veedol Medium Cup Grease
KS-6320	Orange Stick	-	Twine
KS-6367	Wrench - 7/16" and 5/8" Hex. Open Double-end Flat	-	Piece of No. 22 Bare Tinned Copper Wire
		<u>Test Apparatus</u>	
		35-C	Test Set
	Bell System Cabinet Screw-driver-3-1/2" per A.T.&T.Co. drawing 46-X-40	3.002	<u>Use of Reading Glass and Dental Mirror</u> The KS-6232 reading glass and

## 3.002 (Continued)

the No. 376-A dental mirror may be used in connection with the visual inspections specified in Part 2 - Requirements and the corresponding adjusting procedures.

3.003 Make Busy Information, Except Trip Magnets and Trip Rods Whenever it is found necessary to readjust a multiple brush, brush rod or compensator, make the associated district selector circuit busy in the approved manner. To prevent the operation of the down drive armature, block the necessary relays or insulate the sequence switch springs.

3.004 Make Busy Information Trip Magnets and Trip Rods Unless otherwise specified, whenever it is found necessary to readjust a trip magnet or trip rod, make all circuits busy which are associated with the trip rod. If it is necessary to operate the trip magnet electrically during periods of heavy load remove the wire connected to the "B" terminal of the trip magnet (See figure 30) and establish a circuit from this terminal through the No. 35-C test set to ground as specified in the Circuit Requirement Tables associated with the trip magnet under adjustment. During periods of light load, it may not be necessary to disconnect the wire from the magnet before operating the trip magnet electrically or to make busy the elevators which are associated with the trip magnet under test. In this case the test lead should be connected directly to the "B" terminal to operate the trip magnet electrically.

3.005 Before making any of the readjustments covered in this section pertaining to trip rods or trip magnets, make a check to determine that the trip magnets are mounted firmly on the frame. Tighten the mounting screws by means of the No. 344 screw-driver and the No. 417-A wrench.

3.01 Lubrication (Rq.2.01)

M-1 Trip Rod Bearings Raise the brush rod adjacent to the bearing so that the multiple brush will not interfere with the process of lubricating the bearing.

M-2 Apply one drop of KS-2832 oil dag mixture or KS-2245 oil by means of a piece of No. 22 bare tinned copper wire to the oil hole in the trip rod bearing, making sure that it is applied to this point only. Work the lubricant in by moving the trip rod sideways and up and down in its bearings.

M-3 Rotating Levers and Trip Magnet Armature Extension To lubricate the rotating levers and trip magnet

armature extensions which are associated with trip magnets mounted at the extreme right side of the frame, it is necessary first to make the end selector busy and raise it approximately half-way up the bank. Dip the No. 4 Artist's Sable Rigger Brush into the Western Electric lubricating compound No. 3 and insert the brush between the two selectors at the end of the frame. With the index finger of the right hand, hold up the trip magnet armature and draw down the rotating lever with the middle finger as shown in Fig. 26 so as to allow room for the brush to reach the surface of the rotating lever which rubs against the trip magnet armature extension. Then release the rotating lever and slowly withdraw the brush. This will squeeze the lubricant from the brush onto the two surfaces to be lubricated. Take care that the lubricant does not get on adjacent apparatus or on the racks or cork rolls of the drive.

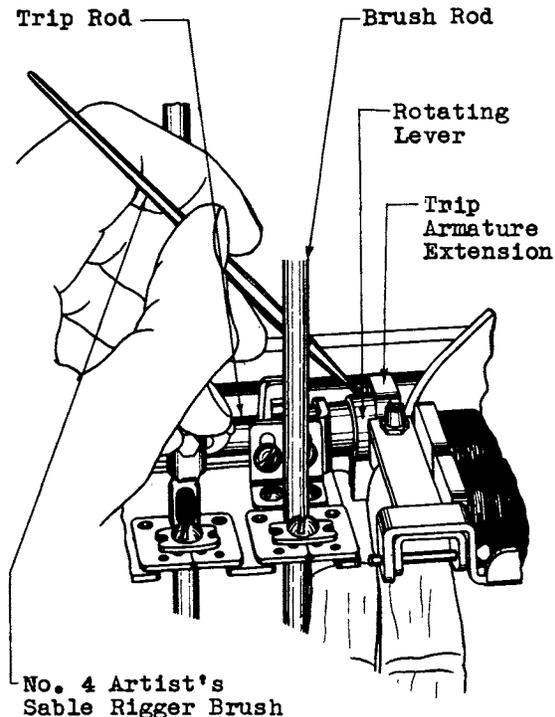


Fig. 26 - Method of Lubricating Rotating Lever and Trip Armature Extension at Right of Frame

M-4 To lubricate the rotating levers and trip magnet armature extensions associated with the trip magnets mounted on the extreme left side of the frame insert the brush from the left in back of the front upright frame angle. Hold the trip magnet armature and draw down the rotating lever as covered in M-3, insert the brush between the

## 3.01 (Continued)

rotating lever and the trip armature extension, release the rotating lever and apply the lubricant as shown in Fig. 27.

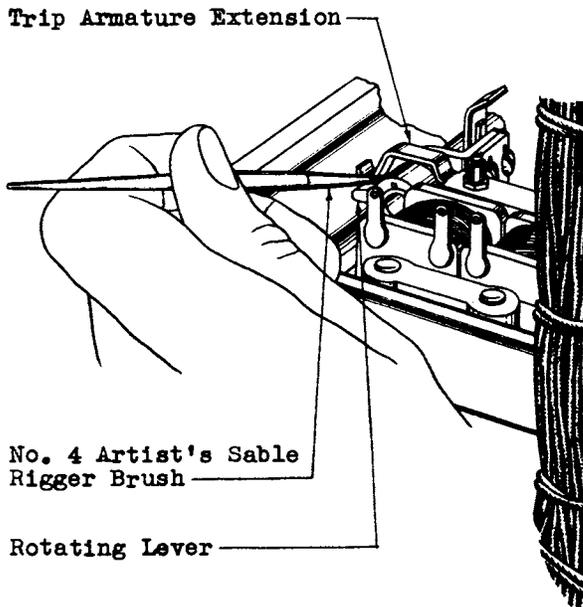


Fig. 27 - Method of Lubricating Rotating Lever and Trip Armature Extension at Left Side of Frame

M-5 After applying the lubricant it is advisable, if service conditions permit, to keep the rotating lever from rubbing on the trip armature extension for fifteen minutes, if possible, to permit the carbon tetrachloride to evaporate.

## 3.02 Compensator Tape Protection (Rq.2.02)

M-1 Before lubricating the compensator tapes, clean the surfaces of the tape and drum by wiping them with a piece of KS-2423 cloth. Then lubricate the tapes by wiping the surfaces with a clean piece of KS-2423 cloth saturated with Veedol medium cup grease. Take care not to apply too much lubricant. Just enough to cover the surfaces with a thin film is sufficient.

## 3.03 Compensator Bracket Location (Rq.2.03)

M-1 If the bracket is not properly located loosen the bracket clamping screws with a 3-1/2" cabinet screw-driver and with the brush rod in the normal (down) position pull down the

tape until the stop on the drum strikes the frame of the compensator. Then clamp the bracket loosely to the brush rod so that all the slack is removed from the tape. Note the position on the rod now occupied by the bracket. With the blade of the screw-driver tap the bracket until it occupies a position approximately 1/8" higher than that previously noted. Turn the bracket until all twist is removed from the tape and securely fasten the bracket to the rod.

## 3.04 Compensator Spring Tension (Rq.2.04)

M-1 To measure the tension of the compensator, place the tip of the No. 79-B gauge against the screw holding the tape to the wheel. Push against this screw until the tension on the tape is removed and the tape begins to buckle and observe whether the required tension is registered. If there is not room enough to permit the measurement of the tension in this manner, remove the steel band from the compensator bracket with the 3-1/2" cabinet screw-driver and attach the No. 79-B gauge to it at the eyelet, by means of a piece of thin cord. Pull down on the gauge until the eyelet in the steel band is opposite the top screw hole in the bracket clamp attached to the top of the brush rod, as shown in Fig. 28 being sure to allow for the weight of the plunger. In this position

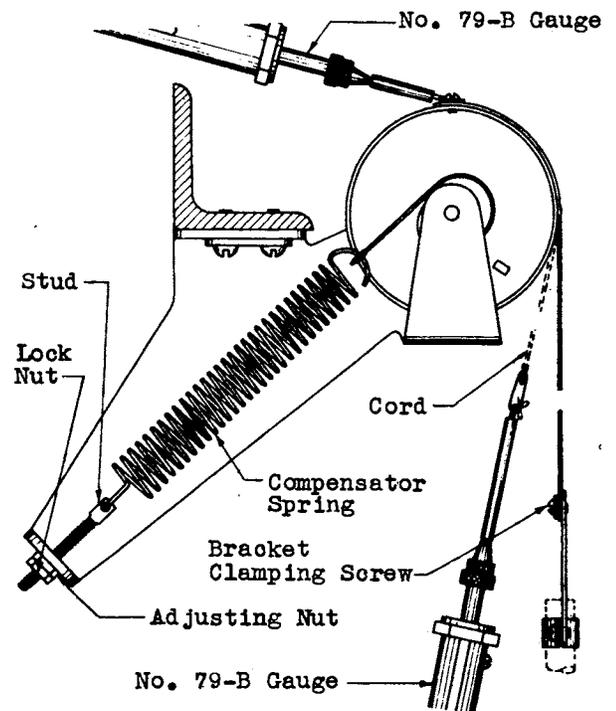


Fig. 28 - Method of Using the No. 79-B Gauge to Check Compensator Spring Tension

3.04 (Continued)

the gauge should register a tension within the limits specified. This check is made with the rod in the normal (down) position.

M-2 To adjust the tension of the compensator, shorten or lengthen the helical spring by means of the stud and adjusting nut attached to it. To loosen the lock nut, two No. 310 wrenches should be used. Hold the adjusting nut with one wrench and loosen the lock nut with the other. With the lock nut loosened, turn the adjusting nut to the right (clockwise) to increase the tension; turn it to the left (counter-clockwise) to decrease the tension. When the desired tension is obtained, hold the adjusting nut in place and turn the lock nut firmly against it.

3.05 Compensator Alignment (Rq.2.05)

M-1 To check for misalignment, sight along the tape with the rod in the normal (down) position. The tape should line up with the commutator in back of it.

M-2 To correct for any misalignment, first check several compensators for alignment as described above, to determine whether there is a general condition of misalignment on that side of the frame. If such is the case loosen the bolts by which the compensator mounting angle iron is fastened to the frame with the KS-6367 wrench using the No. 246 wrench or the 5" regular screw-driver to hold the bolt. Then shift the angle iron to the right or to the left as required.

M-3 If it is found that the individual compensator is out of alignment, correct by loosening the compensator mounting screws with the 4" regular screw-driver and shifting the compensator to the desired position.

M-4 With the compensator lined up as covered in M-1, M-2 and M-3 above, the tape should not overrun the edge of the drum. To check for this, run the rod up and down a few times and note the travel of the tape over the drum.

3.06 Compensator Spring Adjusting Nut Position (Rq.2.06)  
(No Procedure).3.07 Rack Tongue Position (Rq.2.07)

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 socket 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.

3.08 Rack Coupling Pin Engagement (Rq.2.08)

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 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 3.09). 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.

3.09 Freedom of Movement of Brush Rod (Rq.2.09)  
3.10 Brush Rod Bearing Gap (Rq.2.10)

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

## 3.09-3.10 (Continued)

of the rod. Then rub the rod dry with a piece of 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, they shall be placed in the metal container approved for discarded oil materials.

M-5 If the brush rod still fails to meet requirement 3.09 (Freedom of Movement of Brush Rod) proceed as follows.

M-6 To check for freedom of movement of a 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 injury to the multiple brushes or the brush rod.

M-7 Hold back the pawl of the associated clutch with the 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. The brush rod should follow the movement of the finger without sticking or binding during its entire travel; that is, until the restoring lever of a tripped brush touches the restoring plate. It is not necessary that the tripped brush be restored by the combined weight of the rod and rack alone. (See requirement 2.25 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. To determine the true cause uncouple the rack and raise the brush rod as high as it will go. 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 is out of alignment

refer to the section covering the particular type of clutches involved. The commutator brush and all the multiple brushes on the rod must now be rechecked for height. Check the brushes on the No. 0 and No. 1 banks for horizontal centering, as the adjustment for alignment may have raised or lowered the clutch.

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 plate 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. Remove spots of paint or shellac 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 2.10 (Brush Rod Bearing Gap).

M-12 Before separating the halves of a bearing, make sure that the bind is not caused by the misalignment of the bearing halves. This may be checked by moving the rod first from side to side and then from front to rear. This is generally due to the front and rear displacement of one half of the bearing with respect to the other half. This may be corrected 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 light 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 3.19 and to the section covering panel selector commutators and commuta-

## 3.09-3.10 (Continued)

tor 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 or interference with 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. After straightening the rod, check requirements 2.18 (Horizontal Centering of Multiple Brushes), 2.20 (Clearance Between Brush Frame and Bank Terminals), 2.21 (Brush Intrusion) and 2.23 and 2.24 (Hunt, Tip, Ring and Sleeve Spring Location). 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.

3.11 Armature Gap with Trip Magnet Normal (Rq.2.11)

M-1 To readjust the gap between the non-freezing disc and the pole-piece further from the fulcrum, place the .040" step of the No. 87-A gauge between the non-freezing disc on the armature further from the fulcrum and the magnet core. Turn down the armature back stop with the No. 48 wrench until the non-freezing disc on the armature touches the gauge. In making this adjustment, take care to keep this gap close to the maximum limit since decreasing this gap decreases the amount of movement in the trip rod.

3.12 Armature Gap With Trip Magnet Operated Manually (Rq.2.12)

M-1 Check for the gap between the non-freezing disc and the pole-piece nearer the fulcrum as follows: (a) Place the .012" blade of the No. 74-D gauge between the armature non-freezing disc nearer the fulcrum and the corresponding magnet core. (b) Press down the armature at a point directly over the gauge. (c) Withdraw the gauge. The gauge should be felt to bind and the armature should snap into place as the gauge is withdrawn. (d) Operate the armature manually by grasping it at the magnet core further from the fulcrum as

shown in Fig. 29. Hold the armature in this position with the index finger and remove the thumb from the magnet core so that a visual inspection can be made from the front to determine that the non-freezing disc does not touch the pole-piece nearer the fulcrum. To see this clearance easily, use the No. 38-B lamp or a regular 110 volt extension lamp. If the No. 38-B lamp is used, place it between the magnet cores so that the light will shine upward on the armature. Use the regular 110 volt extension lamp by placing it under the trip magnet in such a position that the light will shine up on the armature between the magnet cores.

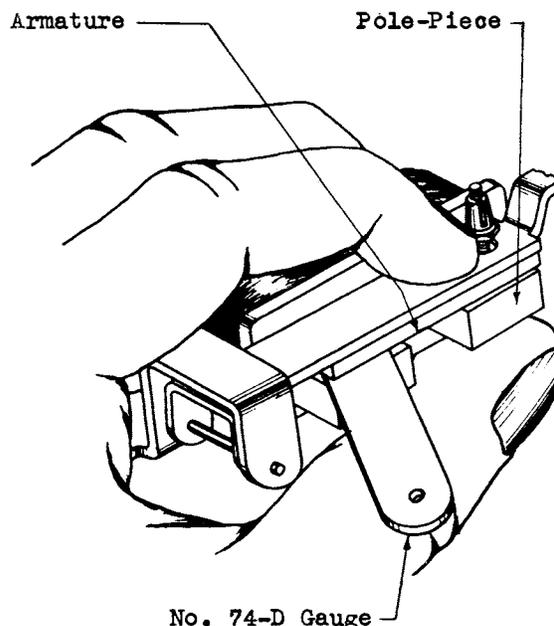


Fig. 29 - Method of Measuring Armature Gap with Trip Magnet Operated Manually

M-2 To readjust the armature gap, attach the No. 325-B adjuster to the trip magnet armature as near as possible to the fulcrum. Press down on the end of the tool to increase the gap and press up to decrease the gap.

3.13 Clearance Between Trip Armature Extension and Hub of Rotating Lever (Rq.2.13)

M-1 To readjust the clearance between the trip armature extension and the hub of the rotating lever, loosen the trip magnet mounting screws by means of the No. 344 screw-driver and the No. 417-A wrench and shift the trip magnet or adjust the trip armature extension with the No. 325-B adjuster.

### 3.14 Engagement of Trip Armature Extension with Rotating Lever (Rq.2.14)

M-1 To check for the engagement of the trip armature extension with the rotating lever, sight along the trip armature extension and see that at no point does it project over the sides of the rotating lever.

M-2 To readjust for this requirement, loosen the trip magnet mounting screws by means of the No. 344 screw-driver and the No. 417-A wrench and shift the trip magnet to the left or right so that the trip armature extension assumes a central location with respect to the sides of the rotating lever. Then securely retighten the mounting screws.

### 3.15 Trip Rod End Play (Rq. 2.15)

M-1 When the end play is controlled by the rotating lever, increase or decrease it by loosening the rotating lever screw or screws with the 3-1/2" cabinet screw-driver and moving the rotating lever to the right or left as required. After moving the rotating lever check to see that requirement 2.14 can be met.

M-2 When the end play is controlled by the bearings, increase or decrease it by loosening the screws holding the bearing to the bearing plate with the screw-driver and moving one of the bearings to the right or left as required.

### 3.16 Freedom of Movement of Trip Rod (Rq.2.16)

M-1 It is impossible to meet the electrical requirements on the

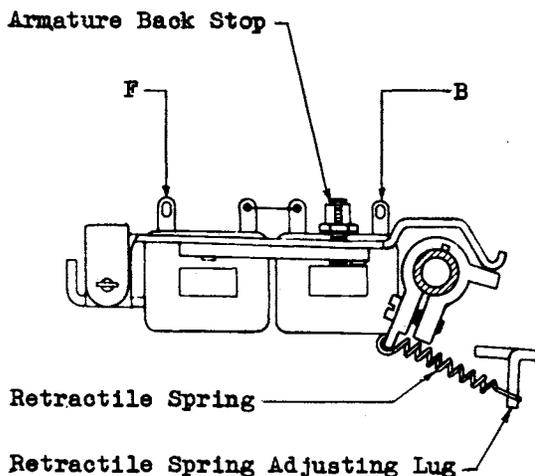


Fig. 30 - Correct Position of Retractile Spring

trip magnet unless the trip rod is free in its bearings. When checking the trip rod for bind, do not detach the retractile spring unless it is found impossible to detect the bind without so doing. In removing or replacing the spring exercise great care not to distort it. When replacing the spring see that it is in its correct position as shown in Fig. 30.

M-2 The bearing or bearings causing the bind may be detected by feeling for play in an up and down and forward and backward direction at each bearing.

M-3 If the bearing causing the bind cannot be discovered with the method outlined above, loosen one of the screws holding the bearing mounting plate to the mounting bracket with the KS-2631 screw-driver on the bearing assembly further from the rotating lever. Operate the trip rod by hand and move the free end of the bearing plate up and down until the spot at which it has least friction is found. Tighten the mounting screws.

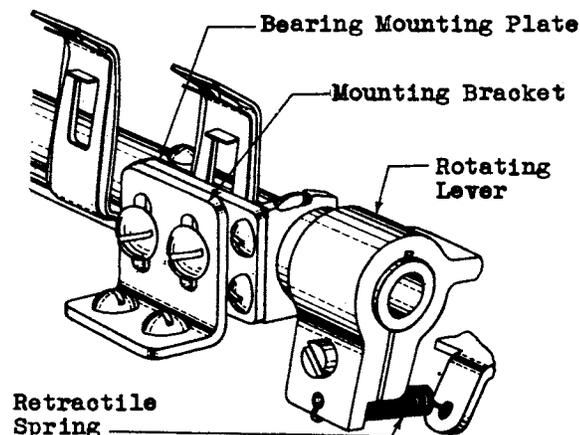


Fig. 31 - Illustration of Bearing Mounting Parts

M-4 If this does not remove the bind loosen the screws holding the bearing bracket to the frame cross member and shift the bracket backward and forward until the point or position of least friction is found. Be sure to tighten the screws on the bracket and bearing. If possible do not loosen more than one screw on each bearing or bracket, or the vertical or horizontal adjustment of the trip rod will be lost. If the readjustment of this bearing does not remove the bind, perform the foregoing operations on the other bearing. After shifting the bearings, recheck all requirements which may be affected.

M-5 Check to see that the armature clears the back stop stud on all

## 3.16 (Continued)

sides. Failure to do this is usually due to a misplaced magnet core which may be corrected by loosening the magnet core assembly screw with the No. 245 wrench and adjusting as required. It may be necessary to loosen the trip magnet mounting screws as outlined in procedure 3.14, M-2.

3.17 Brush Stud Gap (Rq.2.17)

M-1 The stud gap may be checked with the No. 86 gauge or it may be checked 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 or hunt springs are distorted, adjust the stud gap by adjusting the outside springs using the No. 331 spring adjuster as shown in Fig. 32. Use extreme care in making the necessary corrections. The adjuster's efforts should be to restore the spring to its correct condition as shown in Fig. 32.

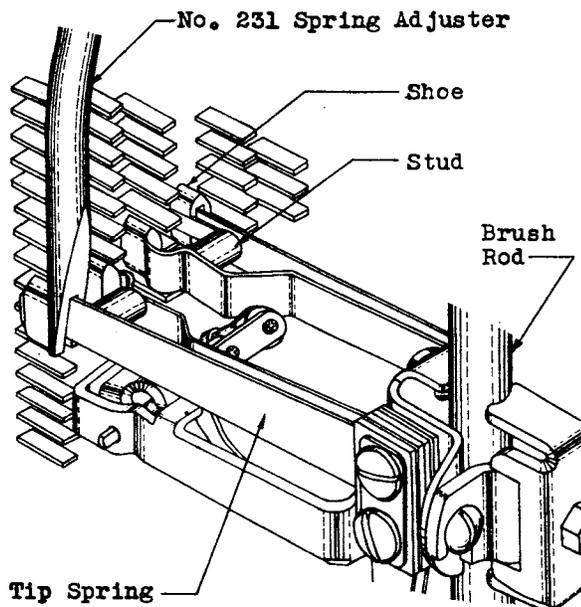


Fig. 32 - Method of Adjusting for Brush Stud Gap

3.18 Horizontal Centering of Multiple Brushes (Rq.2.18)

M-1 If there is no clearance between the back of one sleeve or hunt shoe and the associated tip or ring terminal; and there is a large clearance

between the back of the other hunt or sleeve shoe and its associated ring or tip 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 socket wrench and twist the brush assembly so that both sleeve and hunt springs will be approximately equidistant from the adjacent hunt and sleeve terminals. 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 or hunt spring shoes still make contact with the tip or ring terminals, it will generally be found that the gap between the sleeve or hunt spring at fault and the adjacent tip or ring spring at the first bend of the sleeve or hunt spring will be much greater than normal. To correct this condition, apply the No. 380-A spring adjuster close to the base of the faulty spring 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.

3.19 Brush Spring Tension (Rq.2.19)

M-1 Readjust the spring tension with the No. 380-A spring 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. 33

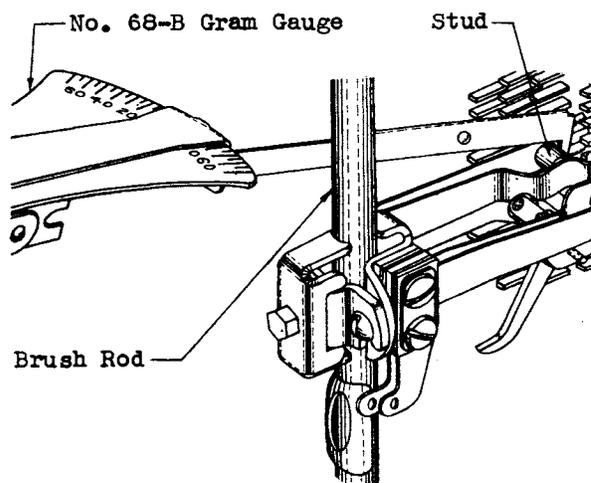


Fig. 33 - Method of Checking Brush Spring Tension Using No. 68-B Gram Gauge

3.19 (Continued)

M-2 When making any adjustment of brush springs, take care to prevent any distortion or kinking of the springs, thereby affecting their relation with the associated bank terminals.

3.20 Clearance Between Multiple Brush Frame and Bank Terminals (Rq.2.20)

M-1 If it is found that a multiple brush frame fails to clear the bank terminal the specified amount, make a check to determine if this condition is caused by a bowed rack.

M-2 Uncouple the rack and brush rod and raise the rod away from the rack, supporting the rod in the raised position with a clothes pin. Remove the rack from the clutch and, if it is bowed, straighten it in accordance with the section covering the particular type of clutches involved.

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

M-4 If the necessary clearance is not visible now, inspect the brush rod for kinks and bows. Remove any bowing or kinking of the rod as covered in procedure 3.09. If the required clearance is still unobtainable, the bearing closest to the faulty part of the rod may be moved so as to get the required clearance. Take care however, not to move the bearing enough to prevent the brush from meeting the requirements for brush intrusion 2.21 and freedom of movement of brush rod, 2.09.

M-5 If the required clearance cannot be met on the top banks on 300 point frames which are not equipped with a bearing plate between the top bank and the commutators, the trouble may be due to a bent or bowed brush rod. Correct this condition as outlined in procedure 3.09.

3.21 Brush Intrusion (Rq.2.21)

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 adjust-

ment, do not readjust it to meet this requirement. If, however, any of the adjustments covered above are made check the multiple brushes for requirements 2.18, 2.20, 2.23 and 2.24. 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.

3.22 Parallelism of Brush Springs (Rq.2.22)

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 spring adjuster. Correct any distorted spring at this time.

3.23 Hunt Spring Location (Rq.2.23)3.24 Tip, Ring and Sleeve Spring Location (Rq.2.24)

M-1 If these requirements are not met, and the brush rod is coupled to a No. 3-A or No. 4-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 line finder elevator apparatus.

M-2 To locate the hunt spring in the specified position loosen the multiple brush clamping screw with the No. 220 socket wrench sufficiently to permit shifting the brush up or down as required. Do this by tapping the shank of the socket wrench. Do not tap the frame of the brush in making this adjustment as this will be likely to mar or distort some part of the brush assembly.

M-3 While setting the hunt spring make sure that the tip, ring and sleeve springs will also meet their requirements and that the brush is located as accurately as possible horizontally after which the multiple brush clamping

## 3.23-3.24 (Continued)

screw should be securely tightened. Check the brush spring tensions and if necessary, readjust as covered in procedure 3.19.

M-4 If, after this adjustment, it is found that the tip, ring or sleeve spring fails to meet the limits specified readjust the springs at fault in the following manner.

M-5 Loosen the lower assembly screw with the No. 206 or No. 207 offset screw-driver and raise or lower the spring at fault with the No. 380-A spring adjuster until it is within the specified limits. Tighten the assembly screw and recheck the adjustment of the other spring in the same assembly. After making this adjustment check to see that requirement 2.24 (a) can be 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 and should be corrected in accordance with the section covering panel multiple banks.

- 3.25 Down Stop Collar Location (Rq.2.25)
- 3.26 Clearance Between Trip Lever and Trip Rod (Rq.2.26)
- 3.27 Clearance Between Trip Finger and End of Brush Trip Lever (Rq.2.27)
- 3.28 Clearance Between Multiple Brush Frame and Trip Rod Bearings (Rq.2.28)

M-1 To adjust for down stop collar location, first make sure that the multiple brush springs meet requirements 2.23 and 2.24, and that the commutator brush has been properly adjusted for height with respect to the brush rod as specified in the section covering panel selector commutators and commutator brushes.

M-2 If these requirements are met place the brush rod in its normal (down) position and check the adjustment of the "H", "M" and "KX" commutator brush springs in accordance with the section covering panel selector commutators and commutator brushes to determine if the brush rod has become lowered due to the down stop collar slipping on the rod.

M-3 If the stop collar has shifted upward on the brush rod it will probably be found that the setting of the "H", "M" and "KX" springs is low. If it is noted that there is but very little clearance between the trip levers of all brushes on the rod and the associated trip rods; also in the case of brush rods located adjacent to a trip rod bearing, that all the multiple brushes on the rod just

clear the adjacent trip rod bearings, proceed as follows:

M-4 Loosen the down stop collar with the KS-2630 Hex. socket wrench. Then raise the brush rod approximately 1/8" and with the down stop collar resting on the top clutch locating plate tighten the clamping screw just sufficiently to support the weight of the brush rod. Grasp the brush rod just below the commutator brush frame and tap the stop collar up by carefully raising and lowering the brush rod until the top edges of the "H" and "M" commutator springs and the bottom edge of the "KX" commutator spring are within the limits specified in the section covering panel selector commutators and commutator brushes when the brush rod is resting on the down stop collar. With the down stop collar in this position, securely tighten the clamping screw.

M-5 Slight adjustments of the "H" and "M" commutator brush springs may be made by adjusting them in accordance with the section covering panel selector commutators and commutator brushes. Do not in any case, however, adjust the "KX" spring by adjusting the contact lip, as it has been previously adjusted to meet the requirement for position with respect to the "X" segment as specified in the section covering panel selector commutators and commutator brushes.

M-6 Now check for the brush trip lever reset as follows: Raise the brush rod and trip the multiple brush by hand. Place the No. 85-B gauge beneath the down stop collar and lower the brush rod under power. Notice whether each brush resets with a snap before the brush rod comes to rest with the stop collar against the gauge. If a brush does not reset properly, check requirement 2.19 to make sure that the brush springs have enough tension.

M-7 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 surface of the rollers which come in contact with the connecting plate with Western Electric Lubricating Compound No. 3. To do this raise the brush rod and trip the multiple brush. Dip the No. 4 Artist's Sable Rigger brush into the lubricant, remove the excess lubricant from the brush before withdrawing it from the container and apply the lubricant as shown in Fig. 34. After the lubricant has been applied, restore and trip the brush a few times manually to insure that the lubricant will reach the entire surfaces of the

**3.25-3.28 (Continued)**

rollers where they come in contact with the connecting plate.

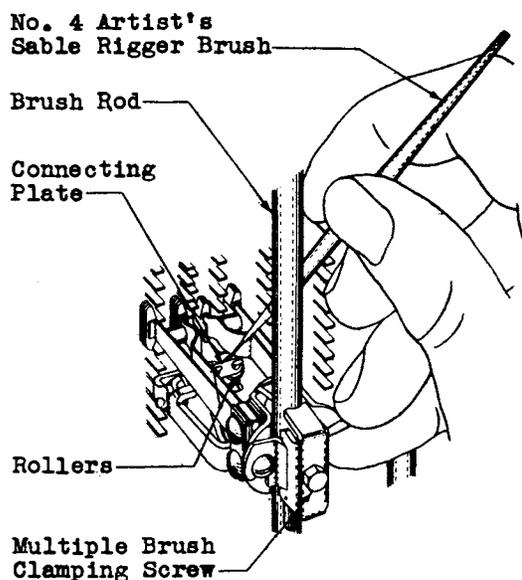


Fig. 34 - Method of Lubricating the Connecting Plate and Rollers on the Trip Lever Assembly

M-8 If, after setting the down stop collar as covered above, it is found that any or all of the requirements 2.25, 2.26, 2.27 and 2.28 cannot be met raise or lower the brush frame on the rod as required and shift the springs in the assemblies as covered in procedures 3.23 and 3.24 to compensate for the shifting of the brush frame so that the requirements for the hunting spring location (2.23) and, tip, ring and sleeve spring location (2.24) are met.

**3.29 Clearance Between Up Stop Collar and Bottom of Bearing Plate (Rq.2.29)**

M-1 To readjust the up-stop collar for position shift it on the rod as required using the No. 220 Hex. socket wrench or the KS-2631 screw-driver to loosen and tighten the stop collar clamping screw.

M-2 Also check to see that when the brush rod is raised so that the up-stop collar makes contact with the bottom of the bearing plate, the multiple brushes do not run off the topmost terminals. If this should occur the multiple brush will be damaged when the down drive is applied because it will not be guided back to the terminals, but

will snag on the topmost terminals. Remedy this by raising the stop collar nearer its minimum limit.

**3.30 Clearance Between Sides of Slots in Trip Finger and Trip Lever (Rq.2.30)**

M-1 To readjust for this clearance on all the trip fingers on a trip rod, move the trip rod bearing adjacent to the rotating lever and shift the rod to the right or left as required. Take care that adjustments specified in procedures 3.15 and 3.16 are not disturbed.

M-2 When only one or two of the brush trip levers do not clear the sides of the slots of the associated trip fingers, adjust these trip levers to meet the requirement with a pair of duck-bill pliers as shown in Fig. 35.

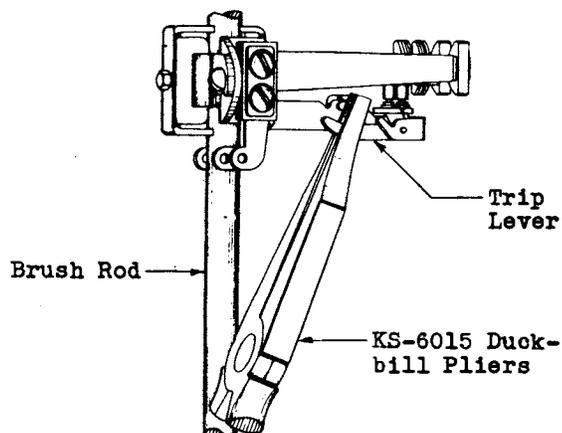


Fig. 35 - Method of Adjusting Trip Lever with KS-6015 Duck-bill Pliers

M-3 Check the multiple brushes for horizontal centering and spring tension after adjusting the trip lever.

**3.31 Clearance Between Trip Lever and Trip Finger (Rq.2.31)**

M-1 To meet this requirement on an individual trip finger, adjust the trip finger back stop slightly with a No. 330-B back stop adjuster applied to the portion of the back stop nearest the trip rod. Hold the trip rod by

## 3.31 (Continued)

means of the No. 382-A holder as shown in Fig. 36. Although this figure shows the holder over the mounting screw, the holder may be used where there is no mounting screw. Before using the No. 382-A holder make sure that the trip finger mounting screws are tight. Adjusting the back stop will change the tension of the trip finger against the back stop.

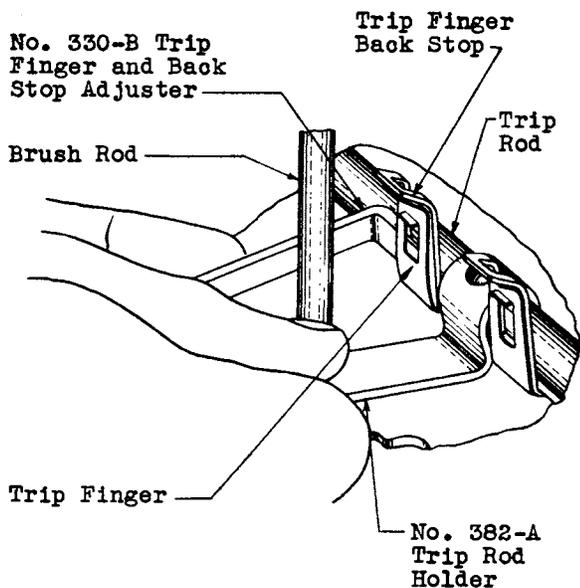


Fig. 36 - Method of Adjusting Trip Finger Back Stop to Obtain the Necessary Clearance Between Trip Lever and Trip Finger

M-2 To readjust all trip fingers on a trip rod, adjust the trip armature extension as covered in procedures 3.13 and 3.14 or reset the rotating lever by loosening the set screw while the trip rod is moved to the desired position. To obtain the maximum possible movement of a trip rod, adjust the trip armature extension so that it will engage the rotating lever as close to the fulcrum as possible, still allowing a reliable clearance between the angle portion of the trip armature extension and the rotating lever when the trip rod is held in the operated position.

3.32 Location of Trip Finger Back Stop with Respect to Trip Lever (Rq.2.32)

M-1 To check for the clearance between the trip lever and the trip finger back stop, operate the trip magnet and move the brush rod up until

the trip lever is adjacent to the back stop.

M-2 To obtain the correct clearance, adjust the bent portion of the trip finger back stop with one No. 330-B adjuster while holding the vertical portion of the back stop with a second No. 330-B adjuster as shown in Fig. 37.

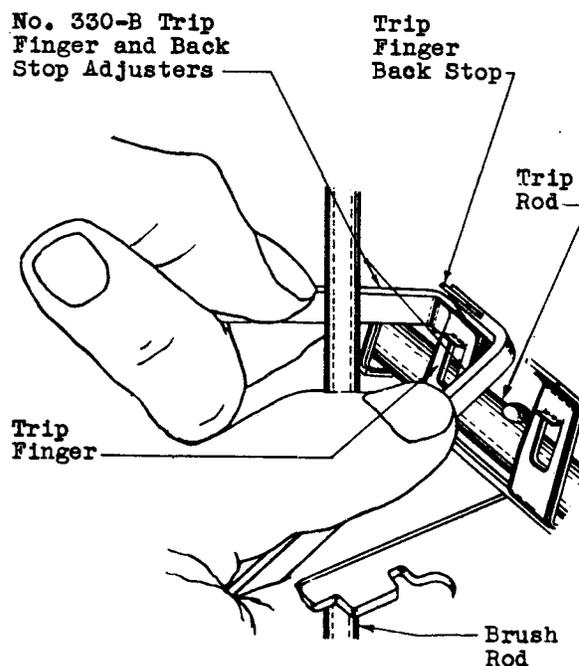


Fig. 37 - Method of Locating Trip Finger Back Stop with Respect to Trip Lever

3.33 Pressure of Trip Fingers Against Their Back Stops (Rq.2.33)

M-1 To check for this requirement, pull the trip fingers away from their back stops by placing the tip of the No. 79-C gram gauge behind the trip finger at the point where the lip is bent back and note the reading of the gauge at the instant the trip finger leaves the back stop.

M-2 To obtain the correct pressure, adjust the trip finger close to the base with a No. 330-B adjuster, holding the trip rod with a No. 382-A holder as shown in Fig. 38. Before using the holder make sure that the trip rod mounting screws are tight. As mentioned in procedure 3.31, M-1, it is not necessary to apply the holder over the head of a mounting screw.

## 3.33 (Continued)

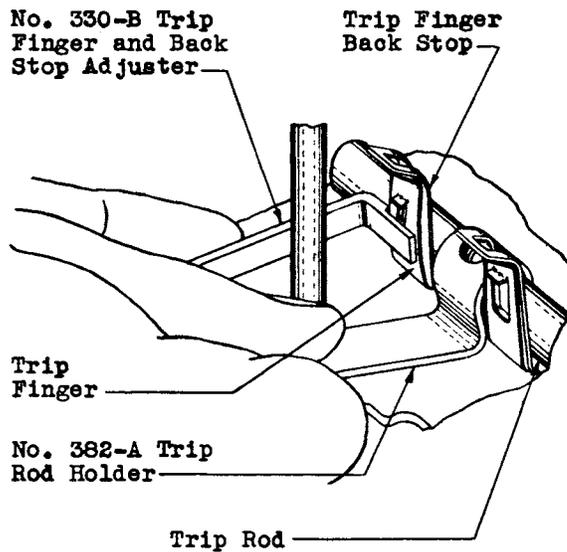


Fig. 38 - Method of Adjusting for Pressure of Trip Fingers Against Their Back Stops

3.34 Retractable Spring Tension (Rq.2.34)

M-1 To increase the tension of the rotating lever retractile spring, adjust the lug, by means of which it is attached to the plate with the No. 332 retractile spring lug adjuster as shown in Fig. 39. Exercise care in in-

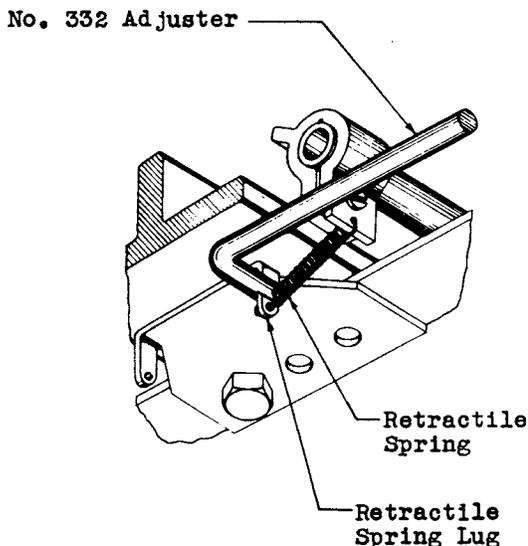


Fig. 39 - Method of Adjusting Retractable Spring Tension

creasing the tension of this spring not to prevent the trip magnet from meeting its operate requirements. To decrease the tension it may be necessary to apply the lug adjuster from the opposite side of the plate.

M-2 See that the retractile spring is in a position such that the loop attached to the fixed stud will enter the hole in the stud from the side next to the elevator rod, and not from the bottom.

3.35 Trip Magnet Operate and Release (Rq.2.35)

M-1 Before adjusting to meet this requirement, make the necessary circuits and elevators busy as covered in paragraph 3.004. During periods of heavy load, when the wire is removed from the "B" terminal regulate the test set resistances until the proper current flow specified for one magnet is established for operate and release. During periods of light load, if the test lead is connected to the "B" terminal, without removing the wire, the current flow should be regulated to two or four times the amount specified, depending upon whether or not two or four magnets are connected in parallel.

M-2 If the trip magnet does not operate and release on the proper current, increase or decrease the tension of the rotating lever retractile spring as required by adjusting the lug by means of which it is attached to the plate, from or toward the trip rod, with the No. 332 retractile spring lug adjuster. In adjusting this lug to increase the tension, do not bend it back more than approximately 45°. If the tension of the retractile spring is made to meet this requirement recheck requirement 2.34.

M-3 If difficulty is experienced in meeting the requirement, make sure that the trip rod does not bind in its bearings and then if necessary increase or decrease the gap between the non-freezing disc on the armature and the pole piece nearer the fulcrum.

M-4 If care is not exercised in attaching and removing the test clips when making this test and when obtaining battery from the trip magnet terminals for other tests on the frame the terminals may become loosened.

3.36 Multiple Brush Tripping Test (Rq.2.36)

M-1 This is a final check of other adjustments. If the multiple brush fails to meet this requirement it will be necessary to refine the foregoing adjustments to produce the maximum engagement of the trip finger with

3.36 (Continued)

the trip lever of the multiple brush. Particular attention should be given to requirements 2.11, 2.13, 2.26 and 2.31.

3.37 Smooth Brush Travel (Rq.2.27)

M-1 If a reset brush snags against the bank terminals as the selector travels up and down it will be necessary to center it horizontally as described in procedure 3.18.

M-2 To detect chattering or snagging of a tripped brush, run it to its topmost position under power. Watch the brush reset lever and if it jiggles or vibrates, the brush in question should be checked 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 Attempt to correct chattering or snagging by adjusting the springs causing the trouble so that their contact surfaces are within the parallelism requirement as covered in requirement 2.22. The No. 380-A spring adjuster may be used for this purpose.

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

REASON FOR ISSUE - CHANGES IN ADJUSTING PROCEDURES

1. To revise the list of tools, gauges, materials and test apparatus (3.001).
2. To add procedures for cleaning and oiling of brush rods (3.09).

APPROVED:

Bell Telephone Laboratories, Inc.  
Department of Development and Research

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GWK 5-4-31

(A446.003) Section 2.34

(Continued)

ELEVATOR APPARATUS  
 PANEL LINE FINDER AND  
 PANEL TRUNK FINDER

rests against the outside edge of the retractile spring adjusting lug at either side but not at the bottom.

**1. GENERAL**

1.01 This addendum covers requirements for panel trunk finder elevator apparatus and a change in the requirements for clearance between trip lever and trip finger and retractile spring tension. It supplements Section A446.003, Issue 1-D, and replaces Provisional Addendum A446.003, Issue 1-D. This addendum is reissued to cover panel trunk finder elevator apparatus and to revise the requirement covering retractile spring tension.

1.02 In addition to requirements 2.31 and 2.34 of this addendum, panel trunk finder elevator apparatus shall meet the requirements for panel line finder elevator apparatus specified in Section A446.003, Issue 1-D.

**2. REQUIREMENTS**

2.01 The following requirements replace requirements 2.31 and 2.34 of Section A446.003, Issue 1-D.

2.31 Clearance Between Trip Lever and Trip Finger - Fig. 23(A) - With the trip rod in the normal position and the brush raised, this clearance shall be:

Test - Min. .003"  
 Readjust - Min. .005"

Gauge by eye.

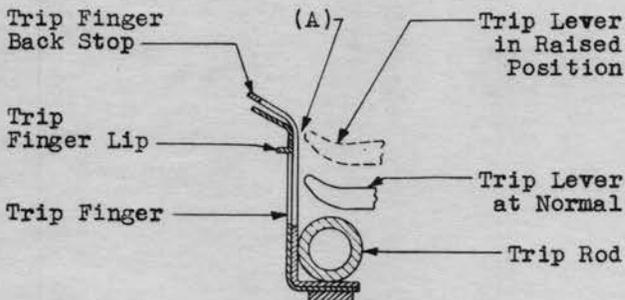


Fig. 23

2.34 Retractile Spring Tension - Fig. 24(A) - The tension of the rotating lever retractile spring shall be sufficient to restore the trip rod to its normal position and press the trip magnet armature against its back stop. Gauge by eye and by feel.

Note In checking for tension, see that the open end of the retractile spring loop

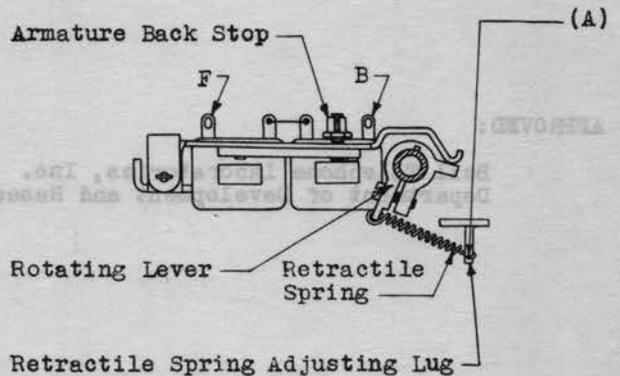


Fig. 24

**REASON FOR REISSUE - CHANGES IN REQUIREMENTS**

1. To add requirements for panel trunk finder elevator apparatus.
2. To revise the note of the requirement covering retractile spring tension (2.34).

**3. ADJUSTING PROCEDURES**

3.01 The following procedures replace procedures 3.16 M-1 and 3.34 M-2 of Section A446.003, Issue 1-D.

**3.16 Freedom of Movement of Trip Rod (Rq.2.16)**

- (1) It is difficult to meet the electrical requirements on the trip magnet unless the trip rod is free in its bearings. When checking the trip rod for bind, do not detach the retractile spring unless it is found impossible to detect the bind without so doing. If necessary, detach the retractile spring from the rotating lever with the long nose pliers, exercising great care not to distort the spring, and check for bind as outlined in M-2 to M-5 of this procedure in Section A446.003, Issue 1-D. Before hooking the retractile spring to the rotating lever, make sure that the other end of the spring passes through the hole in the retractile

3.16 (Continued)

spring lug from the front. If the spring is not hooked to the retractile spring lug in this manner, remove the spring and hook it in the lug correctly with the fingers. Then hook the spring to the rotating lever with the long nose pliers and make sure that the end of loop in the other end of the spring hooks over the outside edge of the retractile spring lug at either side, but not at the bottom as shown in Fig. 24 of this addendum.

3.34 Retractable Spring Tension (Rq.2.34)

(2) See that the rotating lever retractile spring is attached to the retractile spring lug so that the end of the loop of the spring passes through the hole in the lug from the front and hooks over the outside edge of the lug at either side, but not at the bottom.

REASON FOR REISSUE - CHANGE IN ADJUSTING PROCEDURES

1. To change the method of connecting the rotating lever retractile spring to the retractile spring lug (3.16 and 3.34).

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Department of Development and Research

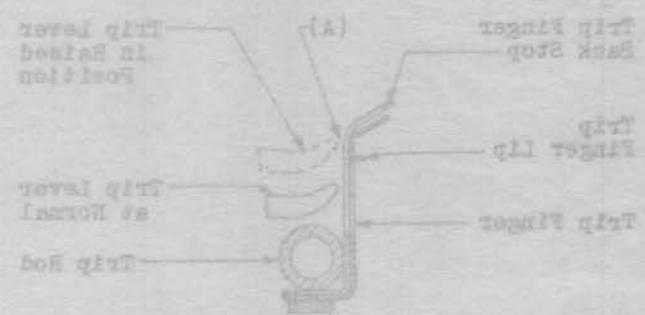
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1.02 In addition to requirements to replace the retractile spring tension, it supplements Section A446.003, Issues 1-D, and replaces Provisional Addendum A446.003, Issue 1-D. This addendum is required to cover trunk binder elevator apparatus and to revise the requirement covering retractile spring tension.

2.01 The following requirements replace requirements 2.31 and 2.34 of Section A446.003, Issue 1-D.

2.31 Clearance Between Trip Lever and Trip Finger - Fig. 24(A) - With the trip rod in the normal position and the pressure rod raised, this clearance shall be:  
Trip Finger - Min. .003"  
Trip Rod - Min. .003"  
Gauge by eye.



2.34 Retractable Spring Tension - Fig. 24(A) - The tension of the rotating lever retractile spring shall be sufficient to restore the trip rod to its normal position and press the trip against atmosphere against the back stop. Gauge by eye and by feel.

Note in checking for tension, see that the open end of the retractile spring loop