POWER DRIVEN ROTARY SELECTORS

TOGETHER WITH ASSOCIATED BANKS

1. GENERAL

1.01 This section covers Power Driven Rotary Selectors (202, 203, 207, and 208 type selectors) together with associated banks, and replaces specification X-70084-01, Issue 2-D.

1.02 Reference shall be made to Section 400.001, 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 One Discharge of Veedol Medium Cup Grease is the amount of grease that is ejected from the nozzle of the No. 353-B Lubricator when the piston is depressed to the limit of its stroke.

1.05 Operate-Operated Position Operate means that when the specified test or readjust operate current is applied, the armature shall move so that it touches the core of the magnet. This is also the operated position of the armature.

1.06 Non-Operate-Normal Position Non-Operate means that when the specified test or readjust non-operate current is applied the armature shall not leave its position against the armature back stop. This is also the normal position of the armature.

1.07 Bank Feeder Brushes are those feeder brushes which are a part of the 11 or 27 type bank.

1.08 Detachable Feeder Brushes supplement or replace the bank feeder brushes and are mounted in an individual molded base fastened in position by the top selector mounting screw.

1.09 Numbering of Rotor Brushes Facing the selector and counting from left to right from the disc, the No. 1 brush of each of the two sets of six brushes is the "bridging brush" and the remaining brushes are referred to as "non-bridging brushes".

1.10 Feeder Brush Tension and Feeder Brush Position Requirements covered in this section apply only to selectors which are equipped with the single piece type feeder brushes (one forked feeder brush spring being provided for each pair of rotor brush springs). The single piece type feeder brushes may be either detachable or bank type. No requirements are specified for the double piece type of feeder brushes.

1.11 The 207 and the 208 type selectors together with their associated banks replace the 1203 type selectors as follows:

207-A together with associated banks replaces the 1203-A selector.
207-B together with associated banks replaces the 1203-B selector.
207-C together with associated banks replaces the 1203-E selector.
208-A together with associated banks replaces the 1203-C selector.
208-B together with associated bank replaces the 1203-D selector.

As a matter of convenience, whenever mention is made herein of a 202, 203, 207 or 208 type selector the associated banks are included with the selector. For example, 207-A selector means the 207-A selector and the associated banks.

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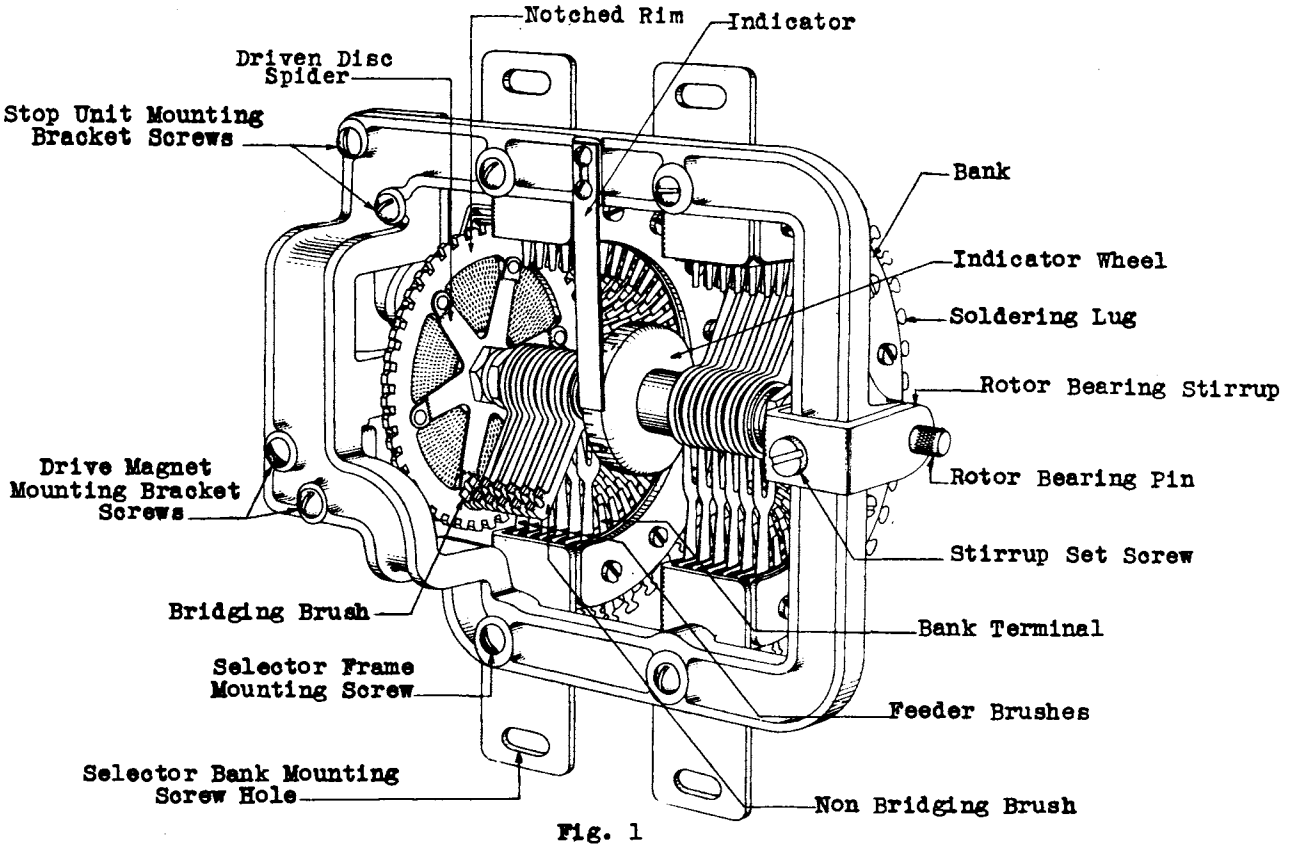

Fig. 1

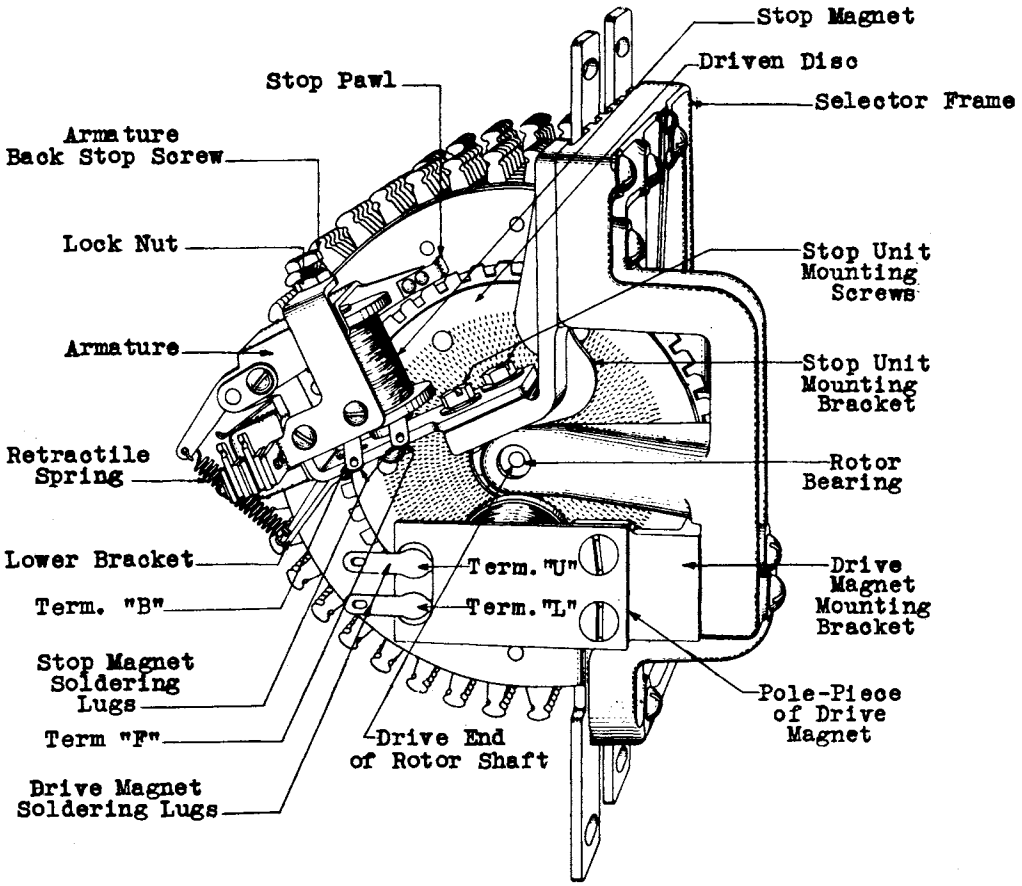

Fig. 2

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2. REQUIREMENTS

2.01 Cleaning The armature bearings, rotor bearings, the stop magnet contact springs, bank and bank terminals and the air-gap between the armature and the core shall be cleaned when necessary. Approved methods only shall be used for cleaning.

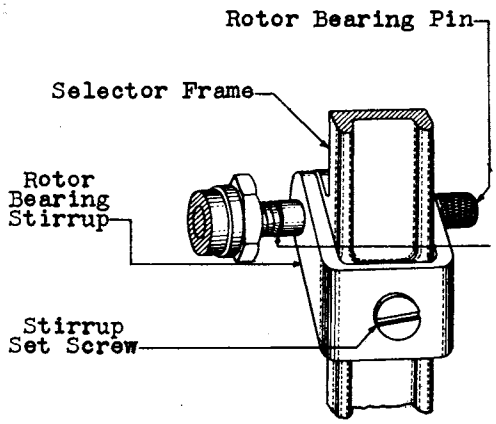

Fig. 3

2.02 Lubrication

(a) The rotor bearings shall be adequately lubricated with Veedol medium Cup Grease. When lubrication is necessary one discharge of lubricant from the No. 353-B Lubricator shall be applied.

(b) After turnover it is recommended that the bearings be lubricated at intervals of six months. This interval may be extended if periodic inspections have indicated that local conditions are such as to insure that requirement (a) will be met during the extended interval.

2.03 Record of Lubrication During the period of installation a record shall be kept, by date, of the lubrication of the selectors and this record shall be turned over to the Telephone Company with the equipment. If no lubrication has been done, the record shall so state.

2.04 End Play of Rotor Shaft The rotor shaft shall be free to turn in its bearings and the end play of the shaft shall be max. .005". Gauge by feel.

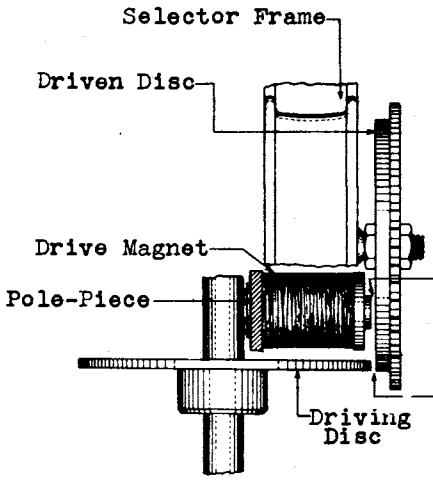

Fig. 4

2.05 Gap Between Core of Drive Magnet and Driven Disc

(a) When the drive magnet is energized the driven disc shall not rub against the magnet core.

(b) With the drive magnet de-energized and with the end play of the rotor taken up toward the driving disc, the gap between the core of the drive magnet and the driven disc shall be:

Test - Max. .045"
Readjust - Min. .030" - max. .045"

Use the No. 87-B thickness gauge.

(c) These requirements shall be met for all positions of the driven and the driving discs.

2.06 Gap Between the Driving and the Driven Discs With the driving shaft and the rotor shaft in any position about their axes, the gap between the driving and the driven discs shall be:

Test - Min. - Discs shall not touch, max. .020"
Readjust - Min. .005", max. .020"

The maximum limit shall be measured when the shafts are in the positions which bring the two discs farthest apart. Use the No. 85-A and 85-C thickness gauges.

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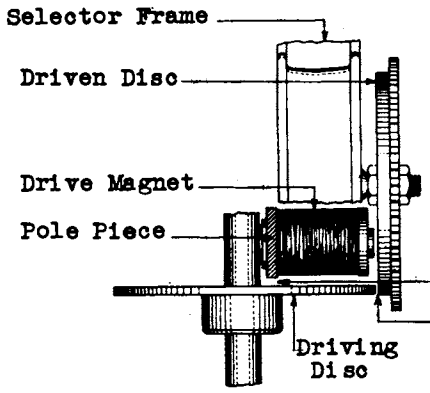

Fig. 5

2.07 Gap Between Driving Disc and Pole Piece With the drive magnet de-energized and when the driving disc is in the position where it is nearest to the pole-piece, the driving disc shall not touch the pole-piece and the gap between the driving disc and the pole-piece shall be max. .010". Use the No. 85-B thickness gauge.

2.08 Drive Pull There shall be no appreciable slip between the driving and the driven discs when the drive magnet is energized.

2.09 Stop Unit Vertical Adjustment With the armature in its operated position the pawl:

(a) On 202 Type, 203-A, B, E, 207-A, B and C Selectors shall enter, any notch in the notched rim to a depth of min. 1/32" but shall not touch the bottom of the notch. Gauge by eye;

(b) On 203-C, D, 208-A and B, Selectors shall not touch the notched rim in its closest position and the clearance between them shall be max. .022". Use the No. 87-A thickness gauge.

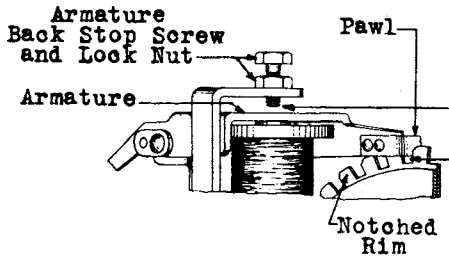

Fig. 6

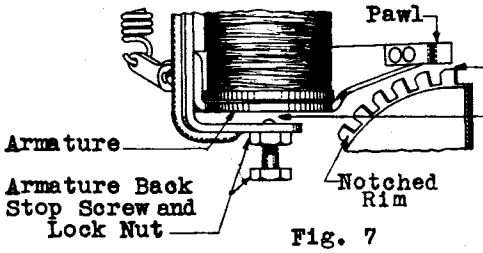

Fig. 7

2.10 Position of Armature Back-Stop The armature back stop shall be set so that, with the armature in its released position, the pawl:

(a) On 202 Type, 203-A, B, E, 207-A, B and C, Selectors will not touch the notched rim in its closest position and the maximum clearance between the pawl and the notched rim at any point during a complete revolution will be max. .022". Use the No. 87-A thickness gauge;

(b) On 203-C, D, 208-A and B, Selectors will enter all notches in the notched rim to a depth of 1/32" but the pawl shall not touch the bottom of the notch. Gauge by eye.

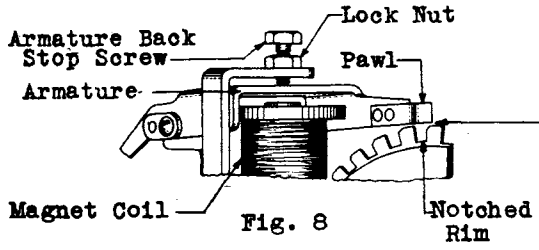

Fig. 8

2.11 Gap Between Armature and Back-Stop When the armature is in the operated position the gap between the armature and the back-stop shall be:

Test - Max. .045"
Readjust - Max. .040"

Use the No. 87-A and the No. 87-B thickness gauges.

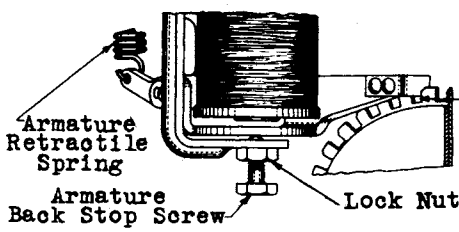

Fig. 9

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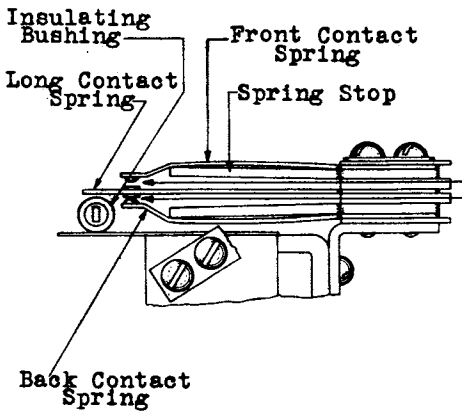

Fig. 10

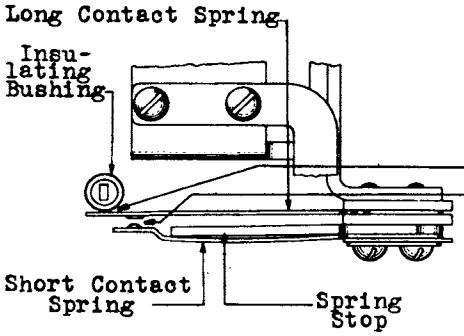

Fig. 11

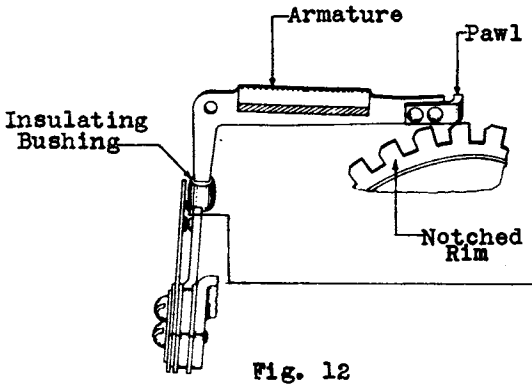

Fig. 12

2.12 Contact Pressure of Stop Unit Springs

(a) The contact pressure between normally closed spring combinations and the contact pressure between normally open spring combinations when they are closed shall be:

Test - Min. 30 grams
Readjust - Min. 35 grams

Use the No. 79-C gram gauge.

(b) On 203-C, D, 208-A and B Selectors this requirement shall be met with the pawl resting against the outer edge of the notched rim in any position of its rotation. Use the No. 70-D gram gauge.

2.13 Contact Gap Between Stop Unit Springs

(a) On 202 Type, 203-A, B, 207-A and B Selectors with the armature in the operated position and with the pawl resting in a notch of the notched rim, the gap between the contacts shall be:

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

Use the No. 88-A and 88-B thickness gauges.

(b) On 203-C, D, 208-A and B Selectors, with the armature in its normal position, the gap between the contacts shall be:

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

Use the No. 88-B thickness gauge and the .012" blade of the No. 74-D thickness gauge nest.

(c) On 203-E and 207-C Selectors, with the pawl resting against the edge of the notched rim in any position of its rotation, the gap between the front contacts shall be:

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

Use the No. 88-B thickness gauge and the .012" blade of the No. 74-D thickness gauge nest.

(c1) With the armature in the operated position and with the pawl resting in a notch of the notched rim, the gap between the back contacts shall be:

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

Use the No. 88-B thickness gauge and the .012" blade of the No. 74-D thickness gauge nest.

2.14 Gap Between Insulating Bushing and Long Contact Spring On 202 Type, 203-A, B, E, 207-A, B and C Selectors, the insulating bushing on the armature shall not touch the long contact spring when the pawl is resting on the edge of the notched rim in any position of its rotation. Gauge by eye.

2.15 Pressure of Insulating Bushing Against Long Contact Spring On 203-C, D, 208-A and B Selectors With the armature in the normal position, the long contact spring shall have a pressure against the insulating bushing on the armature of:

Test - Max. 22 grams
Readjust - Max. 20 grams

Use the No. 70-D gram gauge.

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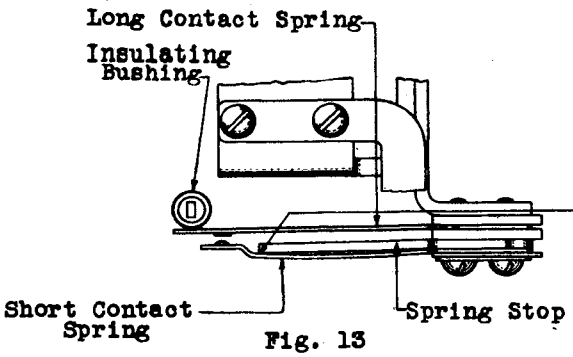

Fig. 13

2.16 Short Contact Spring Position On selectors equipped with spring stops, the contact spring shall bear against the outer end of its spring stop when the contact is open and shall not bear against the outer end of its spring stop when the contact is closed. Gauge by eye:

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

Fig. 14

2.18 Stop Unit Horizontal Adjustment

(a) All brushes shall make contact with their respective terminals when the pawl is engaged with the stopping edge of any notch in the rim. The bridging brushes shall not make contact with adjacent terminals when the pawl is engaged with the stopping edge of any notch in the rim. Gauge by eye.

(b) The trailing edges or tips of bridging brushes shall rest approximately on the center of the terminal with which they are making contact. Gauge by eye.

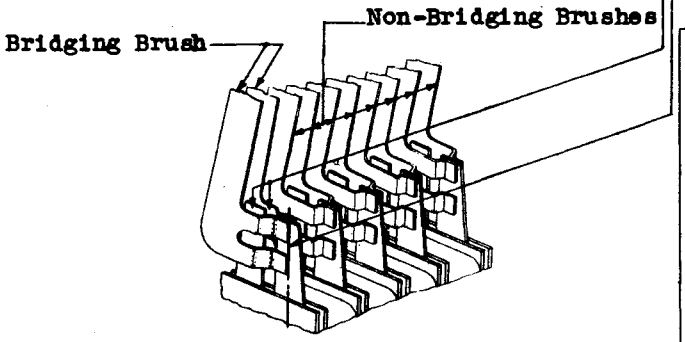

Fig. 15

2.19 Armature Retractile Spring Tension 203-C, D, 208-A and B Selectors Only With the armature resting against the armature back stop, the tension of the armature retractile spring, measured at the pawl, shall be:

Test - Min. 225 grams
Readjust - Min. 250 grams

Use the No. 79-B gram gauge.

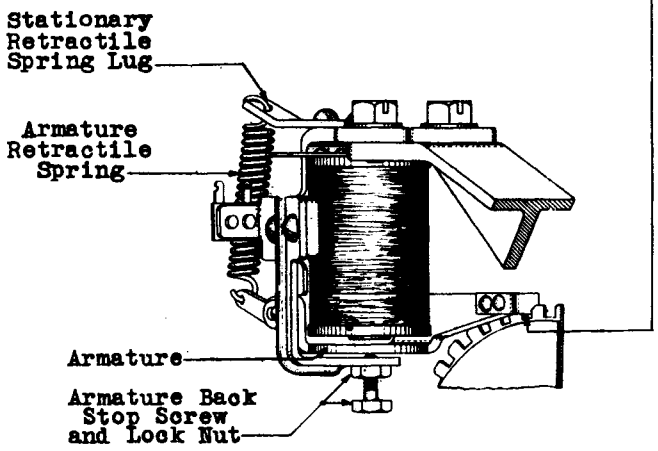

Fig. 16

2.20 Stop Magnet Electrical Requirements for 202 Type, 203-A, B, E, 207-A, B and C Selectors

(a) When the selector is wired into its associated circuit with the stop magnet permanently connected in parallel with a relay, the stop magnet shall operate under the following requirements.

		Test	Readjust
Requirements for parallel combination with 2000 ohm relay	Operate	.085 amp.	.080 amp.
	Non-Operate	.064 amp.	.067 amp.
Requirements for parallel combination with 1800 ohm relay	Operate	.085 amp.	.080 amp.
	Non-Operate	.064 amp.	.067 amp.
Requirements for parallel combination with 1500 ohm relay	Operate	.090 amp.	.085 amp.
	Non-Operate	.066 amp.	.069 amp.

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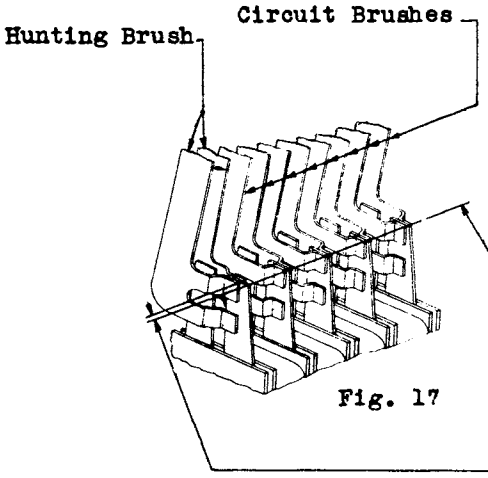

Fig. 17

2.20 (Continued)

(b) When the selector is not wired in parallel with a relay the stop magnet shall operate on:
Test - .073 amp.
Readjust - .070 amp.
and shall non-operate on:
Test - .057 amp.
Readjust - .060 amp.

(c) On 203-C, D, 208-A and B Selectors the stop magnet shall operate on:
Test - .155 amp.
Readjust - .140 amp.

2.21 Alignment of Tips of Rotor Brushes

(a) The trailing edges or tips of all "non-bridging brushes" shall be in approximately alignment. Gauge by eye.

(b) The tips of the contact portions of the "bridging brush" springs shall be advanced in the direction of normal rotation beyond the contact edges of the "non-bridging" brushes as follows:
202-E, 203 type, 207 type and 208 type selectors approximately 1/64" (Within .005")
202-C and 202-D selectors min. 1/32", max. 3/64".
Gauge by eye.

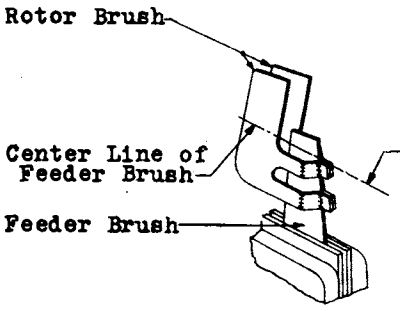

Fig. 18

2.22 Rotor Brush Alignment The junction between each pair of rotor brush springs shall line up with the center line of the associated bank feeder brush within .014" when the brushes are in the position in which they are about to pass on to the feeder brushes. Gauge by eye.

Note: In case the bank feeder brushes have been cut away this requirement shall apply to the first row of bank terminals. The feeder brushes and bank terminals are .014" thick.

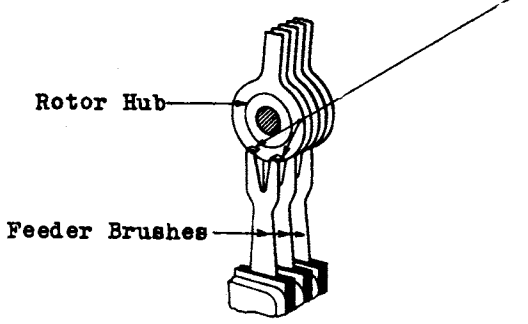

Fig. 19

2.23 Feeder Brush Position (Single Piece Type Only)

(a) When the feeder brush is pushed away from the rotor with pressure applied on the center line of the feeder brush and close to the crotch, the two prongs shall leave the rotor at the same time. Gauge by eye.

(b) Both prongs of the feeder brush shall make contact with the rotor over their entire contacting surfaces and shall not interfere with the spacing washers on the rotor at any point in the revolution of the rotor. Gauge by eye.

(c) Except where otherwise specified, there shall be an appreciable clearance (minimum .005") between all parts of the feeder and the rotor brushes except contacting surfaces thereon. Gauge by eye.

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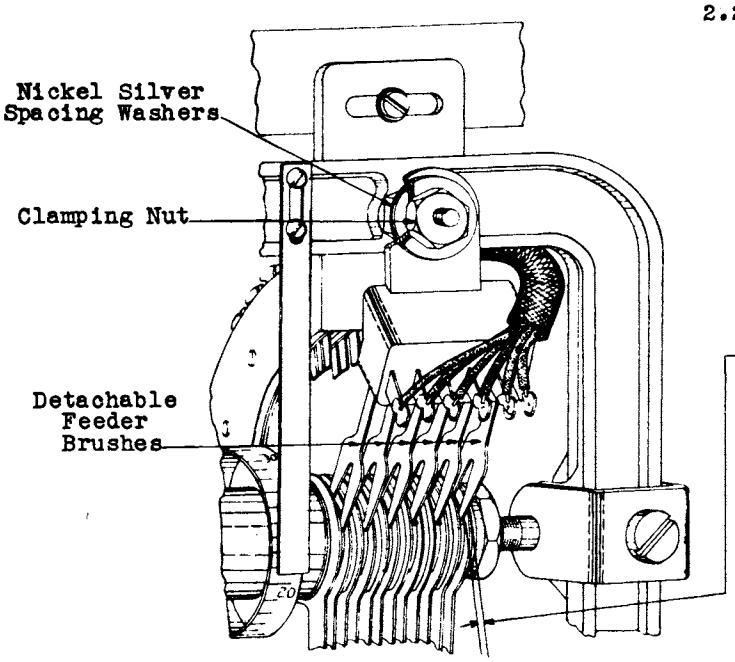

Fig. 20

2.23 (Continued)

(d) That part of the bank feeder brush over which the rotor brushes pass shall be in alignment with the bank terminals within .010". Gauge by eye.

(e) Detachable Feeder Brushes Only When one end of the non-bridging brushes is climbing up on the feeder brushes, the brushes on the opposite end of the rotor shall not be in contact with the bank terminals. Gauge by eye.

(f) Detachable Feeder Brushes Only The contacting surfaces of both prongs of each feeder brush shall be parallel to the face of the rotor brush hub and they shall be Min. 1/64" from the outside edge of the hub. Gauge by eye.

(g) Detachable Feeder Brushes Only With one end of the rotor brushes resting on the fifth row of bank terminals, the center line of each feeder brush shall line up with the junction of the associated pair of rotor brush springs within .010". The feeder brushes are .014" thick. Gauge by eye.

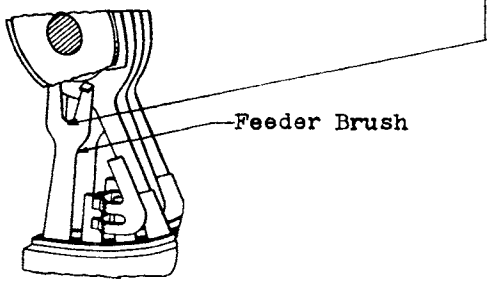

Fig. 21

2.24 Feeder Brush Tension (Single Piece Type Only) The tension of each feeder brush against the associated rotor hub measured at a point on the center line of the feeder brush and close to the crotch between the brush springs shall be:

Test - Min. 65 grams,
Max. 90 grams
Readjust - Min. 70 grams,
Max. 90 grams

This requirement shall be checked with the rotor in its normal position with respect to side-play. Use the No. 70-E gram gauge.

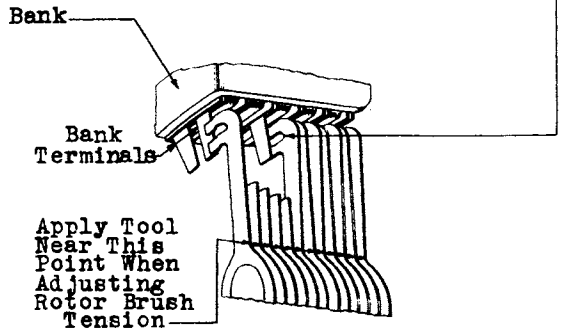

Fig. 22

2.25 Rotor Brush Tension The tension of each brush member measured at a point approximately midway between the prongs of the brush member, with the brushes on the topmost row of terminals shall be:

Test - Min. 20 grams,
Max. 50 grams
Readjust - Min. 25 grams,
Max. 50 grams

Use the No. 70-D gauge.

Note: On selectors equipped with detachable feeder brushes, it will be satisfactory to check this requirement with the brushes on the detachable feeder brushes instead of on the topmost row of terminals.

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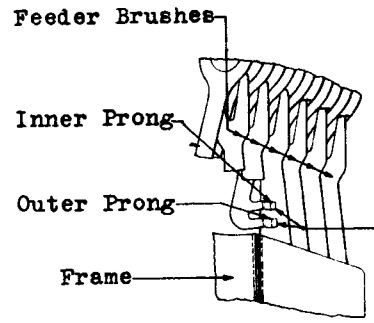

Fig. 23

2.26 Rotor Brush Prong Contact At least one prong of each individual brush member shall make contact with the associated bank feeder brush. The other prong shall not be away from the feeder brush more than:

Test - Max. .005"
Readjust - Max. .003"

Gauge by eye.

Note: In case the bank feeder brushes have been cut away this requirement shall apply to the first row of bank terminals.

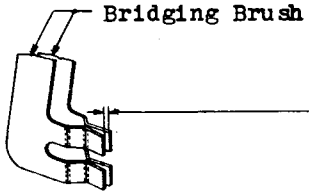

Fig. 24

2.27 Toeing of Bridging Brushes The trailing edges or tips of the bridging brushes shall toe out, but the maximum separation between tips of each pair of brushes shall not exceed .010" when the brush members are making contact with each other. Gauge by eye.

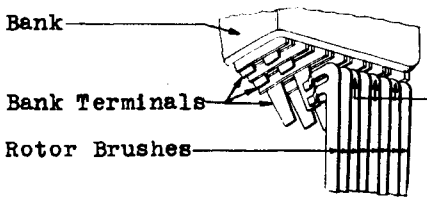

Fig. 25

2.28 Heel Spacing

(a) There shall be minimum 1/32" clearance between brush members of adjacent pairs when the brushes are in contact with the bank terminals. This requirement shall be checked on the topmost row of terminals.

Note: On selectors equipped with detachable brushes, it will be satisfactory to check this requirement on the detachable feeder brushes.

(b) The heels of rotor brush members shall clear the sides of the bank feeder brushes by Min. 1/64", (approximate thickness of a terminal) just before the brushes engage the feeder brushes. Gauge by eye.

Note: In case the bank feeder brushes have been cut away, this requirement shall apply on the first row of bank terminals.

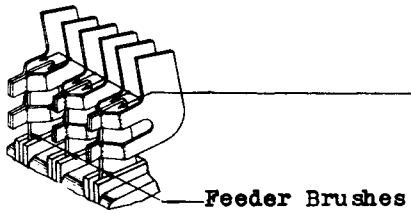

Fig. 26

2.29 False Contacting

(a) Non-Bridging Brushes There shall be a clearance of min. 1/64" (approximate thickness of a terminal) between the heels of non-bridging brush members and their associated bank terminals, when their contacting edges are in contact with each other between the bank feeder brush and the 1st bank terminal, the 11th and 12th terminals and the 2nd and 3rd terminals from the top of the bank. Gauge by eye.

Note: In case the bank feeder brushes have been cut away this requirement shall apply to the 1st and 2nd bank terminals.

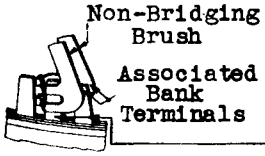

Fig. 27

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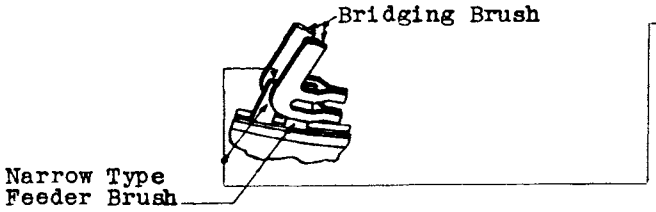

Fig. 28

2.29 (Continued)

(b) Bridging Brushes On all selectors equipped with single piece narrow type bank feeder brushes the heels of bridging brushes shall clear the first terminal by min. 1/64" (approximate thickness of a terminal) just before the rotor brushes engage the feeder brushes. Gauge by eye.

Note: In case the bank feeder brushes have been cut away this requirement shall apply to the second row of terminals.

REASONS FOR REISSUE COVERING CHANGES IN REQUIREMENTS

1. To make the necessary changes and additions to cover detachable feeder brushes.
2. To revise the requirement for lubrication (2.02).
3. To make requirement on stop unit horizontal adjustment 2.18 (b) both test and readjust.
4. To change the requirement for feeder brush tension (2.24).

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3. ADJUSTING PROCEDURES

TOOLS

Code No.	Description
35	Screw-driver - 3-1/2"
38-B	Lamp Socket with 802 Cord
103	Combination Pin, Wrench and Screw-driver
138	Adjuster
179	Spring Adjuster
245	Wrench - 3/8" and 7/16" Hex. Open Double-end Flat
265-B	Contact Burnisher
310 (2 required)	Wrench - 9/32" Hex. Open-Double-end Offset
353-B	Lubricator
359	Magnet Core and Armature Cleaning Tool
363 (2 required)	Spring Adjuster
376-A	Dental Mirror
378-A	Friction Surface Restorer
KS-6015	Duck-bill Pliers
KS-6098	Wrench - Bristo Set Screw
KS-6320	Orange Stick
-	Bell System Regular Screw-driver - 4" per A. T. & T. Co. Drawing 46-X-34
-	Bell System Cabinet Screw-driver - 3-1/2" Per A. T. & T. Co. Drawing 46-X-40
-	Bell System P-Long Nose Pliers - 6-1/2" Per A. T. & T. Co. Drawing No. 46-X-56
-	Bastard Flat File

GAUGES

Code No.	Description
70-D (or the replaced 70)	50-0-50 Gram Gauge
70-E (or the replaced 70-B)	150-0-150 Gram Gauge

GAUGES (Continued)

Code No.	Description
74-D	Thickness Gauge Nest
79-B	0-1000 Gram Push-Pull Tension Gauge
79-C	0-200 Gram Push-Pull Tension Gauge
85-A	.005" Thickness Gauge
85-B	.010" Thickness Gauge
85-C	.020" Thickness Gauge
87-A	.022" and .040" Double-end Thickness Gauge
87-B	.030" and .045" Double-end Thickness Gauge
88-A	.008" Offset Thickness Gauge
88-B	.010" Offset Thickness Gauge

TEST APPARATUS

35-C	Test Set

MATERIALS

KS-2423	Cloth
-	Veedol Medium Cup Grease
-	C.P. Carbon Tetrachloride
-	Toothpick - Hardwood - Flat at One End and Pointed at Other

3.001 Before making any of the following adjustments the associated circuit should be made busy and the necessary relays should be held operated or non-operated to isolate the circuit in which the selector operates.

3.002 In all cases where it is necessary to move the rotor brushes by hand, this should be done by placing the finger on the notched rim and applying a slight downward pressure.

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3.01 CLEANING (Rq.2.01)

M-1 Rotor and Armature Bearings If upon inspection there is found to be an accumulation of gummy oil or foreign matter on the rotor or armature bearings, carbon tetrachloride may be used very sparingly to soften this material sufficiently so that it may be removed. Only C.P. carbon tetrachloride should be used and extreme care should be taken to keep it from coming in contact with the spoolheads of the selector magnets or with any part of the bank or rotor brush assemblies other than those specified above. If the rotor bearings are cleaned with carbon tetrachloride they must be allowed to dry and then be relubricated. Under no circumstances should carbon tetrachloride be used on bank terminals or rotor brushes.

M-2 Stop Magnet Contacts Stop magnet contacts should be cleaned, when necessary, by drawing the No. 265-B contact burnisher back and forth between the contacts five or six times with the surface of the tool flat against the surface of the contact disc. At the same time the contact point should be allowed to press against the other side of the burnishing tool. In cases where this method does not prove adequate, the contacts should be flushed with a drop of C.P. carbon tetrachloride applied with a toothpick. A clean toothpick must be used for each pair of contacts cleaned. After applying the carbon tetrachloride use the contact burnisher as specified above.

M-3 Bank and Bank Terminals The selector should be rotated a number of times and any loose dirt should be carefully removed from the bank in a manner that does not affect the alignment of the terminals.

M-4 Gap Between Armature and Core Insert the No. 359 magnet core and armature cleaning tool between the armature and the core, energize the magnet and then forcibly withdraw the tool. Repeat this operation several times to remove dirt and loose galvanizing scales that may have accumulated between the armature and the core.

3.02 LUBRICATION (Rq.2.02)

General

M-1 When lubrication is necessary, use the No. 353-B Lubricator. Before doing any lubricating, examine the Lubricator, see that it is filled and working properly. If the lubricator fails to eject the lubricant properly when the piston is depressed, it is an indication that the tool is either empty or that there is an air pocket beneath the plunger. In this case it will be necessary either to refill the tool or to follow M-7 below.

To Fill the Lubricator

M-2 Unscrew the nozzle from the reservoir. Then with the Bell System 3-1/2" cabinet screw-driver remove the screw immediately above. Remove the cap from the rear of the reservoir, grip the rib in the center of the plug in the reservoir with the P-long nose pliers and exert a pull on the plug to withdraw it from the reservoir.

M-3 The Veedol Medium Cup Grease should be in a container having a minimum depth equal to the length of the reservoir of the Lubricator. Care should be taken to see that the air bubbles have been worked from the grease and that the top surface is approximately flat.

M-4 Place the rear end of the reservoir on top of the grease and depress the Lubricator until all of the air has been forced from the reservoir through the screwhole at the top and the grease starts to come out.

M-5 Replace the screw and the nozzle and withdraw the Lubricator from the grease and wipe off the excess lubricant. Place the plug in the reservoir with the rib out and while applying pressure to the plug operate the plunger repeatedly. This will eject enough lubricant to allow space for the plug as well as remove any air bubbles that may be trapped at the nozzle end of the Lubricator.

M-6 Replace the cap and tighten it against the plug.

To Remove Air Pocket

M-7 Remove the cap and apply pressure to the plug as covered in M-5, at the same time operating the plunger until grease begins to flow again.

Lubricating Rotor Shaft Bearings

M-8 In order to lubricate the disc end of the rotor shaft, loosen

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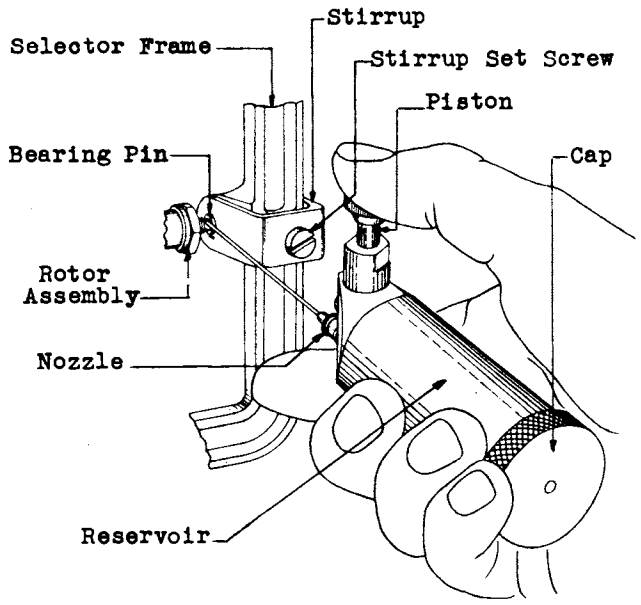
3.02 (Continued)

the set screw in the stirrup with the 4" regular screw-driver and shift the rotor to the right just sufficiently to allow the insertion of the Lubricator nozzle. Then slightly retighten the set screw. Rest the end of the nozzle against the bearing surface of the rotor shaft and depress the piston to the end of its stroke, holding the Lubricator as shown in Fig.29. Then release the piston.



Method of Using the No. 353-B Lubricator

Fig. 29

M-9 In removing the Lubricator draw the nozzle over the bearing surface of the rotor shaft so that the lubricant will be deposited on the shaft.

M-10 Care should be exercised in lubricating the disc end of the rotor shaft to make sure that the lubricant does not reach the driving or the driven discs of the selector. Care should also be exercised in lubricating the rotor bearings to prevent misplacement of the feeder brushes.

M-11 After lubricating the disc end of the rotor shaft, shift the rotor assembly to the left and apply the lubricant to the bearing surfaces of the bearing pin at the stirrup end of the selector in the manner specified for lubricating the disc end of the rotor shaft.

M-12 After the rotor bearings have been lubricated reset the bearing pin and tighten the stirrup set screw making sure that the rotor shaft is left with the specified amount of end play.

3.03 RECORD OF LUBRICATION (Rq.2.03)
(No Procedure)

3.04 END PLAY OF ROTOR SHAFT (Rq.2.04)

M-1 To check the end play of a rotor shaft, grasp the indicator wheel and attempt to move the rotor sideways.

M-2 If an adjustment is necessary, loosen the stirrup set screw with the 4" regular screw-driver and slide the bearing pin to the right or left as required. Then reset the stirrup set screw and recheck the adjustment.

3.05 GAP BETWEEN CORE OF DRIVE MAGNET AND DRIVEN DISC (Rq.2.05)

M-1 To check the clearance between the core of the drive magnet and the driven disc press the rotor to the left and attempt to insert the No. 87-B thickness gauge between the two parts with the magnet deenergized. The .030" step of the gauge should enter the gap and the .045" step should not enter or if it does it should bind.

M-2 To adjust for this clearance loosen the two round head machine screws which hold the drive magnet mounting bracket to the selector frame with the 4" regular screw-driver and shift the bracket as required. Before retightening the screws a check should be made to see that the magnet core is parallel to the face of the driven disc.

3.06 GAP BETWEEN THE DRIVING AND THE DRIVEN DISCS (Rq.2.06)

M-1 To readjust the gap between the driving and driven discs loosen the selector bank mounting screws with

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3.06 (Continued)

the 4" regular screw-driver and then move the entire selector as required. Tighten the mounting screws sufficiently to hold the selector in position. Rotate the selector brushes to the position in which the driven disc is nearest the driving disc and then check this gap. Then rotate the selector brushes to the position in which its disc is farthest from the driving disc and recheck the gap. Securely tighten the screws.

M-2 If the requirement for the gap cannot be met because of a wabbly driven disc, the spider may be sprung to correct the gap. Revolve the driven disc to the point where the gap is smallest, then apply a pressure to the top and to the bottom of the driven disc which will force the top of the disc towards the left and the bottom of the disc towards the right. Revolve the disc to check for the maximum and the minimum gaps and if necessary repeat the bending operation until the wabble is reduced sufficiently to meet the maximum and the minimum requirements.

M-3 The rotor assembly should not be taken out to adjust for the wabbly disc or for any other reason unless it is absolutely necessary. Wabbly driven discs can usually be corrected by the method described above. If the desired adjustment cannot be obtained in this manner, remove the rotor assembly in the manner outlined in Section 508.207 and then make the necessary adjustments. If the spider is bent so as to cause an eccentric motion of the disc, it should be straightened at this time.

M-4 After replacing the rotor assembly recheck the gap between the driving and the driven discs in the manner outlined under M-1 above.

3.07 GAP BETWEEN DRIVING DISC AND POLE-PIECE (Rq.2.07)

M-1 Check the gap between the driving disc and the pole-piece with the shaft revolving and with the No. 85-B thickness gauge inserted between the pole-piece and the driving disc and with the selector magnet deenergized there must be a decided drag on this gauge in at least one position but the gap should be large enough to receive it without forcing.

M-2 To adjust for this gap, stop the shaft and turn it to the position in which the driving disc set screw is under the magnet. Experience has shown that this is the position in which the gap between the driving disc and the pole-piece is the smallest. Loosen the driving disc mounting screw with a 4" regular screw-driver or with the KS-6098 Bristo set screw wrench depending on whether the screw is an old style set screw or a Bristo set screw and raise or lower the driving disc to a position within the specified limits. Then tighten the set screw. Check the gap as covered in M-1. In some cases, it may be more convenient to loosen the drive magnet bracket screws with the 4" regular screw-driver and raise or lower the drive magnet as required. Tighten the screws securely after the desired adjustment has been obtained.

M-3 Should the gap fail to meet the requirements upon recheck, it will be necessary to repeat the readjustments. With the disc mounting screw only slightly tightened, it is permissible to tap lightly on the top surface of the disc with the handle of the screwdriver when adjusting for the minimum requirement but the disc should never be tapped upward to meet the maximum requirement as this will groove the shaft and hence the disc will not hold its adjustment.

3.08 DRIVE PULL (Rq.2.08)

M-1 To determine whether or not a selector is slipping connect ground to the ground side of the drive magnet coil to cause the selector to rotate. In some cases it may be necessary to block the stop magnet non-operated in order to prevent its operation stopping the rotation of the selector.

M-2 As the selector rotates exert a slight braking pressure against the indicating wheel with the thumb and the forefinger.

CAUTION Exercise care in applying pressure to the indicating wheel as excessive braking will cause the selector to slip resulting in worn and polished surfaces on the driving and the driven discs.

M-3 If an appreciable slip between the driving and the driven discs is noted, make sure that the discs are free from the slightest traces of oil or grease. To clean the discs due to the presence of oil or grease, the following method should be employed.

M-4 With the drive shaft revolving clean the shaft directly above

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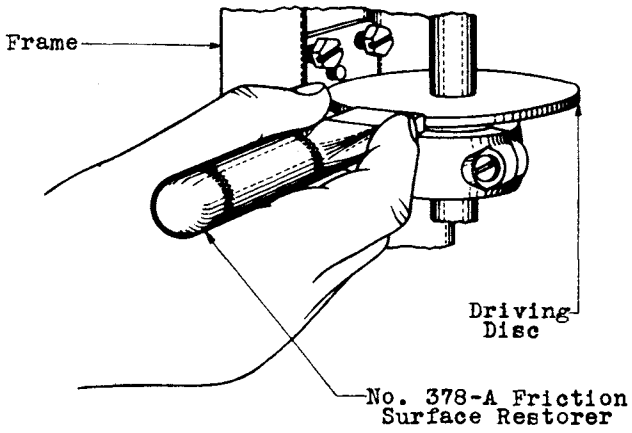
3.08 (Continued)

the driving disc, the top surface of the driving disc and the driving surfaces of the driving and the driven discs using a piece of KS-2423 cloth saturated with C.P. carbon tetrachloride. Shift the cloth as required so as to present a clean spot for each disc. When cleaning a driven disc, hold the cloth against the disc with some pressure while the rotor shaft is revolving for six or more revolutions. This pressure must not be enough to change the disc gap adjustments.

M-5 Since carbon tetrachloride dissolves asphaltum paint, care should be exercised that the cloth does not come in contact with any part of the iron framework as the dissolved paint will be absorbed by the cloth and may be carried to the driving surfaces of the discs.

M-6 Take the necessary precautions to prevent the oil or grease cleaned from one disc being transferred to other discs.

M-7 If it is found that there is an appreciable slip between the driving and the driven discs after the above cleaning operation has been performed, it will be necessary to apply the 378-A friction surface restorer to the driving disc as shown in Fig. 30 employing the following methods.



Method of Using the No. 378-A Friction Surface Restorer

Fig. 30

M-8 Grasp the stone on the 1/4" sides close to the holder and remove both the cloth and the stone simultaneously from the holder by working the stone gently from side to side to prevent breakage and exert an outward pull. Immerse the stone in water to saturate it and fill the tube approximately 2/3 full of clean water. Place the narrow side of the cloth over the end of the stone to be inserted in the tube so that the ends of the cloth can be folded down over the wide sides of the stone. Pull over the superfluous cloth on the long narrow sides of the stone and insert the stone and the cloth in the tube. Shake the tube in a lengthwise direction to work the water out over the stone. After the entire stone has been wet in this manner, clean the end of the stone to be applied to the disc with a piece of moistened KS-2423 cloth. Always keep the stone cleaned in this manner while using it.

M-9 To keep the stone in proper condition and obtain the best results do not permit oil or grease to come in contact with the stone. The stone should always be used wet as the water prevents oil and grease collecting in and filling the pores of the stone. Clean the used surface of the stone frequently and when necessary dress it flat on a bastard flat file.

M-10 Apply the friction surface restorer very lightly to the friction surface on the driving disc for one revolution of the disc. This is usually sufficient to make the selector rotate.

M-11 The moisture aids the grit of the stone in adhering to the surfaces of the discs and also starts the rusting. Care should be exercised to prevent an excessive deposit of the stone on the disc as this may produce less pull by preventing the driving surfaces of the discs making proper contact with each other.

M-12 Allow the selector to rotate and check for slip from time to time as covered in M-2 above.

M-13 If, after revolving several minutes, the selector fails to develop sufficient pull for prompt operation or has a tendency to falter or hesitate in any position, clean the driving and driven discs again thoroughly in the manner indicated under M-4 above. Then apply the friction surface restorer

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3.08 (Continued)

lightly to the driving surface of the disc as explained in M-10 above. Allow the selector to rotate until it is assured that it will operate satisfactorily.

M-14 Do not leave the position while the selector is energized, for should the selector stop or hesitate, steps should be taken immediately to eliminate the trouble and not allow the discs to rub. This prevents smooth spots being worn on the driven disc.

M-15 After the selector has been ground-in satisfactorily and while it is still revolving check the clearance between the driven disc and the core of the drive magnet during at least one revolution. If the driven disc rubs on the magnet core shift the magnet as covered in procedure 3.05.

M-16 In some cases after the friction surface restorer has been applied as outlined above and the switch fails to operate properly, it may be necessary to keep the selector out of service for a period of time to allow rusting to take place.

M-17 Caution Empty the water from the case of the friction surface restorer when its use is no longer required.

3.09 STOP UNIT VERTICAL ADJUSTMENT (Rq.2.09)

M-1 202 Type, 203-A, B, E, and 207 Type Selectors To check the vertical adjustment of the stop unit of these selectors, rotate the driven disc manually to the point where the gap between the notched rim and the pawl is smallest with the stop magnet non-operated. With the notched rim in this position operate the armature manually, rotate the selector until the pawl engages the notch nearest to this point, (do not rotate the driven disc backwards) and check to see that the pawl does not strike the bottom of the notch. Next rotate the driven disc manually to the point where the gap between the pawl and the notched rim is greatest with the stop magnet non-operated. Operate the armature manually, rotate the selector until the pawl engages the notched rim in the notch nearest to this point, and observe that the pawl engages the notch to a depth of min. 1/32".

M-2 203-C, D and 208 Type Selectors To check the vertical adjustment of the stop unit of these selectors operate the stop magnet, rotate the driven disc manually through several revolutions and observe that the pawl does not touch the notched rim in its closest position and that the gap between the pawl and the notched rim is not greater than .022".

M-3 To adjust the vertical position of the stop unit, loosen the two stop unit mounting bracket screws with a 4" regular screw-driver just sufficiently to permit shifting the bracket and raise or lower the bracket as required.

M-4 After relocating the stop unit mounting bracket, securely tighten the mounting bracket screws.

3.10 POSITION OF ARMATURE BACK STOP (Rq.2.10)
3.11 GAP BETWEEN ARMATURE AND BACK STOP (Rq.2.11)

M-1 202 Type, 203-A, B, E and 207 Type Selectors To check the position of the armature back stop on these selectors, with the armature released, rotate the selector by hand several revolutions and observe that the pawl does not touch the notched rim at any point during the revolution and also that the maximum clearance between the pawl and the rim does not exceed .022".

M-2 203-C, D and 208 Type Selectors To check the position of the armature back stop on these selectors, with the armature released, observe that the pawl rests in a notch in the notched rim at a depth of min. 1/32" but does not touch the bottom of the notch. The point of checking the minimum intrusion limit should be found by operating the armature manually and rotating the selector to the point where the gap between the pawl and rim is greatest. In checking the maximum intrusion limit the point of checking should be that where the gap between the pawl and the rim is smallest.

M-3 To check the gap between the armature and armature back stop with the armature operated, operate the armature manually and try to insert the No. 87-A thickness gauge between the armature and the armature back stop. The maximum gauge should not enter or should fit snugly in this position.

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3.10-3.11 (Continued)

M-4 To adjust the armature back stop loosen the lock nut on the armature back stop screw with a No. 310 Hex. open double-end offset wrench applied to the back stop screw and another No. 310 wrench applied to the lock nut and then turn the screw in or out as required to meet the specified adjustment. When the adjustment is completed tighten the lock nut on the armature back stop screw.

3.12 CONTACT PRESSURE OF STOP UNIT SPRINGS (Rq.2.12)
3.13 CONTACT GAP BETWEEN STOP UNIT SPRINGS (Rq.2.13)
3.14 GAP BETWEEN INSULATING BUSHING AND LONG CONTACT SPRING (Rq.2.14)
3.15 PRESSURE OF INSULATING BUSHING AGAINST LONG CONTACT SPRING (Rq.2.15)
3.16 SHORT CONTACT SPRING POSITION (Rq.2.16)
3.17 CONTACT ALIGNMENT (Rq.2.17)

M-1 Gap Between Insulating Bushing and Long Contact Spring To check the gap between the insulating bushing on the armature and the long contact spring, operate the armature manually and place the pawl on the outer edge of the notched rim. Then observe that the insulating bushing does not touch the long contact spring. This check should be made at the point of the notched rim where the gap between the pawl and the rim is greatest.

M-2 If it is found necessary to adjust for any of these requirements with the exception of requirements 2.16 and 2.17 apply the No. 179 spring adjuster close to the base of the spring and adjust the springs as required.

M-3 If the short contact spring does not bear against the outer edge of the spring stop when the contact is open, insert a toothpick close to the insulators between the short contact spring and the spring stop. Then place the No. 179 spring adjuster over the spring and the spring stop near the contact end of the spring and work the tool toward the toothpick and the insulators. Then remove the toothpick and the spring adjuster and recheck the position of the spring. Care should be exercised in making this adjustment to prevent distorting the springs.

M-4 To adjust for contact alignment loosen the assembly screws slightly with the 3-1/2" cabinet screwdriver and shift the springs as required. Then securely retighten the assembly screws.

CAUTION: The assembly screws should be loosened only when necessary.

3.18 STOP UNIT HORIZONTAL ADJUSTMENT (Rq.2.18)

M-1 To check the horizontal adjustment of the stop unit, rotate the selector brushes to a convenient position, operate the armature and see that the pawl engages the stopping edge of the associated notch in the rim. Note that the bridging brush is approximately centered on the bank terminal.

M-2 To adjust the horizontal position of the stop unit so that the hunting brush is approximately centered on the terminal, loosen the stop unit mounting screws with the 4" regular screw-driver just sufficiently to permit moving the stop unit and shift the unit back or forth as required. In some cases, due to interference of framework and wiring it may be necessary to use the No. 103 screw-driver.

M-3 After relocating the stop unit, securely tighten the mounting screws.

3.19 ARMATURE RETRACTILE SPRING TENSION (Rq.2.19)
(203-C, D and 208 Type Selectors Only)

M-1 To check the tension of the armature retractile spring see that the armature is in the normal position and apply the No. 79-B gram gauge beneath the pawl and pull in a direction opposing the pull of the spring.

M-2 To adjust the armature retractile spring tension bend the stationary retractile spring lug with a No. 138 adjuster or with a pair of KS-6015 duckbill pliers.

3.20 STOP MAGNET ELECTRICAL REQUIREMENTS (202 TYPE, 203-A, B AND E, AND 207-A, B AND C SELECTORS ONLY) (Rq.2.20)

M-1 To check the stop magnet operation or non-operation on the specified current, connect the No. 35-C test set in series with the stop magnet and by means of the variable resistances regulate the current flow to meet the limits specified in the requirement.

M-2 To adjust for this requirement regulate the current flow to the specified value and increase or decrease the armature retractile spring tension by bending the stationary retractile spring lug as required with the No. 179 spring adjuster.

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3.21 ALIGNMENT OF TIPS OF ROTOR BRUSHES (Rq.2.21)

M-1 An inspection of the rotor brush assembly should show the trailing edges or tips of all "non-bridging brushes" in approximate alignment and the "bridging brush" advanced the specified amount beyond the contact edges of the non-bridging brushes. Should there be a noticeable deviation from the above, the entire rotor brush assembly should be changed in accordance with Section 508.207.

3.22 ROTOR BRUSH ALIGNMENT (Rq.2.22)
3.23 FEEDER BRUSH POSITION (Rq.2.23)
3.24 FEEDER BRUSH TENSION (Rq.2.24)
3.25 ROTOR BRUSH TENSION (Rq.2.25)
3.26 ROTOR BRUSH PRONG CONTACT (Rq.2.26)

Rotor Brush Alignment

M-1 To check the brush alignment, rotate the selector to a position where one end of the rotor brush assembly is about to pass on to the bank feeder brushes, or bank terminals when the feeder brushes are cut away, and note visually that the junction between each pair of brush prongs is in line with the center line of the associated feeder brush or bank terminal within the specified limit.

M-2 The 38-B lamp socket and cord may be used for supplying light when making this adjustment. To use this tool, hold it with the lamp turned to the front, insert it between the frames of adjacent selectors and then give it one quarter turn to the left or right as required. Attach one end of the cord to ground and the other end to the battery fuse panel. It should be noted that a lamp for use with the available voltage is being used in the lamp socket.

M-3 When the majority of the rotor brushes are found to be out of line with the bank feeder brushes or bank terminals and this misalignment is in the same direction, loosen the selector mounting screw and the bank mounting screw and shift the bank to the right or to the left as required and then retighten the screws.

M-4 Adjust an individual rotor brush spring as required with the No. 363 spring adjuster. Care should be used not to produce any sharp bends or kinks or otherwise to distort the brushes.

M-5 Advance the rotor assembly electrically for half revolution or until the opposite ends of the rotor brushes are about to pass on to the bank feeder brushes or bank terminals and repeat the above adjustment.

Feeder Brush Position

M-6 Any adjustments necessary to place the feeder brushes in their proper position with respect to the rotor may be made with the No. 363 spring adjuster or a pair of KS-6015 duck-bill pliers.

M-7 In the case of the detachable units, it may be necessary to loosen the clamping nut with the No. 245 wrench and shift the unit, making use of the play in the mounting hole. If this does not permit the required adjustment, remove the brush assembly from the mounting stud and change the number of nickel silver spacing washers as required.

Feeder Brush Tension

M-8 To check the feeder brush tension apply the No. 70-E gram gauge to each feeder brush except the No. 1 brush at a point on the center line of the brush and close to the crotch. The gauge should be applied in a direction tending to lift the feeder brush away from the associated rotor hub and should register at least the minimum specified tension but not more than the maximum specified tension when the feeder brush prongs break contact with the rotor. When checking this requirement make sure that the rotor assumes its normal or centralized position.

M-9 In adjusting feeder brushes, care should be used in making the adjustments not to distort them. The feeder brushes should usually be adjusted for tension by placing the No. 363 spring adjuster close to the base of the spring and applying a turning motion. If however the bow in the spring is such that bending at this point will leave the part of the feeder brushes over which the rotor brushes passes more than .010" out of alignment with the first bank terminal, use the KS-6015 duck-bill pliers for this operation. When using duck-bill pliers grasp the spring above the point at which the rotor brushes contact and move the pliers towards the top, at the same time giving them a twisting motion in a direction of the desired tension.

Rotor Brush Tension

M-10 Rotate the rotor brushes to the top row of terminals in the back or to the detachable feeder brushes when

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3.22-3.26 (Continued)

installed and then apply the end of the No. 70-D gram gauge to each brush member in the upper end of the rotor brush assembly. The tension gauge should be applied to a point on the heel of the brush midway between its two prongs and in a direction tending to push the contact prongs away from the terminals with which they are making contact. The gauge is provided with a stop which should be set at the minimum tension specified. The reed should leave the stop just before the brush spring breaks contact with the terminal. The 38-B lamp socket and cord may be used in making this adjustment as covered in M-2.

M-11 To adjust an individual rotor brush spring, apply the No. 363 spring adjuster to the base of the brush spring close to the shaft of the rotor brush assembly. In the case involving detachable feeder brushes, it may be necessary to advance the selector one or two steps to adjust the springs close to the shaft of the rotor brush assembly after which the rotor assembly should be returned to its previous position to check the adjustment. Take care in adjusting the brush springs not to change the alignment of the brush contacting edges. This is especially important on bridging brushes where such improper bending would shorten the contact surface. In making adjustments of the brush spring tensions, the tool should be given a turning motion and not used as a lever and given a side motion.

M-12 When tests and adjustments have been completed on one brush end of the rotor brush assembly, rotate the selector to a position where the opposite brush end is in the proper position and resting upon the top row of terminals in the bank on the detachable feeder brushes when installed, and repeat the same tests and necessary readjustments as described in M-11 and M-12.

Rotor Brush Prong Contact

M-13 Check for prong contact in doubtful cases by touching the prongs of the brushes with the end of an orange stick and noting whether or not both prongs make contact with the feeder brush or bank terminal when the feeder brushes are cut away. The "feel" of the tool will be an aid to the visual check for the requirement.

M-14 On selectors equipped with the double piece type feeder brushes which are not in alignment with their associated bank terminals within .010" at the point where the rotor brushes pass over them or which have a separation between the halves at this point of more than .005", it will be advisable to check or adjust for prong contact of the rotor brushes on the first row of bank terminals instead of on the feeder terminals.

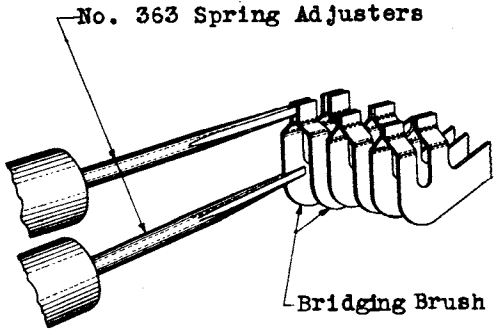
M-15 To readjust the inner prongs to meet this requirement, rotate the selector to the horizontal position, place the end of the No. 35 screw-driver in the slot between the prongs of the brush member and apply a turning or prying motion in the direction required. To adjust the outer prongs, apply the No. 363 spring adjuster to the tip of the prong and give the tool a slight twisting motion. In adjusting prongs which do not meet the requirements, an attempt should be made to bring the clearance as near to zero as possible.

3.27 TOEING OF BRIDGING BRUSHES (Rq.2.27)

M-1 To check the toeing of bridging brushes, rotate the selector to a convenient position and observe whether the trailing edges or tips of each pair "toe out". Toeing bridging brushes out has a tendency to increase the reliability of their bridging. When necessary to adjust the toeing of bridging brushes proceed as follows.

M-2 Rotate the selector until the brushes are approximately in a horizontal position.

M-3 Hold the heel of the brush with one No.363 spring adjuster and use a second No.363 spring adjuster on the contact portion of the brush to produce the required "toeing out". Hold the spring adjusters in the manner shown in Fig. 31 . Care should be taken so that



Method of Adjusting Toeing of Bridging Brushes

Fig. 31

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3.27 (Continued)

the brush is not distorted when applying this adjustment.

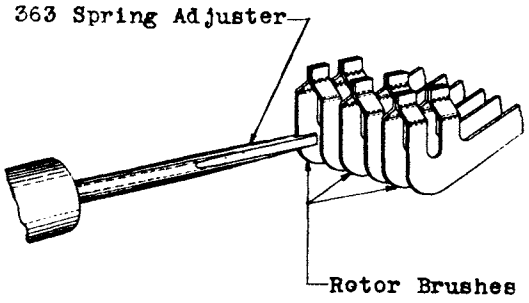
M-4 Advance the selector 1/2 revolution and repeat the adjustment on the other pair of bridging brush members.

3.28 HEEL SPACING (Rq.2.28)
3.29 FALSE CONTACTING (Rq.2.29)

M-1 To check for heel spacing and false contacting, rotate the selector in turns to each of the specified positions and note whether or not the specified requirements are met.

M-2 The 38-B lamp socket and cord may be used to supply light when checking these requirements. The No. 376-A dental mirrors may be used in inspecting for the "false contacting" requirement.

M-3 The Heel Spacing and False Contacting requirements should be met by adjusting the brushes close to the heels as required with a No. 363 spring adjuster as shown in Fig. 32. When detachable feeder brushes are installed, it will be necessary to advance the selector beyond these brushes to adjust the springs after which the rotor brush assembly should be returned to its previous position to check the adjustment. Care must be exercised in adjusting brushes for these requirements not to change the brush tension. The brush tension should be rechecked after these adjustments are made.



Method of Adjusting Heel Spacing and False Contacting

Fig. 32

REASONS FOR REISSUE COVERING CHANGES IN ADJUSTING PROCEDURES

1. To revise the list of tools and gauges.
2. To revise the procedures for lubrication (3.02).

APPROVED:

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