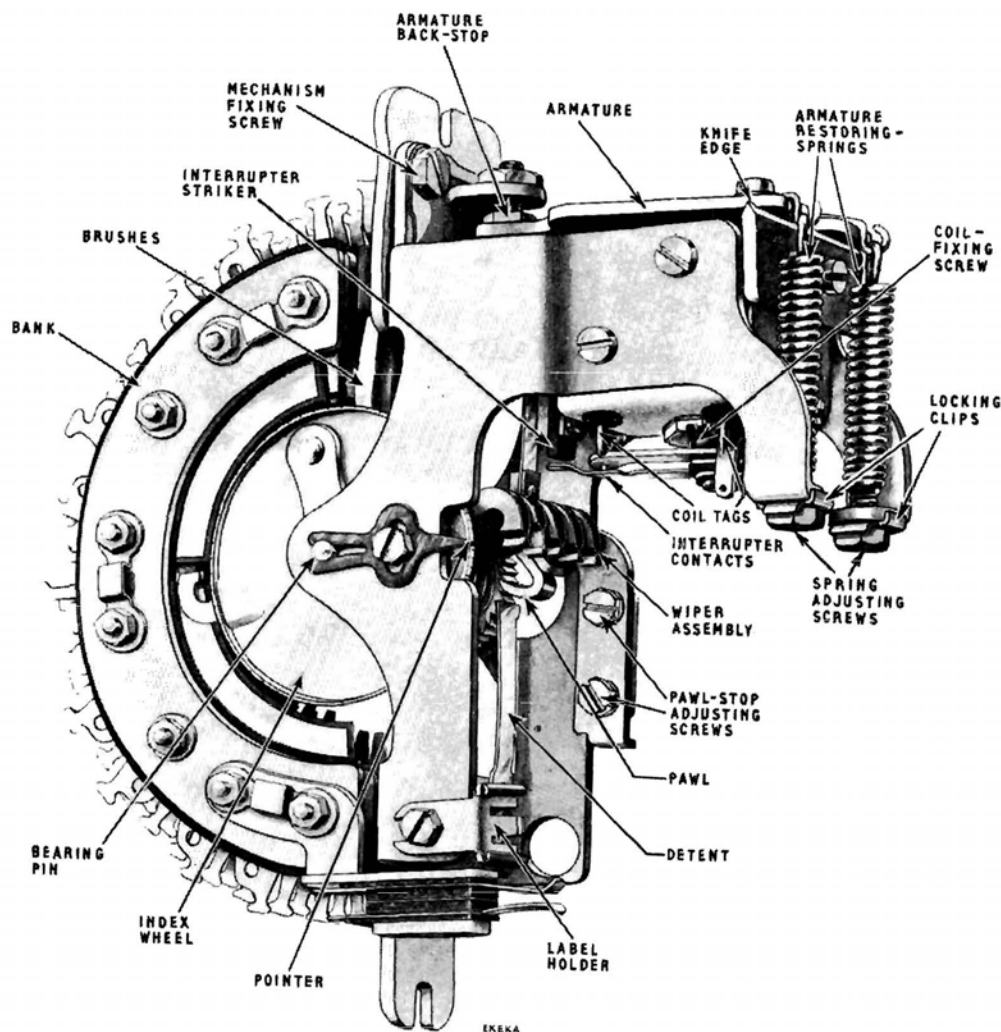


UNISELECTOR P.O. TYPE 3 Maintenance Adjustment Instruction

1. General.—This Instruction details the maintenance adjustments of the P.O. Type 3 uniselector, which is used on subscribers' line equipments. It is available in two sizes, for banks with 4 or 5 levels, the mechanical details of which are identical, except for the wiper assemblies. The uniselectors are of the 25-outlet type with double-ended wipers and each end of the wipers sweeps over the same level of 25 bank contacts in one revolution.

Adjustments which do not involve alignment of the mechanism to the bank and brushes may be performed conveniently with the mechanism mounted on an Outtrigger, No. 2.

General views of the uniselector, showing the names of the principal parts, are given in Figs. 1 and 2.



★FIG. 1

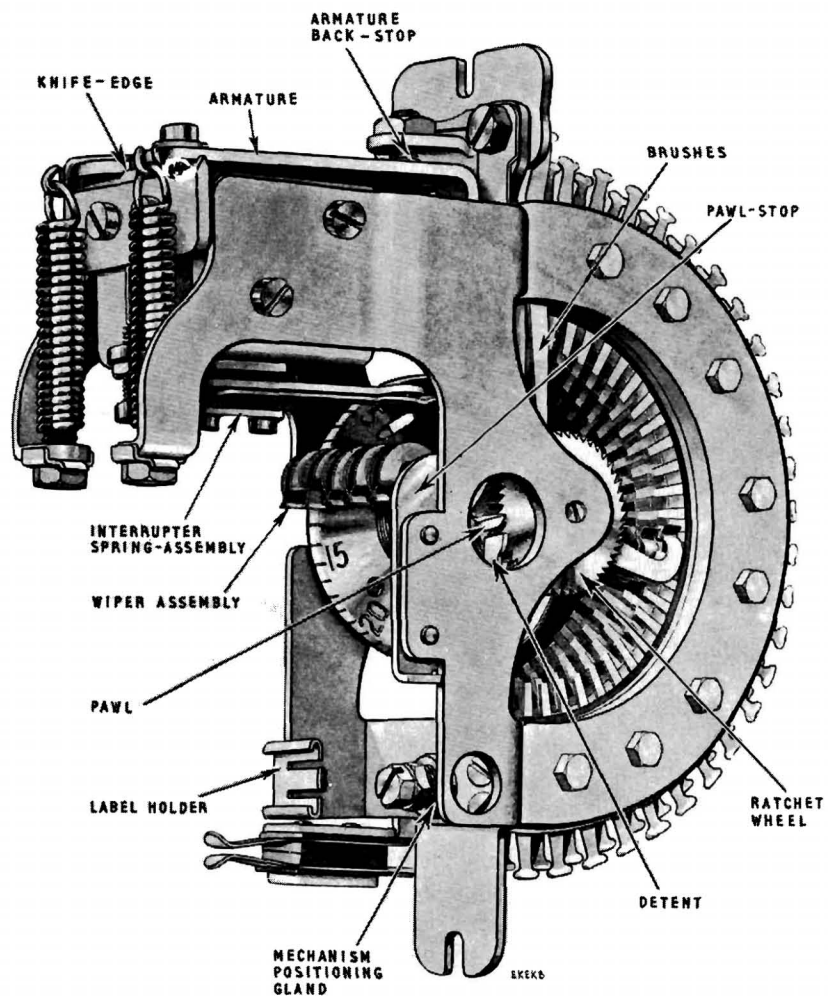


FIG. 2

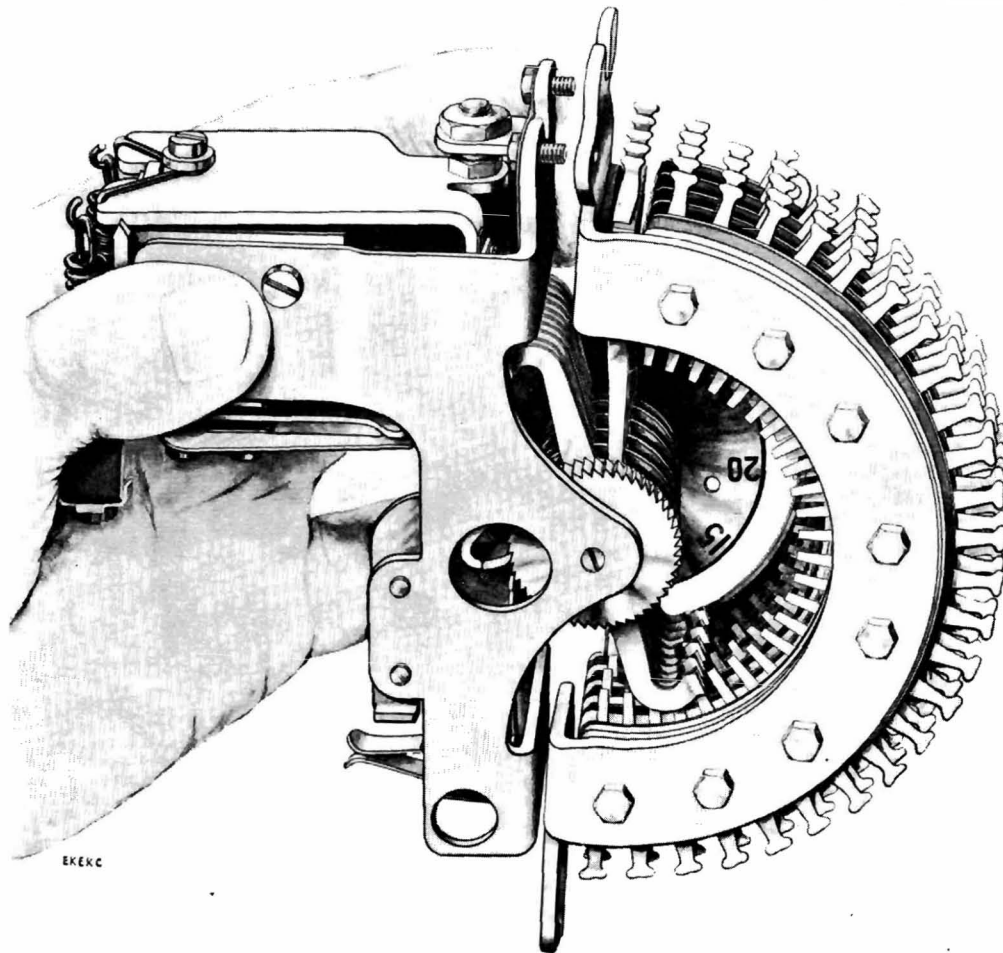


FIG. 3.—REMOVING THE MECHANISM FROM THE BANK

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MECHANISM ADJUSTMENTS

★3. **Adjustment tolerances.**—The terms 'test' and 'readjust' values are defined in B 5100

4. **Removing mechanism from bank.**—To avoid any possibility of the wipers fouling the bank and brushes, set the wipers on the lower half of the bank, between contacts 15 and 25. Then withdraw the two top mechanism-securing screws; grip the mechanism with one hand; remove the bottom securing-screw with the other hand, and withdraw the mechanism (see Fig. 3).

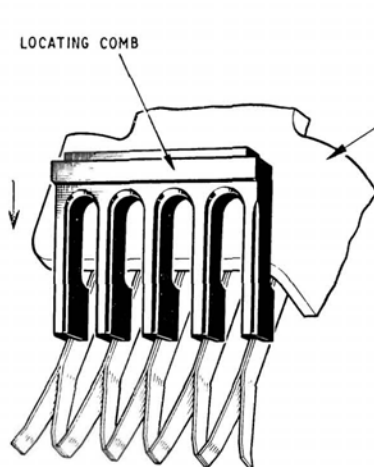


FIG. 5

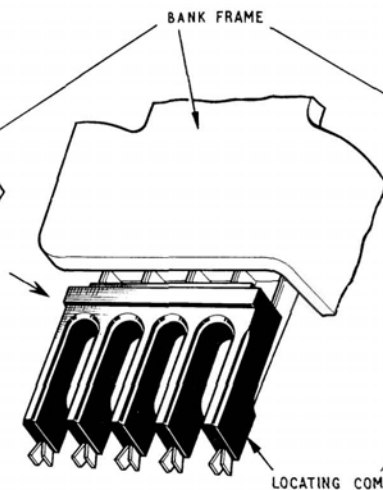


FIG. 6

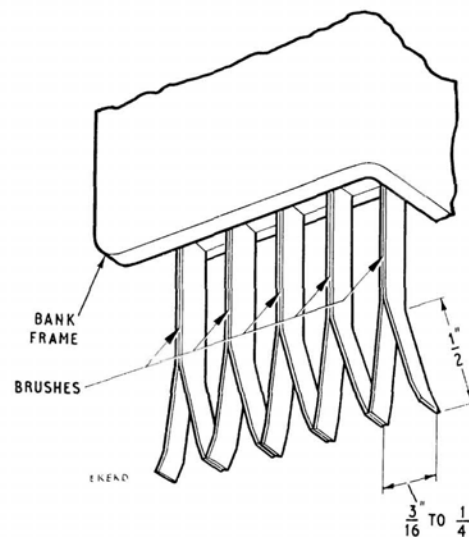


FIG. 4

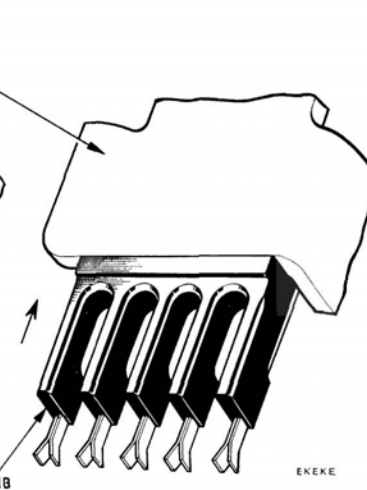


FIG. 7

5. **Adjustment of brushes.**—The two springs of each brush should lie flat against each other from their base to a point $\frac{1}{2}$ in. from the tips. From this point, the tips of the two springs should be set outwards so that there is a space of $\frac{3}{16}$ in. to $\frac{1}{4}$ in. between the tips (see Fig. 4). Each pair of brushes should be at right-angles to their mountings.

6. **Replacing mechanism in bank.**—Place a locating comb over the brushes at a point above the set in the spring (see Fig. 5). Slide the comb downwards until the tips of each pair of springs have been compressed (see Fig. 6). The reduced rib of the comb should then be inserted behind the bank frame by sliding the comb upwards (see Fig. 7).

Set the wipers on a position between 3 and 5, as shown by the index wheel. Pass the heels of each pair of wipers through their respective slots in the comb (see Fig. 8) and move them upwards to engage with the first bank contacts, then push the mechanism well home on the bank, so that the brushes are in engagement with their respective collector rings. Engage the mechanism-fixing screws. Then release and remove the comb. Tighten the mechanism-fixing screws securely by means of a box spanner.

Do not attempt to replace the mechanism without fitting a locating comb over the brushes.

7. Brush spring tension.—The tension of each spring on its collector ring should be 40 ± 20 gm (test) 40 ± 15 gm (readjust), measured as near to the tip as possible (see Fig. 9).

(a) *To increase the tension* of a brush remove the mechanism from the bank and reset the springs (see par. 5).

(b) *To decrease the tension.*—Using an Adjuster, Spring, No. 9, gently lever the particular spring away from the collector ring as shown in Fig. 10.

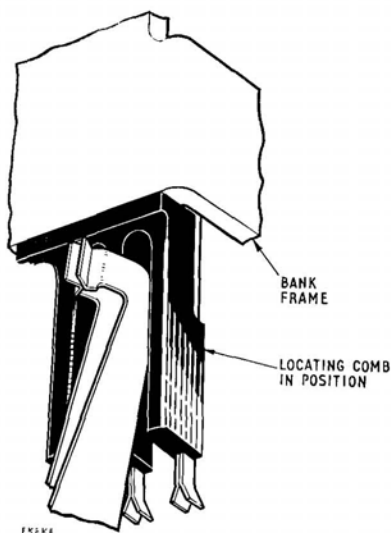


FIG. 8

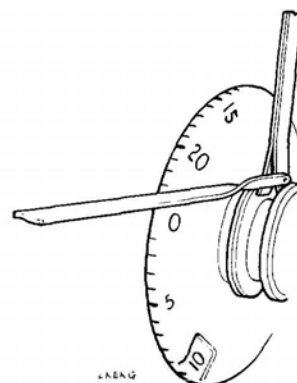


FIG. 9.—MEASURING BRUSH SPRING TENSION

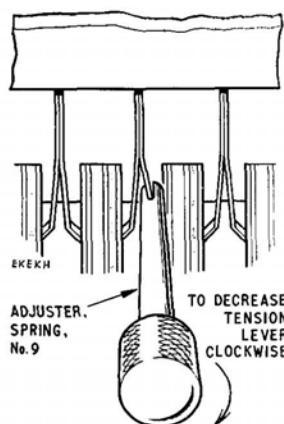


FIG. 10.—DECREASING BRUSH SPRING TENSION

8. Armature knife-edge.—This should be positioned by means of its adjusting screw (see Fig. 11) so that when the armature is manually operated the following conditions obtain:—

- (a) The armature is parallel to the side of the coil box (see Fig. 12).
- (b) There is a clearance between the sides of the coil box and the armature.
- (c) The pawl covers the full width of the ratchet teeth (see Fig. 13).
- (d) The operating face of the pawl tip is parallel to the short face of the ratchet teeth.

It is permissible to tilt the knife-edge slightly to meet the above conditions.

9. Detent.—Position the detent so that the tip of the detent covers the full width of the ratchet teeth (see Fig. 13). The depth of engagement of the detent in the ratchet teeth should be approximately equal to the thickness of the detent.

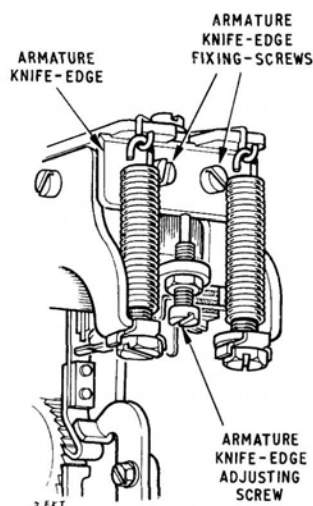


FIG. 11

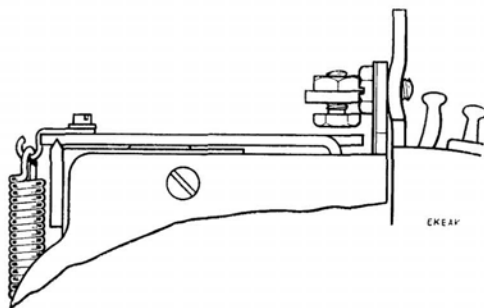
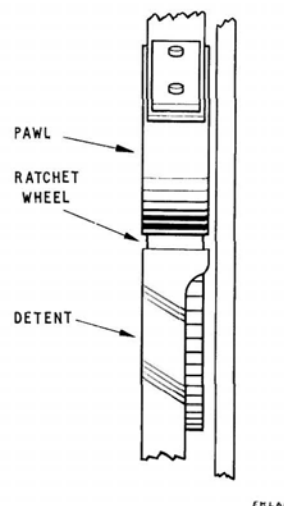


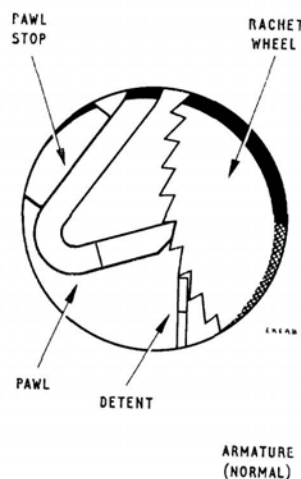
FIG. 12

(a) To adjust the detent, insert a 3-mil feeler gauge between the armature and the magnet core and operate the armature electrically. Lightly push the wipers backwards until the operating face of the pawl is resting against the short face of a ratchet tooth. With the wiper assembly held in this position, adjust the detent to rest squarely against the short face of the ratchet tooth, next to the one in which the pawl is resting. When the armature is normal, the detent spring should rest in the second tooth from the pawl (see Fig. 14).

With the detent-fixing screws lightly tightened, fine adjustment may be obtained by inserting the pointed end of an Adjuster, Detent, No. 4 into the hole in the detent and levering the adjuster in the desired direction.



★FIG. 13



★FIG. 14.—DETENT SPRING RESTING IN 2ND TOOTH AWAY FROM THE PAWL

(b) *Tension of the detent.*—The tension exerted on the ratchet wheel should be 110 ± 50 gm (test) 110 ± 30 gm (readjust), measured as near to the tip as possible. Adjust as follows:—

(i) *To reduce the tension.*—Ease the detent away from the ratchet wheel, using the slotted end of an Adjuster, Detent, No. 4.

(ii) *To increase the tension.*—Remove the detent from the uniselector and, using duck-bill pliers, reset the spring at the root.

When measuring the tension, ensure that the tip of the detent is not binding on the short face of the ratchet tooth.

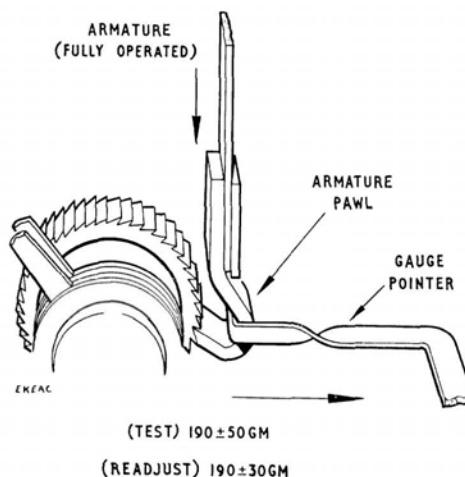
★**10. Armature back stop.**—Lubricate the ratchet wheel, pawl stop and armature back stop, then adjust the armature back stop so that, when the armature is released after electrical operation, the detent drops cleanly into the ratchet teeth without allowing any backlash of the wiper assembly. This must be checked on each tooth of the ratchet wheel. Because of slight manufacturing variations in the ratchet teeth, slight backlash is permissible on some steps but not on all.

11. Pawl-spring tension.—The tension of the pawl spring should be 190 ± 50 gm (test) 190 ± 30 gm (readjust), measured at the hooked portion of the pawl, with the armature fully operated manually (see Fig. 15).

(a) *To reduce the tension.*—With the armature operated, apply an Adjuster, Spring, No. 3 to the root of the spring and gently lever it outwards.

(b) *To increase the tension.*—Remove the armature from the uniselector and, with the aid of Pliers, Adjusting, No. 1, reset the spring at the root.

12. Pawl stop.—With the armature normal, the pawl should be lightly wedged between the pawl stop and the ratchet wheel. The combined adjustment of the pawl stop and detent should be such that the backward and forward lash in the wiper assembly is only just perceptible on at least one position of the ratchet wheel. The backward and forward lash on any of the remaining positions of the ratchet wheel must not be such that the tips of non-bridging wipers, when lightly moved backwards and forwards, by hand, traverse more than $\frac{1}{4}$ the width of a bank contact.



★FIG. 15.—MEASURING PAWL-SPRING TENSION

13. Stepping test.—To check the adjustments described in pars. 9 – 12, insert a 3-mil feeler gauge between the armature and core, operate the armature electrically, and check that the pawl steps over the ratchet teeth. With a 6-mil gauge substituted, the pawl should not step over the ratchet teeth. Check this in at least four positions, approximately equidistant, round the ratchet wheel. These values should be considered as readjust values. The test values for maintenance routine purposes are 2 mils and 7 mils, respectively, and if outside these values the uniselector should be readjusted.

★14. Position of non-bridging wipers on bank contacts.—The position of the non-bridging wipers on the bank contacts should be such that the radial centre (through the contact portion) rests within the limits of $\frac{1}{3}$ and $\frac{2}{3}$ of the width of a bank contact (see Fig. 16). To adjust the position of the wipers:—

(a) Set the wipers on the first bank contact. Using a Spanner, Cranked, No. 11, loosen the wiper-assembly clamping-nut on the index wheel. Place the reverse end of the spanner into the slot in the index wheel and move the wiper assembly in the required direction, until the wipers rest approximately half-way on the bank contacts. (The relative position of the wipers and bank contacts should be viewed by looking up into the uniselector from the front.) Tighten the wiper-assembly clamping-nut.

(b) When uniselectors are mounted close together a Mirror, Inspection, No. 2 should be used to check the position of the wipers on the bank contacts. If any

difficulty is encountered using this method the following tests will determine whether the wiper to bank contact position is correct:—

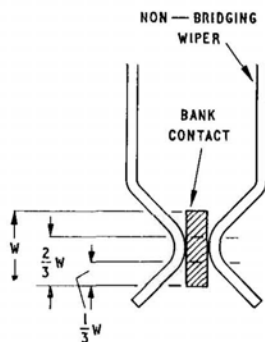
With the wipers on the last bank contacts, operate the armature and insert a 24-mil gauge (test) 22-mil gauge (readjust) between the armature and armature back stop and allow the armature to restore. The non-bridging wipers should then be just clear of the leading edge of the first bank contacts (see Fig. 17). Check the position of the wipers by deflecting each blade of the wiper outwards, in turn; its partner blade should follow. This condition will be met if follow on one blade only of a pair is obtained.

(c) With a 14-mil gauge (test) 16-mil gauge (readjust) applied as indicated in (b), both partner blades should touch the first bank contact (see Fig. 18). Check by deflecting each blade, in turn; the partner blade should *not* follow.

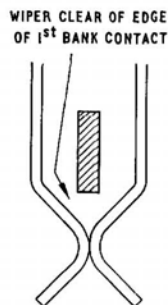
(d) Rotate the wiper assembly, by hand, to the 25th bank contact. The non-bridging wipers must now occupy the same relative position on this contact as they occupied on the first bank contact.

This can be checked by operating the armature when the wipers are standing on the 24th bank contact and gauging between the armature and the back stop, as described in (b) and (c).

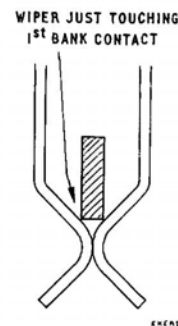
If the wipers do not meet the gauging values, adjust the position of the mechanism relative to the bank, by means of the bank-positioning gland, until the wiper position is correct. Tighten the gland-locking nut and recheck the position of the wipers on the first bank contacts.



★FIG. 16



★FIG. 17.



★FIG. 18.

15. Position of bridging wipers.—With the wipers standing on the first bank contacts, check that the extreme tips of the opposite ends clear the 25th bank contacts by moving the wiper springs sideways and observing that the flared tips do not touch the bank contacts (see Fig. 19).

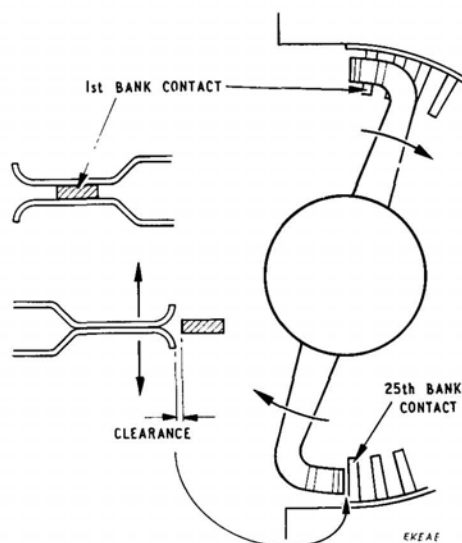
16. Adjustment of wipers.—

(a) *Wiper entry and flare.*—When the wipers are standing on the first bank contacts, the opposite ends should be in alignment with the bank levels, so that they will leave the levels without deflecting in either direction more than the thickness of a bank contact. The adjustment must be made at *both ends* of the wiper assembly.

The position of the mechanism must be adjusted by means of the two top mechanism-fixing screws, so that the wipers enter the bank levels without appreciable side movement.

After adjustment, the mechanism-fixing screws must be securely retightened by means of a box spanner.

(b) *Wiper tips.*—Adjust the wiper tips so that the two contact points lie as flat as possible upon each other when off the bank contacts. There must be no gap perceptible to the eye at the outermost contact points. Between the innermost contact points, however, there may be a gap of 8 mils maximum (test), 4 mils maximum (readjust).

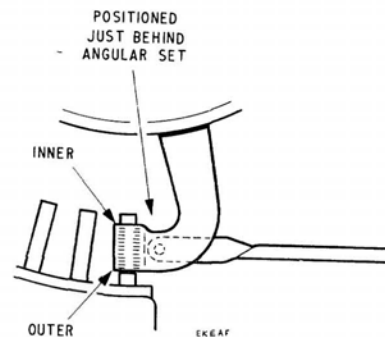


★FIG. 19

(c) *Wiper tension.*—When the wipers are standing on the 25th bank contacts, they should exert a pressure of 30 ± 10 gm on the bank contacts. To check this, insert the gauge so that the pointer tip engages a point just in front of the angular set of the wiper, and as near to the middle of the wiper as possible (see Fig. 20). If readjustment is necessary, tension the wipers to exert a pressure of 30 ± 5 gm.

(d) *Clearance between wipers and brushes.*—When the wipers are standing on the 23rd bank contacts and the wiper assembly is moved sideways on the spindle, there should be a minimum clearance of 10 mils between the brushes and the adjacent wipers (see Fig. 21).

(e) *Clearance between wipers and adjacent bank contacts.*—When the wipers are standing on the 25th bank contacts, and the wiper assembly is moved sideways on the spindle, the heels of the opposite ends should not touch the first bank contacts.



★FIG. 20.—MEASURING WIPER TENSION

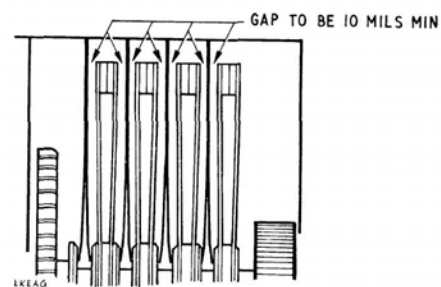


FIG. 21

17. Armature-restoring springs.—The tension of the two armature-restoring springs must be evenly distributed, by adjustment of the spring-adjusting screws. The tension must ensure that, when the release of the armature is lightly retarded by hand, the wipers will step positively on to the next bank contacts. Excessive tension must be avoided.

Locking clips are provided under the heads of the adjusting screws to prevent loss of tension due to the screws turning in the springs in service. If a screw fails to rise when it is turned, the wings of the clips are probably worn and the clip should be changed.

18. Interrupter-spring assembly (see Fig. 22).—With the armature normal, there must be a clearance between the tip of the moving interrupter spring and the interrupter striker. The following conditions must be satisfied for correct adjustment:—

(a) With the armature operated, the lever spring must cover the full width of the interrupter striker (see Fig. 23)

(b) The contacts must not be out of alignment by more than $\frac{1}{3}$ the width of a contact (see Fig. 24).

(c) With the armature normal, the lever spring must rest on the contact spring with a pressure of 200 ± 50 gm (test) 200 ± 30 gm (readjust), measured adjacent to the contacts.

The instant of interruption should be varied by means of an Adjuster, Interrupter, No. 8 (see Fig. 25) to obtain smooth running consistent with the speed specified in par. 19.

Smoothness in running can be checked by observing that the armature movement from the back stop is regular.

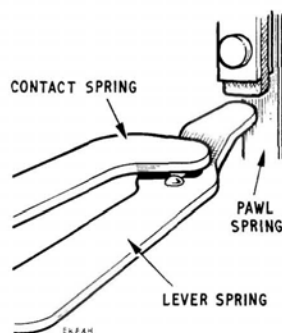


FIG. 22

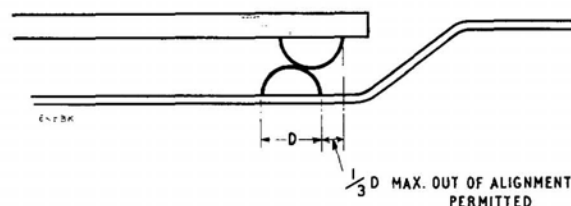


FIG. 24

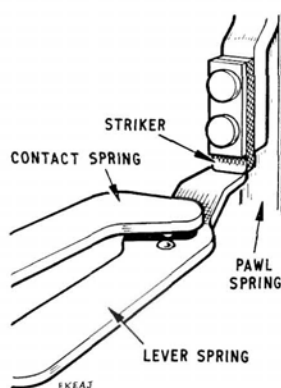


FIG. 23

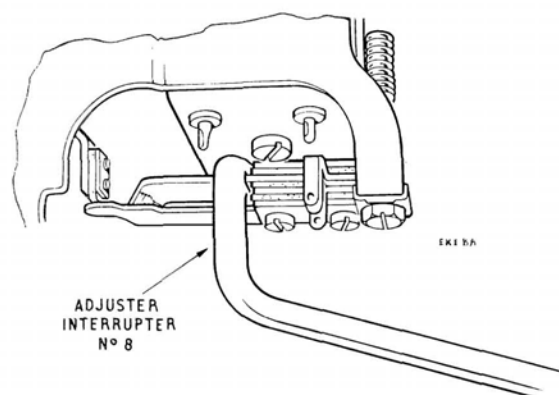


FIG. 25

19. Running tests should be performed at the normal exchange voltage. When testing a homing-type uniselector, the normal homing earth should be disconnected by insulating the appropriate relay contact with an Insulator, Contact, No. 1.

The combined tensions of the armature-restoring springs and interrupter springs must ensure that:—

(a) The uniselector will start, and the wipers rotate smoothly and reliably, when the operating voltage is applied in series with the magnet coil, interrupter contacts and a Tester 80W(Button normal)

(b) With the operating voltage applied in series with the magnet coil and interrupter contacts, the wipers must rotate smoothly at a speed of between 60 and 100 rev/min.

(c) The wipers of all homing uniselectors must home reliably and stop accurately on the home position, when connected as shown in Fig. 26.

When testing or adjusting a uniselector for running, always verify that the spark quench is in order.

20. Position of pointer.—The pointer must be located to indicate position '1' when the wipers are standing on the second contacts in the bank.

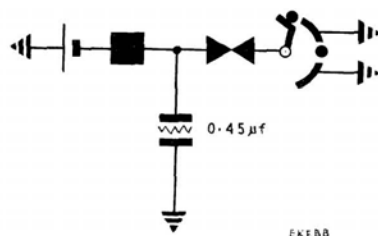


FIG. 26

MISCELLANEOUS

21. Dismantling.—The method of removing the mechanism from the bank is described in par. 4. The order in which the parts of the mechanism should be dismantled is as follows:—

- (a) Remove the pawl stop.
- (b) Remove the armature-restoring springs.
- (c) Remove the armature.
- (d) Remove the retaining plate and mechanism-fixing screws.
- (e) Remove the detent spring.
- (f) Remove the pointer, wiper assembly and ratchet wheel from the frame.

- (g) Remove the armature back stop.
- (h) Remove the knife-edge from the coil box.
- (j) Remove the interrupter-spring assembly.
- (k) Remove the coil-box and coil.
- (l) Remove the mechanism-positioning gland.
- (m) Remove the label-holder and test jack.
- (n) Remove the brush assembly.

22. Assembly.—The adjustment of the mechanism and its replacement in the bank are described in pars. 5 to 18. The order in which the parts of the mechanism should be assembled is as follows:—

- (a) Replace the knife-edge on to the coil box.
- (b) Replace the coil and coil-box on to the frame.
- (c) Replace the interrupter-spring assembly.
- (d) Replace the armature back stop.
- (e) Replace the retaining plate and the mechanism-fixing screws.
- (f) Replace the pointer.
- (g) Lubricate the wiper assembly spindle with Oil, Bearing, No. 16.
- (h) Replace the wiper assembly.
- (j) Replace the pawl stop: set it well back from the wiper assembly.
- (k) Replace the detent.
- (l) Replace the armature, then its restoring springs. To ensure that the springs will not rust, they should be moistened with Oil, Bearing, No. 16.
- (m) Replace the mechanism-positioning gland and locking nut.
- (n) Replace the label-holder and test jack.
- (o) Replace the brush assembly on the bank.

23. Lubrication.—Details of the method of lubrication of the uniselector are given in B 5137.

24. Piece parts.—Details of the piece parts applicable to the uniselector are given in B 5616.

25. Precautions when returning uniselectors to stores.—Before returning a uniselector to stores, the wipers must be positioned on bank contact No. 21 to protect them from damage.

26. Tools.—A list of tools necessary for the adjustment of P.O. Type 3 uniselectors is given in Table 1. The tools should be used only for the purposes for which they are intended. Any tool that is in such a condition that screws, nuts or springs would be damaged by its use should be changed.

[Table 1 follows]

TABLE 1

Description	Use
Adjuster, Interrupter, No. 8 ..	Adjusting interrupter contact springs
Adjuster, Spring, No. 3	Tensioning pawl spring
Adjuster, Spring, No. 9	Adjusting wipers and brushes
Adjuster, Detent, No. 4	Locating detent
★Cleaner, Contact, No. 9	Cleaning interrupter contacts
Comb, Locating, No. 1	For closing brushes when inserting mechanism into bank
Gauges, Feeler, No. 10	General use
Gauges, Tension, No. 2	General use
Gauges, Tension, No. 3	General use
Insulator, Contact, No. 1	Disconnecting homing earth
Mirror, Inspection, No. 2	Examining position of wipers on bank contacts
★Outrigger, No. 2	Mounting the mechanism out of bank
Pointer, Gauges Tension, Cranked, No. 5	For use with tension gauges
Pointer, Gauges Tension, Cranked, No. 6	For use with tension gauges
Pliers, Adjusting, No. 1	Adjustment of wipers, brushes, detent spring, etc.
Pliers, Adjusting, No. 3	Adjustment of wipers, brushes, detent spring, etc.
Pliers, Adjusting, No. 5	Adjustment of wipers, brushes, detent spring, etc.
Screwdriver, Instrument, No. 1 ..	General use
Screwdriver, Instrument, No. 2 ..	General use
Screwdriver, Instrument, No. 5 ..	For use inside box spanners
Spanner, Box, No. 1	Upper mechanism-fixing screws, magnet-fixing screw and mechanism-positioning gland
Spanner, Box, No. 3	Bank-adjusting gland locknut
Spanner, Box, No. 14	Lower mechanism-fixing screw
Spanner, Cranked, No. 11	Adjustment of index wheel
Spanner, Cranked, No. 3	Armature back stop
Spanner, Cranked, No. 12	Armature back stop (when nuts are 1BA and 3BA)
Spanner, Flat, No. 2	Pointer-fixing screw
Spanner, Flat, No. 3	Knife-edge adjusting screw locknut
Tester No. 80W	Running tests

References:—B 5100, B 5137, B 5616
(TPM2/3)

E N D