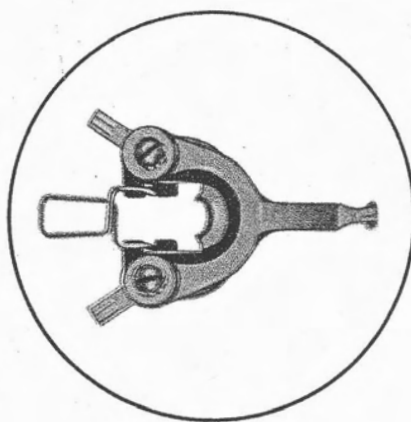


"QUICK CHANGE" WIPERS



Technical
bulletin

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AUTOMATIC ELECTRIC

Subsidiary of

GENERAL TELEPHONE & ELECTRONICS





Factory, development laboratories, and general office at Northlake, Illinois, U.S.A.

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"QUICK CHANGE" WIPERS

1. INTRODUCTION

The "Quick Change" wiper shown in figure 1 for all Strowger switches is the answer to a demand for a wiper assembly that can be easily replaced and maintained. The former wiper assemblies, while they functioned well and gave good service, were difficult to replace and to maintain. For example, to replace the top wiper assembly, the shaft had to be stripped of all wiper assemblies before the replacement could be made. However, with the new "Quick Change" wiper assembly, once it is installed, it is easy to make replacements without disturbing the other wiper assemblies on the same switch shaft. Furthermore, advanced design makes possible easy maintenance in the removal and the replacement of the individual spring wiper blade. This was not possible on the former wiper assemblies.

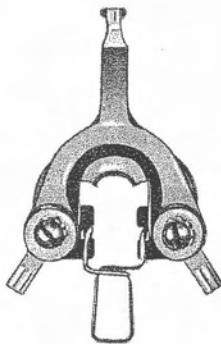


Figure 1. "Quick Change" wiper with cord holder in place.

2. DESCRIPTION OF APPARATUS

2.1 General

The "Quick Change" wiper assembly is primarily composed of two subassemblies: (1) the wiper and (2) the collar. An additional cord holder is supplied with each line and private "Quick Change" wiper if the switch calls for a vertical bank and wiper assembly (see discussion under paragraph 2.6).

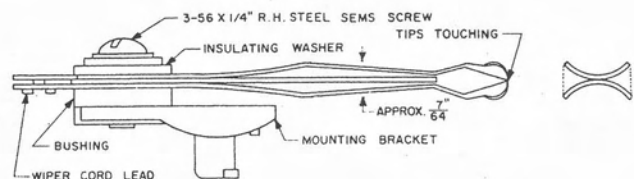


Figure 2. The private "Quick Change" wiper.

2.2 The Private Wiper

The private wiper (or control wiper) consists of two spring wiper blades which are fastened to a metal bracket by means of two #3-56 x 1/4" Pan Head Steel Sems Screws. In assembly, the blades are insulated from the fastening screws, each other and the bracket. This method of insulation makes for uniformity in assembly since the line wiper is also assembled in the same manner. But the similarity ends here, for electrically and mechanically the private wiper spring blades make contact as shown in figure 2 (tips touching and wiper cord lead soldered to the terminal of both blades).

2.3 The Line Wiper

The line wiper is assembled in the same manner as the private wiper. However, there is an electrical as well as a mechanical separation of the wiper spring blades from each other. See figure 3 (minimum clearance of .009" between tips) and figure 5 (wiper cord lead soldered only to one terminal of the blade). The function of the line wiper is different from that of the private wiper. The line wiper must carry both positive and negative sides of the line, whereas the private wiper does not.

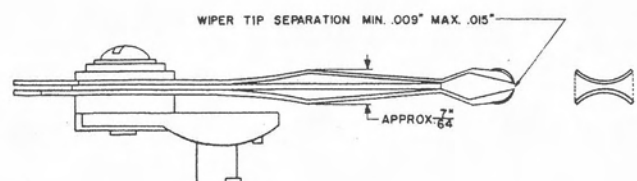


Figure 3. The line "Quick Change" wiper.

2.4 Private and Line "Quick Change" Wiper Comparison

In figure 4, note that each spring wiper blade of the private wiper has two (2) "ears" or terminals; the line wiper blade has only one (see figure 5).

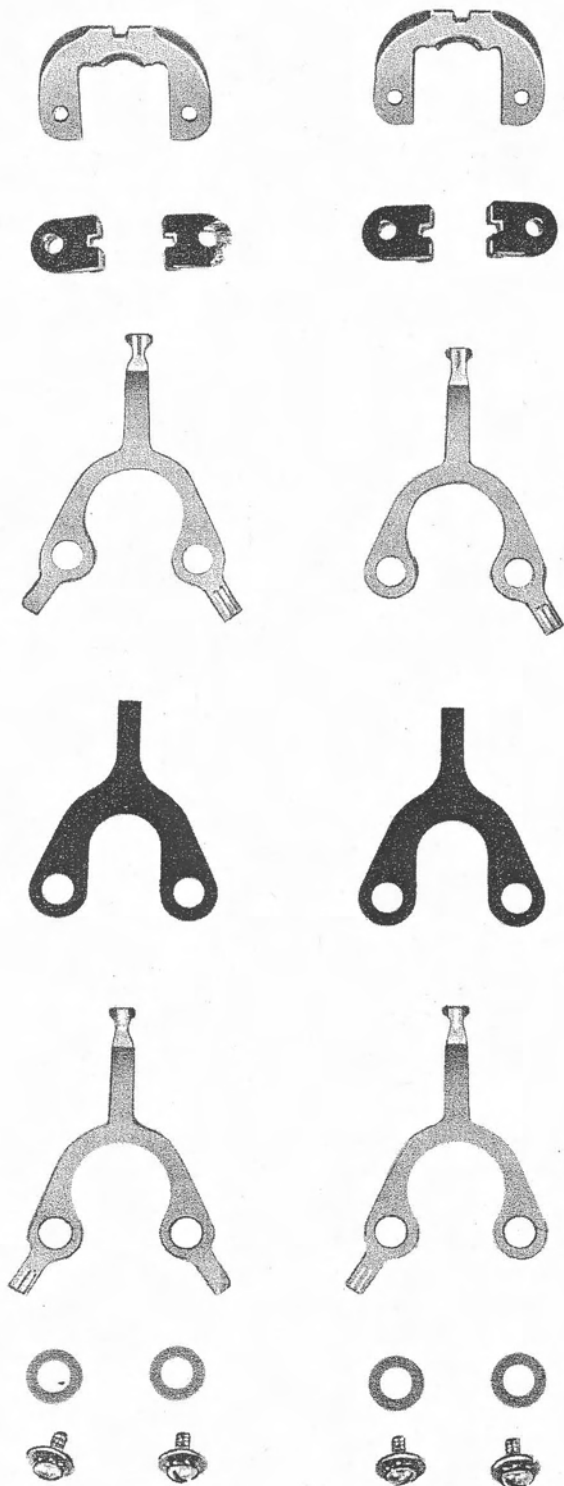


Figure 4. The private "Quick Change" wiper (exploded view).

Figure 5. The line "Quick Change" wiper (exploded view).

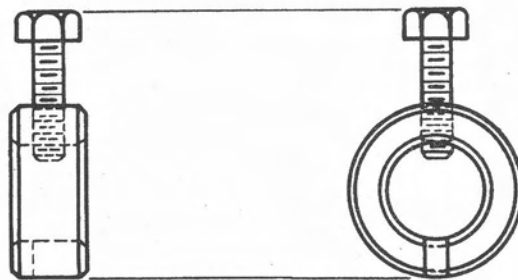


Figure 6. Detachable collar assembly.

2.5 The Collar

In place of the hub which was an integral part of the former line and private wiper, a detachable collar assembly is used on the new line and private "Quick Change" wipers (see figure 6). This collar is the means of locking the wiper to the shaft. When the collar is slipped over the metal bracket of the wiper, its grooved keyway should be mated with the key on the wiper bracket. This interlocking secures the wiper and prohibits it from free rotation. As the collar set screw is tightened to the shaft, both the collar and the wiper are fastened securely to the shaft, ready for operation.

2.6 The Cord Holder

Made from steel wire, the new cord holder may be either attached or detached from the new line or private "Quick Change" wiper. Formerly, the cord holder was made from sheet fiber with a flared over eyelet and was an integral part of the wiper assembly.

The purpose of the cord holder is to protect the various wiper cords from snagging on protrusions or obstructions in the bank-wiper area. When a vertical bank is used, the possibility of the cords snagging is greatly increased. Commutator protrusions on the vertical bank, the lower end obstruction of the vertical bank bracket and the end portion of the right bank rod offer points of snagging for the wiper cords. When used, the cord holders dress the wiper cords properly and hold them in place, away from the points of snagging.

The cord holder is supplied in two sizes: (1) short: dimension A - $7/16''$ and dimension B - $5/8''$, and (2) long: dimension A - $9/16''$ and dimension B - $3/4''$ (see figure 7). The short cord holder is for use with the "Quick Change" wiper on levels one (1) and two (2). (The levels are determined from the top bank - the one closest to the lower cover plate - downward.) The long cord holder is for use with the "Quick Change" wipers on levels three (3) and four (4).

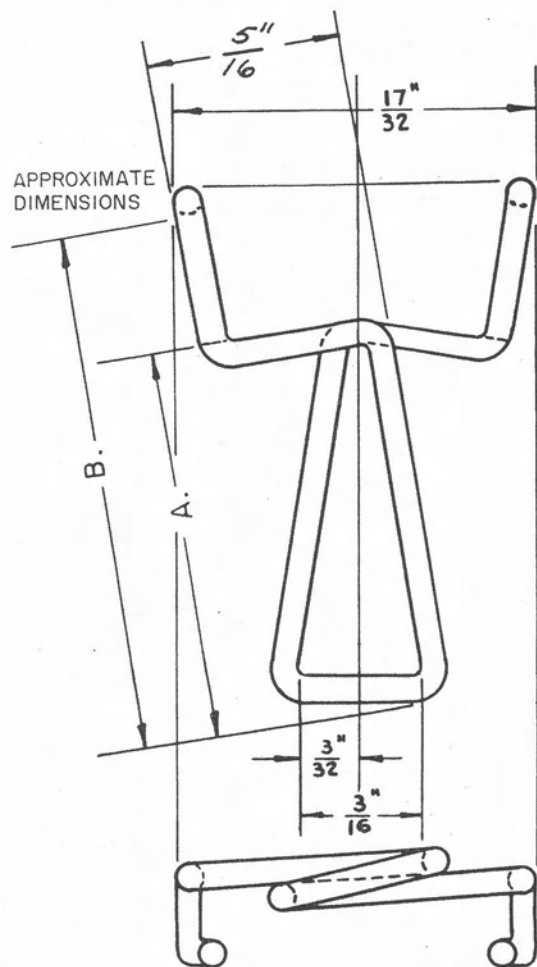


Figure 7. The cord holder.

Switches having a vertical bank and wiper assembly require a cord holder on both the line and private wipers. There is one exception, a two level switch with an extra long test jack and terminal assembly, as shown in figure 13, has the short cord holder only on the second or bottom level wiper assembly.

2.7 The Vertical Wiper

The new vertical wiper is essentially the same as the old one, with many of the parts identical and interchangeable (see figures 8 and 9). However, the hub on the new vertical wiper is lengthened slightly to permit a better positioning of the vertical wiper upon the vertical bank.

When the old style wipers are replaced with the "Quick Change" wipers, a new vertical wiper must be used to prevent interference between the spring on the vertical wiper and the collar on the horizontal wiper.

3. LOCATION AND PLACEMENT OF WIPERS AND WIPER CORDS ON STROWGER SWITCHES

3.1 General

With the institution of the new "Quick Change" wiper, some of the former methods of location and placement of wipers and their wiper cords have been modified.

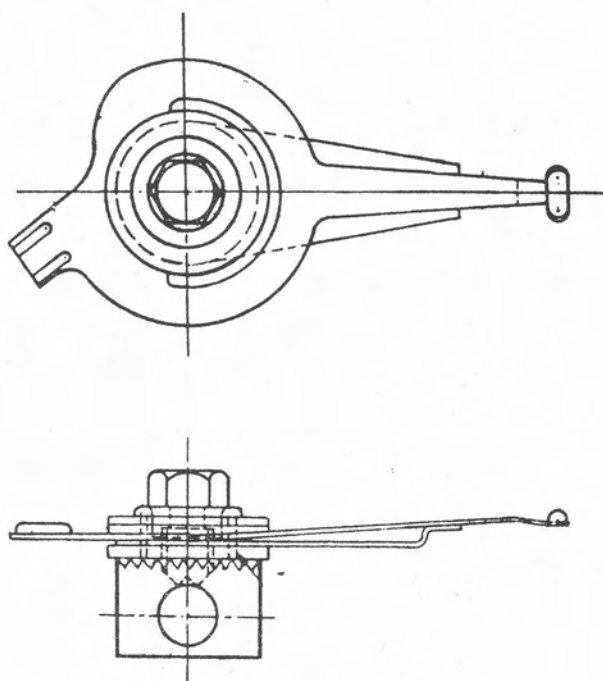


Figure 8. Old vertical wiper.

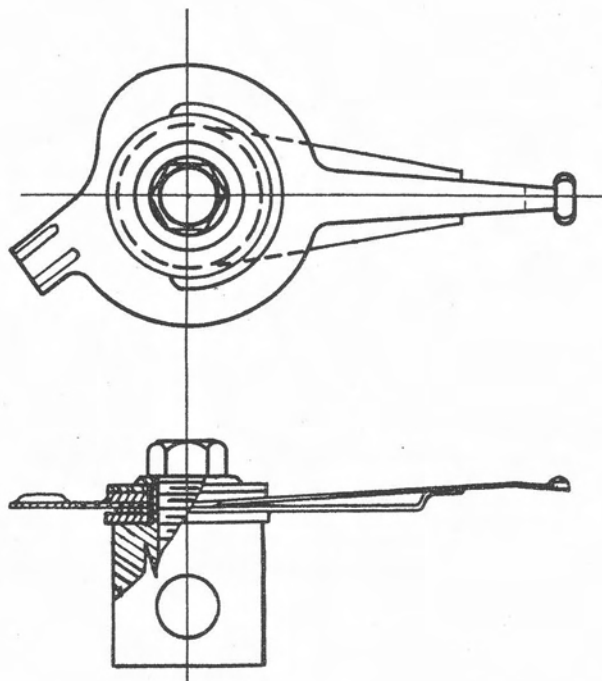


Figure 9. New vertical wiper.

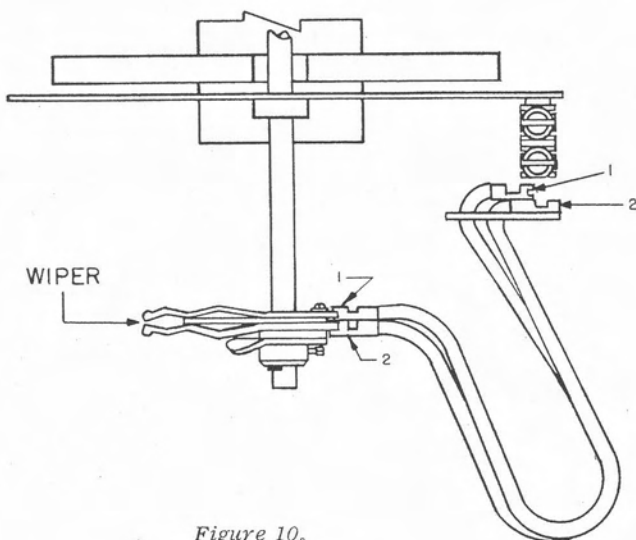


Figure 10.

The most common change is on the number one (#1) wiper. The collar of the wiper is placed downward in ALL cases. The reason for this is to allow proper clearance between the wiper and the lower cover plate bearing when the shaft has traveled to the tenth vertical step.

When the vertical wiper is used, the vertical wiper cord is dressed behind and comes down from above to make its proper connection.

3.2 Classifications

The following classifications cover all existing wiper and wiper cord arrangements both in production and in the field.

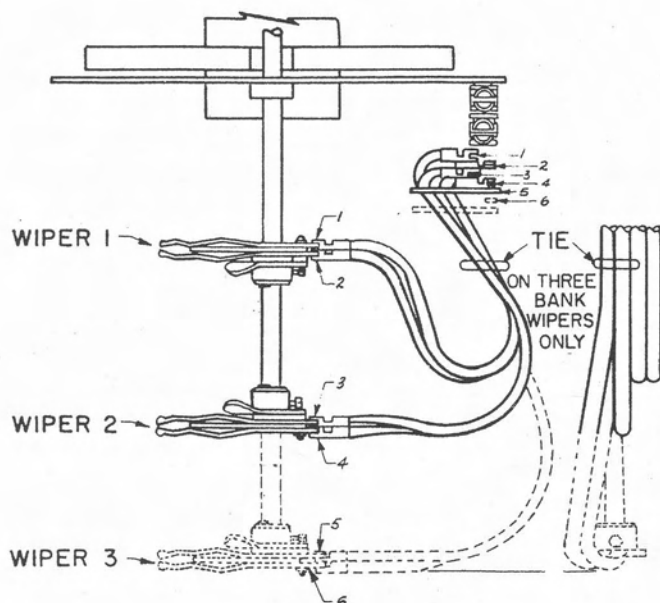


Figure 11.

- Switches with one pair of bank wipers for special applications (see figure 10).
- Switches with two or three pair of bank wipers for selectors, selector-connectors, connectors or test distributors (see figure 11).
- Switches with one, two, or three pair of bank wipers for selectors, connectors, and directors or test distributors without wiper cord terminals in test jack assembly (see figure 12).

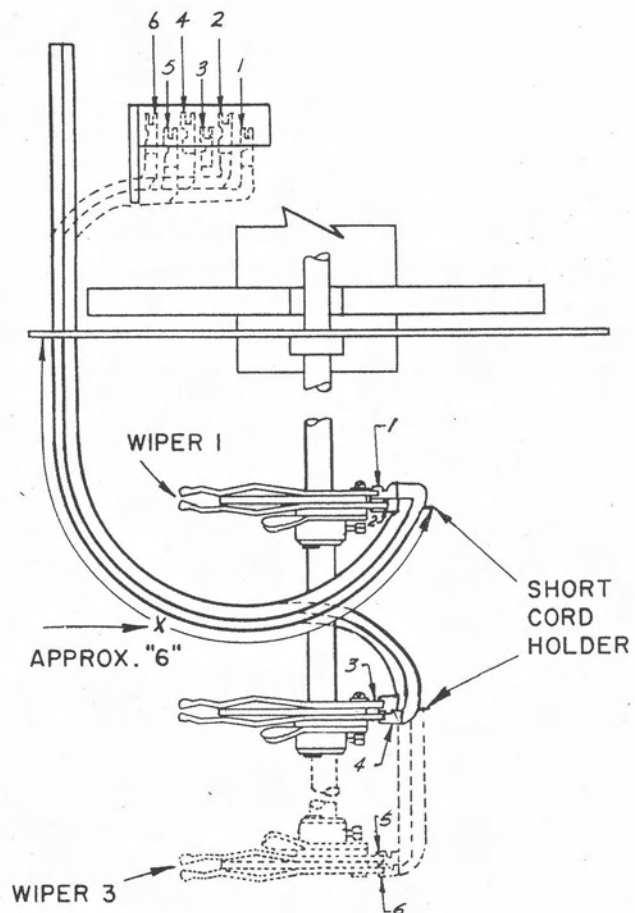


Figure 12.

- Switches with four pair of bank wipers for 700 and 800 point connectors (see figure 13).
- Switches similar to D-236717-M with two pair of bank wipers for selectors, selector-connector, connectors, and test distributor. Eight test jack springs or larger (see figure 14).

The extra long test jack and terminal assembly requires a short cord holder on the #2 wiper.

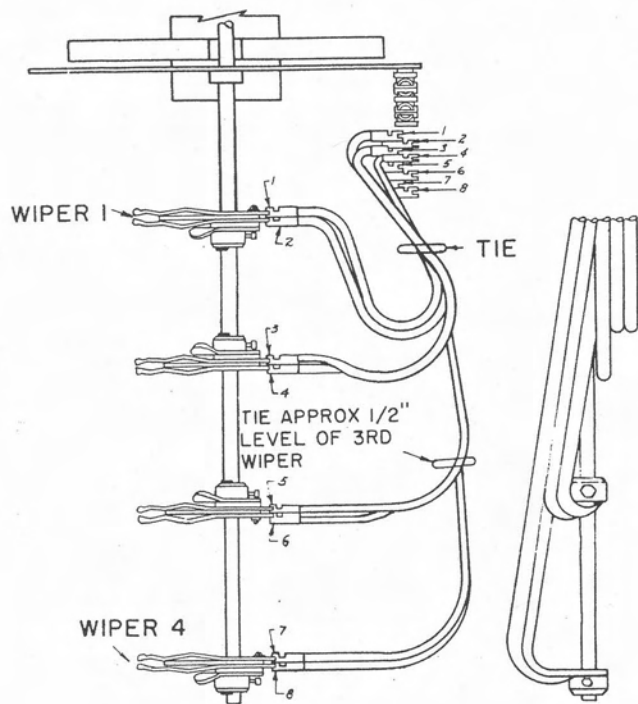


Figure 13.

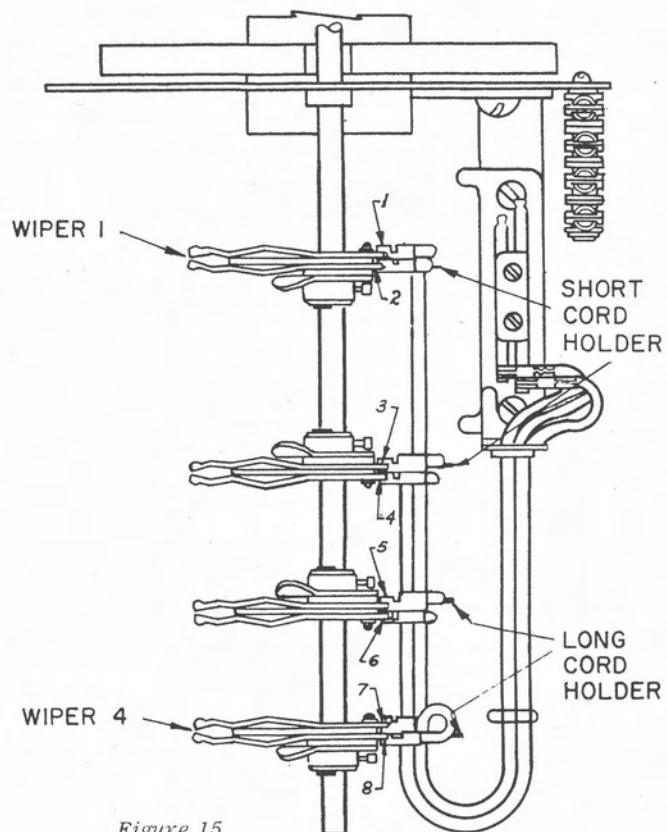


Figure 15.

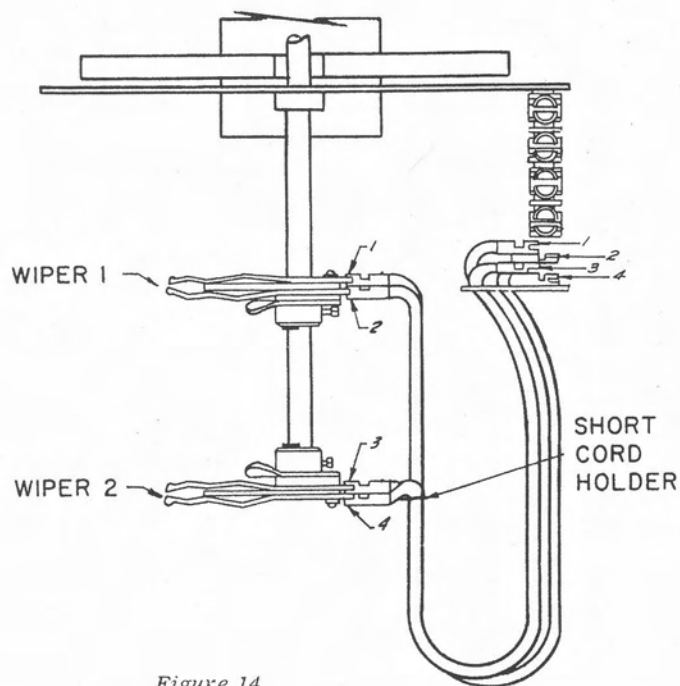


Figure 14.

f. Switches with wiper cord terminal assembly mounted on vertical bank bracket and four pair of bank wipers with 700 and 800 points (see figure 15).

g. Switches with a vertical wiper and one pair of bank wipers but without lower cover plate; code call switches (see figure 16).

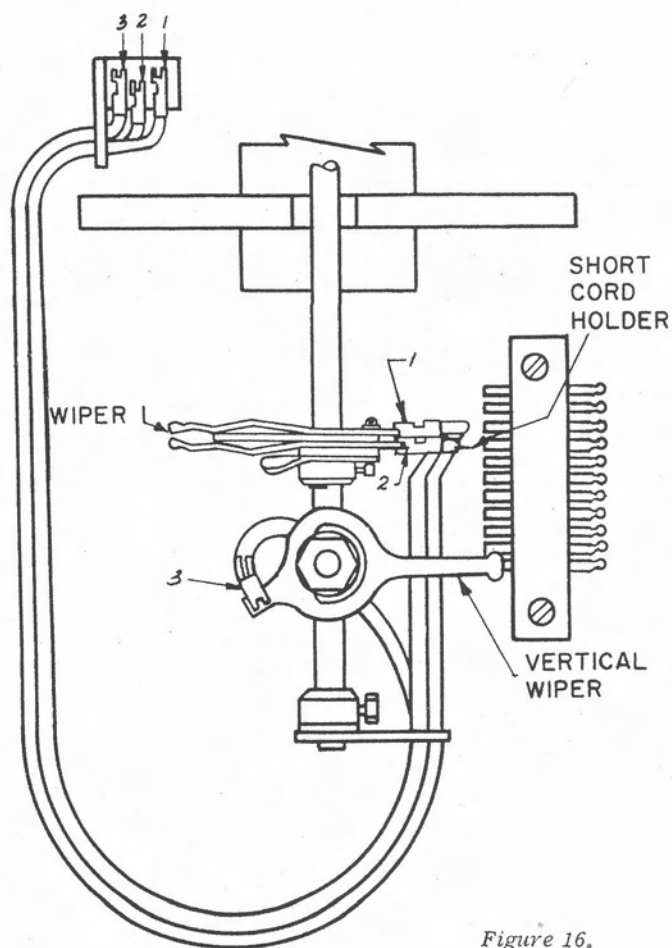


Figure 16.

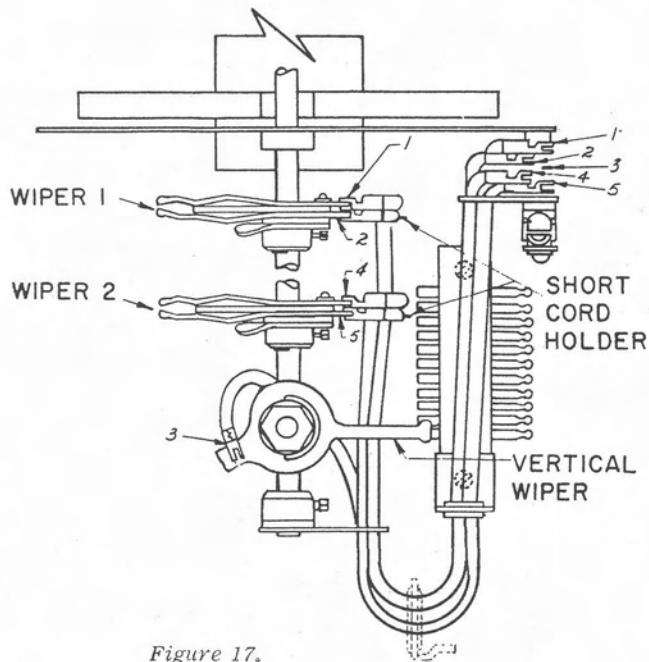


Figure 17.

h. Switches with a vertical wiper and two pair of bank wipers; 50 point linefinder (see figure 17). Notice that the collar of each wiper faces downward.

i. Switches with a vertical wiper and two pair of bank wipers; level hunting connectors, 100 point linefinders, selector-repeaters, and digit absorbing selectors (see figure 18).

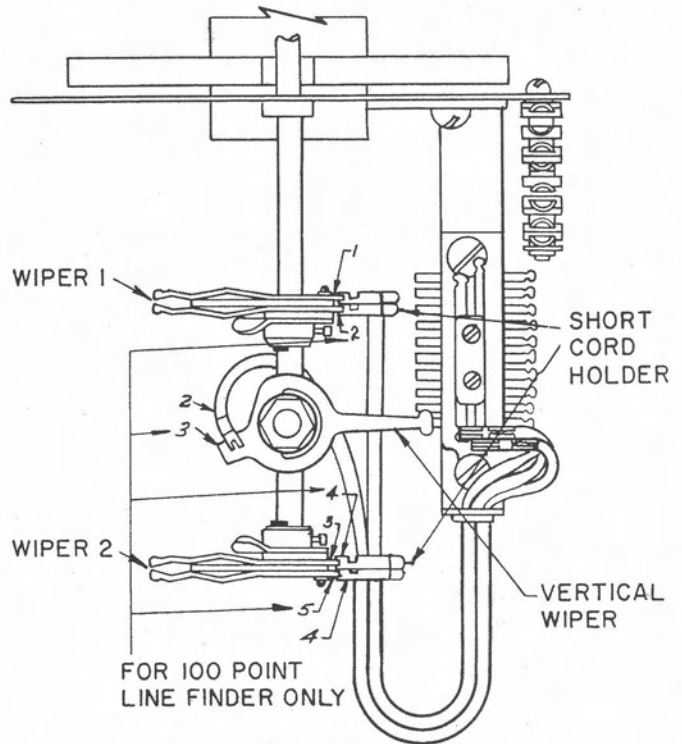


Figure 19.

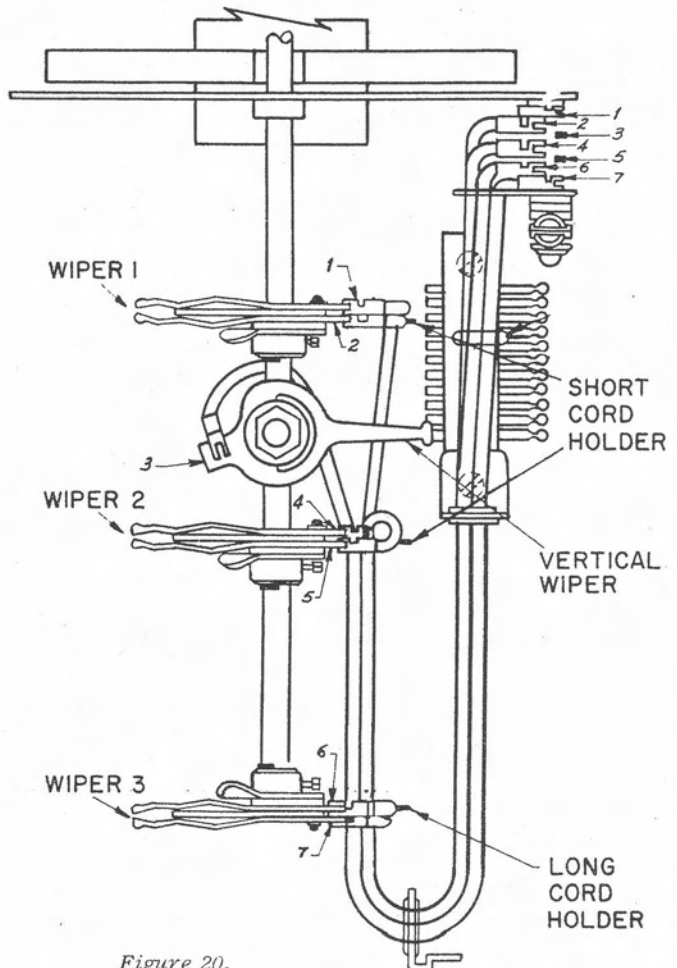


Figure 20.

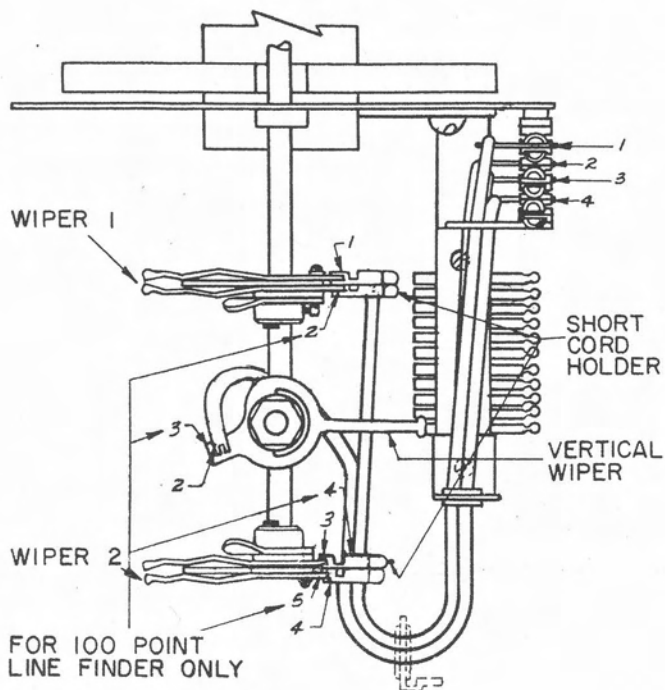


Figure 18.

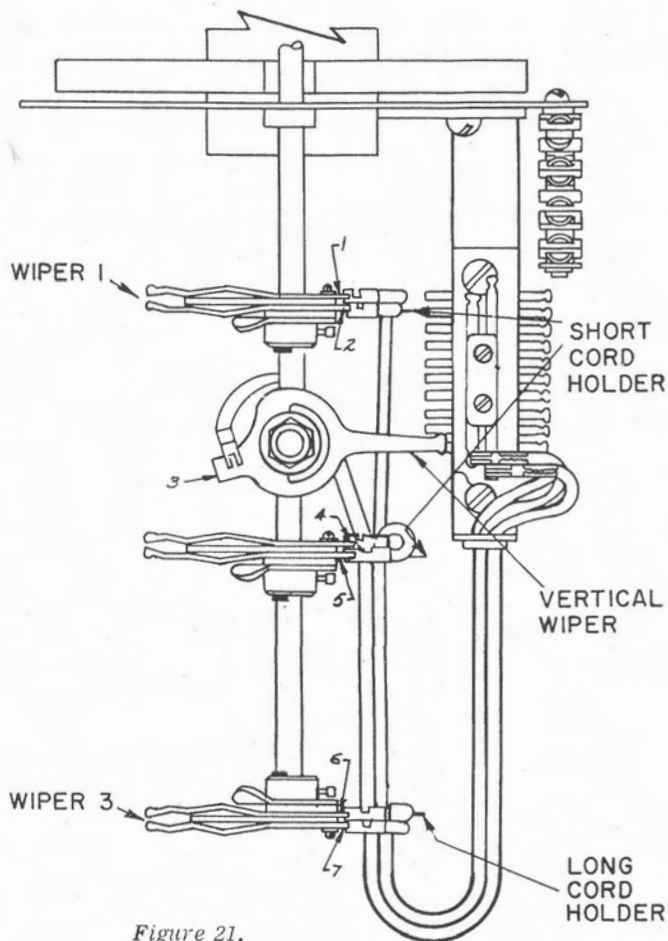


Figure 21.

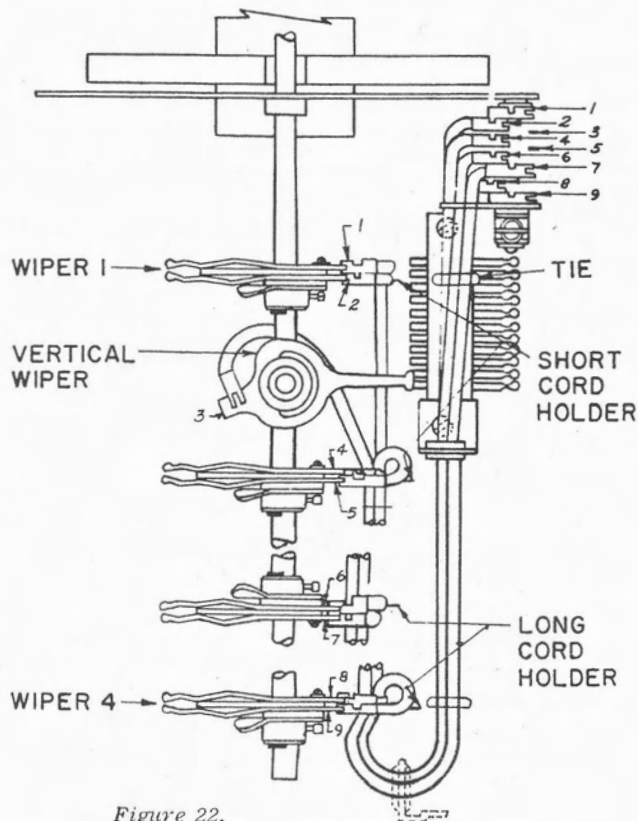


Figure 22.

j. Switches with a vertical wiper and two pair of bank wipers; level hunting connectors, 100 point linefinders, selector-repeaters, and digit absorbing selectors (see figure 19).

k. Switches with a vertical wiper and three pair of bank wipers; for 200 point linefinder (see figure 20).

l. Switches with a vertical wiper and three pair of bank wipers; level hunting connectors, 100 point linefinders, selector-repeaters, and digit absorbing selectors (see figure 21).

m. Switches with a vertical wiper and four pair of bank wipers, for 700 and 800 point linefinder (see figure 22).

4. PROCEDURES FOR INSTALLING AND REMOVING THE "QUICK CHANGE" WIPER

4.1 General

In the previous discussion under paragraph 2, it was stated that the "Quick Change" wiper forms a part, not the whole, of the two part "Quick Change" wiper assembly. The other part is the collar. For the present discussion, the "Quick Change" wiper is the removable part of the "Quick Change" wiper assembly, not the collar. Once the collar is slipped over the shaft, it is, for all practical purposes, considered a non-removable part even though when loosened, it slides freely up or down the shaft. The reason for considering the collar as non-removable becomes apparent when the shaft has two or more wipers attached to it.

The top wiper collar, especially, is prohibited from coming off the shaft by either the lower cover plate bearing above it or the vertical wiper assembly and/or the second wiper assembly below it. Therefore, when the collar of the "Quick Change" wiper assembly is loosened, the "Quick Change" wiper itself may be removed, either for replacement or maintenance, without disturbing the other wiper assemblies on the same switch shaft.

4.2 Replacement of Old Wipers with New "Quick Change" Wipers

This discussion covers the one, two, and three bank switches. For a description of the only exception (four bank switches), see paragraph 4.3.

Because of the easy accessibility to the wipers and their wiper cords, it is not necessary to remove the switch from the shelf when replacing the old wipers with the "Quick

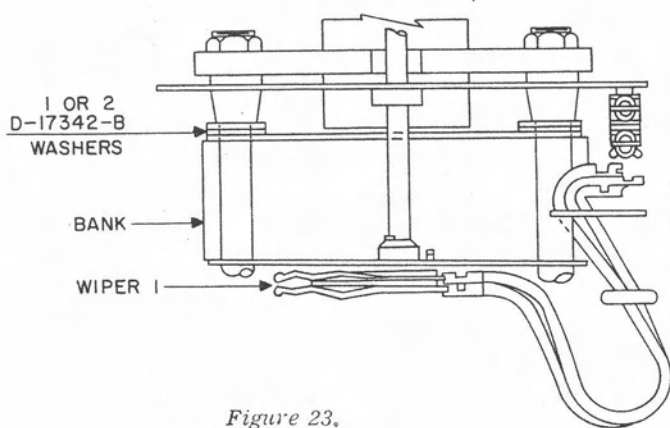


Figure 23.

Change" type. For our discussion, it will be assumed that the switch is to remain mounted on its shelf in the bay.

When the old style wipers are replaced with the "Quick Change" wipers, a new vertical wiper must be used to prevent interference between the spring on the vertical wiper and the collar on the horizontal wiper.

It may be found that the "Quick Change" wipers hit the shaft oil cup. To correct this the length of the shaft assembly has been increased from 8-1/2" to 8-7/8". The switches with short shafts can be corrected by placing either one or two washers (D-17342-B) on each bank rod above the bank as shown in figure 23. The "Quick Change" wipers are then mounted with the collar up.

4.2.1 Removal of the old wipers.

With the switch in its normal (nonoperated) position, flip the busy key lever to the "busy" position. The switch is now temporarily out-of-service, and work may be done on it. The wipers are in the extreme left position with

one terminal of the wiper blade facing the installer. Unsolder each wiper cord lead from its wiper terminal. CAUTION: Take care not to splatter solder either on the bank contacts or on the switch below. It is recommended that the wiper cord lead be grasped by a pair of long nose pliers and gently loosened, then freed from its connection during the unsoldering operation, rather than being pulled or jerked free by hand. It is also suggested that a cloth or fiberboard protector be placed over the switch immediately below.

Next, manually raise the shaft a few steps and index the wipers to position nine or ten on the bank. The other side of the wiper terminal will be readily accessible for unsoldering. Disengage the double dog release link, allowing the double dog to lock the shaft in place. Unsolder the wiper leads and remove all wiper cords from the wiper cord holders, if holders are used. Let the wiper cords hang freely, suspended from the terminals of the test jack or terminal assembly.

By manually pressing the release magnet armature to disengage the double dog, the shaft will automatically restore to its normal position. Proceed, now, to loosen the set screw of each wiper and strip the shaft of all apparatus. The shaft is now ready for the "Quick Change" wipers.

4.2.2 Installation of the "Quick Change" wipers.

Since all of the wiper assemblies must be installed from the bottom of the switch shaft and then raised to their proper position, care must be taken in the selection of the proper wiper (the private wiper for the private bank and the line wiper for the line bank).

To install the "Quick Change" wiper assembly, grasp both the "Quick Change" wiper and the

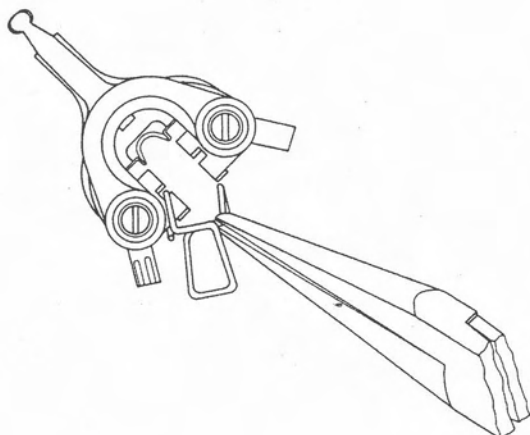


Figure 24. Inserting cord holder: first step.

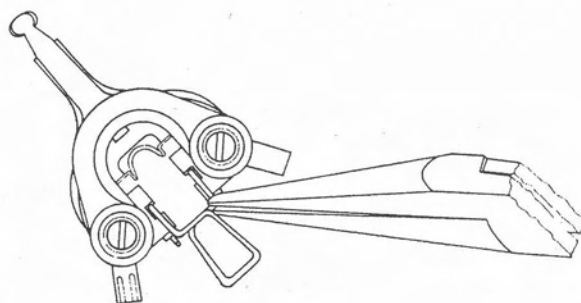


Figure 25. Inserting cord holder: second step.

collar and slip them over the shaft. Make sure that the collar of the top wiper faces downward.

If a wiper cord holder is to be used on the "Quick Change" wiper, it is best to attach the cord holder to the "Quick Change" wiper BEFORE it is installed on the shaft. Figures 24 and 25 show how to insert the cord holder.

To make sure that the cord holder is properly inserted, there is an easy "rule-of-thumb" to follow. Find the side of the "Quick Change" wiper where the collar mates the mounting bracket. On this side the exposed ends of the holder should be located. When the cord holder is so placed, it makes for easy access to the collar set screw.

4.2.3 Method of aligning and testing "Quick Change" wipers.

Prior to the installation of the "Quick Change" wipers (paragraph 4.2.2); disengage the double dog release link, allowing the double dog to engage the shaft. Next, raise the switch shaft to the first level and rotate it one step. This positions the shaft for bank contact "11". Next, install the top "Quick Change" wiper and align its wipers on contact "11". The wiper tips should overlap the bank contact approximately one-sixteenth of an inch ($1/16''$) and should be centrally located on it. Fasten the wiper to the shaft by tightening the "Quick Change" collar set screw, using wrench H-46437-1 (see technical bulletin 540). Next, install another wiper assembly. Continue to install wiper assemblies, using the appropriate classification under paragraph 3.2.

After the various wiper assemblies have been fastened to the shaft, rotate the wipers to the tenth step and back, observing contact engagement. Next, raise the shaft to the tenth level, engage other wipers and align. Rotate the wipers to the tenth step and back, observing the contact engagement. Release the switch shaft, and let it return to its normal position. Now, step the wipers to the fifth level of the bank and check for ease of entry of the wipers onto the bank. Repeat any of the above steps, if need be, to insure proper alignment.

If no vertical wiper is used, proceed to paragraph 4.2.4. But, if a vertical wiper is used, release the shaft from the fifth level and let it return to its normal position. Rotate the loosely installed vertical wiper onto the bottom contact of the vertical bank. Adjust the vertical wiper blade so that its tip end rests centrally upon the bottom contact of the vertical bank (see figure 26) with an overlap of five sixty-fourths of an inch ($5/64''$) to seven sixty-fourths of an inch ($7/64''$). NOTE: The position of the tip end to provide

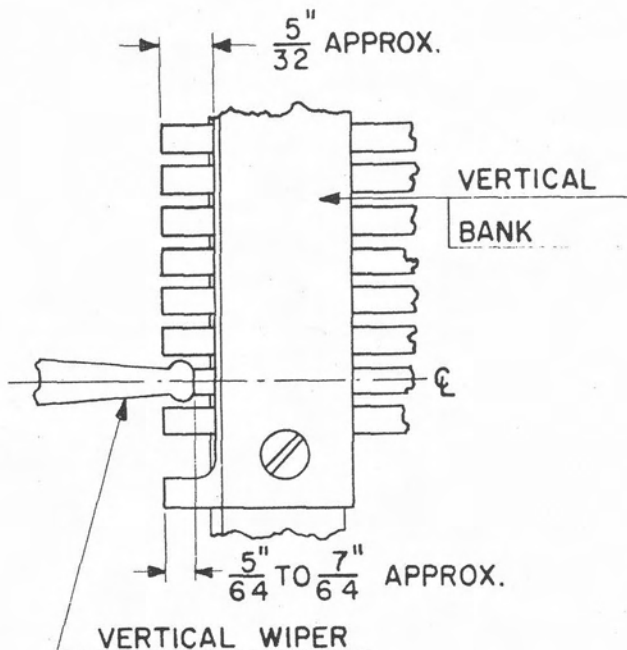


Figure 26. Vertical bank wiper and contacts.

the $5/64''$ to $7/64''$ overlap will be met if the back edge of the wiper tip is in approximate vertical alignment with the edge of the contacts on the vertical bank (see figure 27).

To insure that proper tension is applied to the vertical wiper, it is recommended that the gram gage H-882816-4 be used to test the wiper for thirty (30) to forty-five (45) grams of tension against the vertical bank contact. If the gram gage H-882816-4 is not available, the recommended tension can be approximated by making a three sixty-fourths of an inch ($3/64''$) to one-sixteenth of an inch ($1/16''$) gap between the back stop and the vertical wiper (see figure 27). (Tension on the vertical wiper is necessary to maintain proper circuitry function with the vertical bank for that split

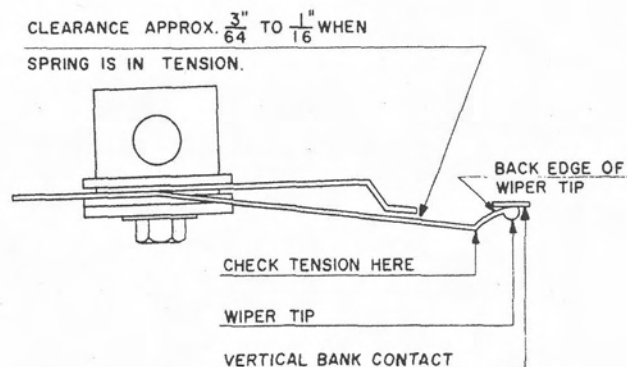


Figure 27. Top view of vertical wiper showing proper alignment and clearance.

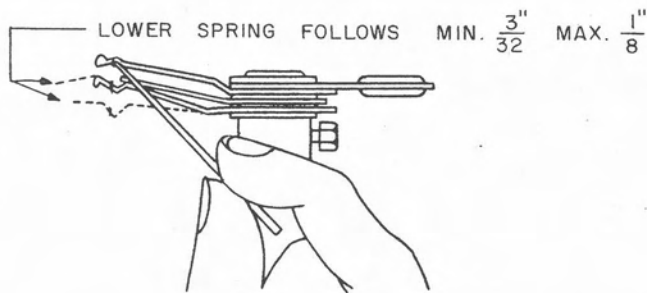


Figure 28. Spring follow measurements with tension removed from upper spring.

second that the switch starts to cut in or goes rotary.) After the tension on the vertical wiper is applied, check for proper positioning of the vertical wiper on the vertical bank contact for each cut in level.

To insure that proper pressure is applied to the horizontal bank contacts by the horizontal wipers, the springs must be adjusted as shown in figures 28 and 29. When the tension is removed from either spring, the other spring should follow between a minimum of $\frac{3}{32}$ " and a maximum of $\frac{1}{8}$ ".

4.2.4 Method of assembling wiper cords to "Quick Change" wipers.

After the required wiper assemblies have been aligned and tested and are in proper working order, raise the shaft to the fifth level of the bank and rotate the wipers along to the ninth or tenth contact. At this position, disengage the double-dog to lock the shaft in place. Then, dress the wiper cords (use the cord holders, if needed). On the wiper blade terminals closest to the installer, solder the appropriate wiper cord leads.

For proper dressing of the wiper cord leads, each wiper cord lead is to be connected to the appropriate wiper terminal in such a way that the natural untwisted position of the cord

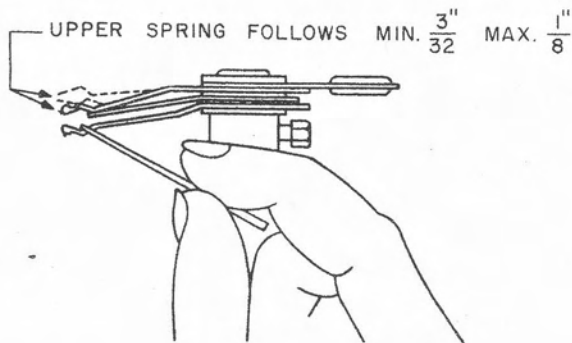


Figure 29. Spring follow measurements with tension removed from lower spring.

follows a smooth contour. There should be no kinks or twists in the wiper cord braid. Make sure that the prongs of the wiper cord are fastened securely to each wiper blade terminal. After the wiper cord leads are soldered to the terminal of the "Quick Change" wipers, press the release magnet armature to disengage the double dog; the shaft will return to its normal position.

At its normal position, the shaft places the other blade terminal of the wipers toward the installer. The final soldering operation of the wiper cord leads to their proper wiper blade terminals then can be accomplished. After this soldering operation, the switch is ready for service. Flip the busy key lever out of the "busy" position. The switch is now back in normal operation once again.

4.3 Replacement of Old Wipers with the New "Quick Change" Wipers (Four Bank Switches)

The four bank switch has a special consideration that distinguishes it from those switches in paragraph 4.2; it is the bottom shaft bearing assembly. This bearing assembly is fastened between the third and fourth banks.

4.3.1 Removal of old wipers.

With the switch in its normal (nonoperated) position, flip the busy key lever to the "busy" position. The switch is now temporarily out-of-service and may be worked on. The wipers are in the extreme left position with one terminal of the wiper blade facing the installer. Unsolder each wiper cord lead from its wiper terminal. CAUTION: See discussion under paragraph 4.2.1.

Next, manually step the shaft up a few steps and index the wiper to position nine or ten on the bank. The other side of the wiper terminal will be readily accessible for unsoldering. Disengage the double dog release link, allowing the double dog to lock the shaft in place. Unsolder the wiper leads and remove all wiper cords from the wiper cord holders, if holders are used. Let the wiper cords hang freely, suspended from the terminals of the test jack or terminal assembly.

By manually pressing the release magnet to disengage the double dog, the shaft will automatically restore to its normal position. Proceed, now, to loosen the set screw of the bottom wiper and remove that wiper from the shaft. If a "chock" spring is handy, raise the shaft and support it with the spring. (The "chock" spring is used to support the shaft when the switch is packed for shipping.) On the other hand, if no "chock" spring is available, manually raise the shaft to the tenth

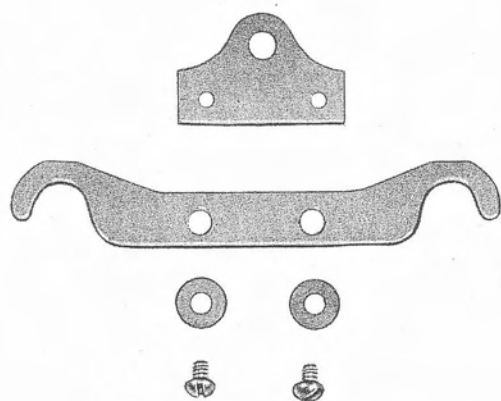


Figure 30. Old type bottom shaft bearing and holder (exploded view).

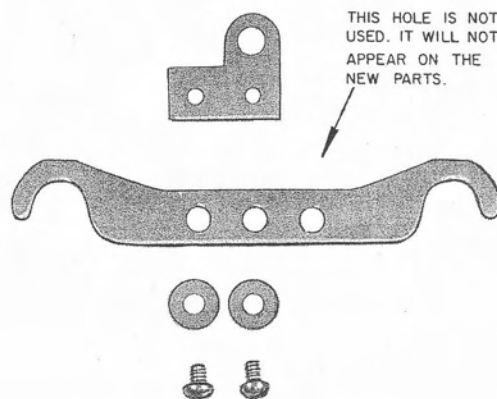


Figure 31. New type bottom shaft bearing and holder (exploded view).

level and index the top wiper to the second or third contact. Use the double dog to lock the shaft in place. The shaft, in its raised position, will permit easier access for the next few steps.

With a screwdriver, loosen the bottom bank rod collars and remove them from both bank rods. The fourth or bottom bank should slide down the bank rods. Lower this bank about an inch and a half (1-1/2"). Next, loosen the set screws on the bank rod collars; these collars support the bottom shaft bearing holder. Slide both collars downward toward the bottom bank. Rotate the right bank rod collar about 90 degrees counterclockwise and the left bank rod collar about 90 degrees clockwise in order to free the bottom shaft bearing holder. With the bottom shaft bearing freed from the shaft, remove it and its holder from the bank rod collar.

If the shaft is supported by a "chock" spring, proceed to remove the remaining wiper assemblies from the switch shaft. If, however, the shaft is supported by the wipers, release the double dog and let the shaft return to its normal position. Proceed, then, to remove the remaining wiper assemblies from the switch shaft. The shaft is now ready for the "Quick Change" wipers.

4.3.2 Installation of the "Quick Change" wipers.

For installation of the "Quick Change" wipers on the first three banks, refer to paragraph 4.2.2. Next, mount the bottom shaft bearing and the bottom shaft bearing holder. However, with the new "Quick Change" wiper assembly, the old bottom shaft bearing and its associated holder must be replaced with new apparatus. This apparatus replacement is to eliminate mechanical interference between the mounting screw of the "Quick Change" wiper assembly

for the third bank and the bottom shaft bearing. The interference takes place when the shaft is in its released or normal (nonoperated) position. (Re-use the old mounting material, two #6-32 x 3/16" R.H.I.M. screws and washers.) See figures 30 and 31.

Insert the corrected bottom bearing assembly into the bank rod collars. Slide both collars upward toward the third bank, engaging the shaft through the bearing. Rotate the right bank rod collar about 90 degrees clockwise and the left bank rod collar about 90 degrees counterclockwise in order to fasten securely the bottom shaft bearing holder. Tighten the set screws on the two bank rod collars.

With the bottom shaft bearing in place, slide the fourth bank upward on the bank rods as far as it will go. Install the bottom bank rod collars, one on each bank rod, and tighten the collar set screws. The fourth bank should be ready for operation. Finally, install the fourth "Quick Change" wiper assembly (see paragraph 3.2 c., e., or l.).

4.3.3 Method of alignment and of testing the "Quick Change" wipers.

Refer to paragraph 4.2.3.

4.3.4 Method of assembling wiper cords to the "Quick Change" wipers.

Refer to paragraph 4.2.4.

4.4 Replacement of "Quick Change" Wiper

When it becomes necessary to replace the "Quick Change" wiper, the following procedure is recommended:

- a. With the switch in its normal (nonoperated) position, flip the busy key lever to the "busy" position.

- b. Unsolder the wiper cord lead from the wiper blade terminal of the "Quick Change" wiper to be replaced (refer to first paragraph of 4.2).
- c. Raise the shaft a few steps and index the wiper to position nine or ten on the bank. Disengage the double dog release link, allowing the double dog to lock the shaft in place. Unsolder the wiper cord lead from the other wiper blade terminal.
- d. If the cord holder is used on the "Quick Change" wiper, it must be removed. To remove the cord holder, release, by manual operation, the double dog and back off the switch shaft to the middle bank position. Engage the double dog again to lock the switch shaft. Remove the cord holder and wiper cords (refer to figure 25 first, and then to figure 24).
- e. Manually press the release magnet armature to disengage the double dog. The shaft will automatically return to its normal position.
- f. Loosen the collar set screw and back it off sufficiently to free the shoulder of the wiper mounting bracket from the collar.
- g. Lower both the collar and the wiper approximately a quarter of an inch ($1/4''$); then, hold the collar stationary while at the same time raising the wiper to disengage and to free the shoulder of the wiper mounting bracket from the collar. As the shoulder of the wiper mounting bracket just about frees itself from the collar, rotate the wiper slightly counterclockwise and remove it from the shaft.
- h. Let the collar hang loosely on the shaft until it is time to install the wiper replacement. In replacing the "Quick Change" wiper, reverse the procedure outlined above. Refer to paragraph 4.2.3 for "Quick Change" wiper alignment and testing.

From normal wiper usage, the line wiper will need replacement before the private wiper. When, however, the private wiper is to be changed, the third step c. may be skipped.

5. BLADE REPLACEMENT OF THE "QUICK CHANGE" WIPER

5.1 General

The advanced design of the "Quick Change" wiper makes possible the removal and replacement of the spring wiper blades from the "Quick Change" wiper. This was not possible on the former wiper assemblies because they were an integrated, solid unit.

5.2 Blade Replacement on the Private Wiper

With a screwdriver, remove the two #3-56 x $1/4''$ Pan Head Steel Sems Screws. Lift off the metal and fiber washers. The rubber "U" shaped insulator, the two black phenolic bushings and the two spring wiper blades will separate from the wiper mounting bracket. Now, remove the top spring wiper blade. Next, detach the hard rubber "U" shaped insulator from the bottom wiper blade. The black phenolic bushings will free themselves. At this point, the "Quick Change" wiper is completely disassembled. The spring wiper blades may now be replaced.

For the reassembling of the "Quick Change" wiper spring blades, just reverse the above procedure. It will probably be helpful to assemble the spring wiper blades and the rubber insulator to the black phenolic bushings first. In this manner the black phenolic bushings will serve as guides for correctly assembling the spring wiper blades to the wiper mounting bracket. The two small depressions on each bushing will always face toward the "shoulder" side of the wiper mounting bracket. When the spring wiper blades have been fastened to the wiper mounting bracket by means of the two #3-56 x $1/4''$ Pan Head Steel Sems Screws, they may be checked for alignment and proper adjustment (see figure 2). After this final checking is finished, the "Quick Change" wiper is ready for use.

5.3 Blade Replacement on the Line Wiper

Follow the same procedure as outlined for the private wiper under paragraph 5.2. After reassembling, the final adjustment of the spring wiper blades should show a minimum .009" air gap between the tips (see figure 3).

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