Oct. 9, 1956 D. W. JOHNSON 2,766,342

SLIDING SHUTTER FOR ELECTRIC SWITCHES

Filed Sept. 14, 1954

FIG. 1

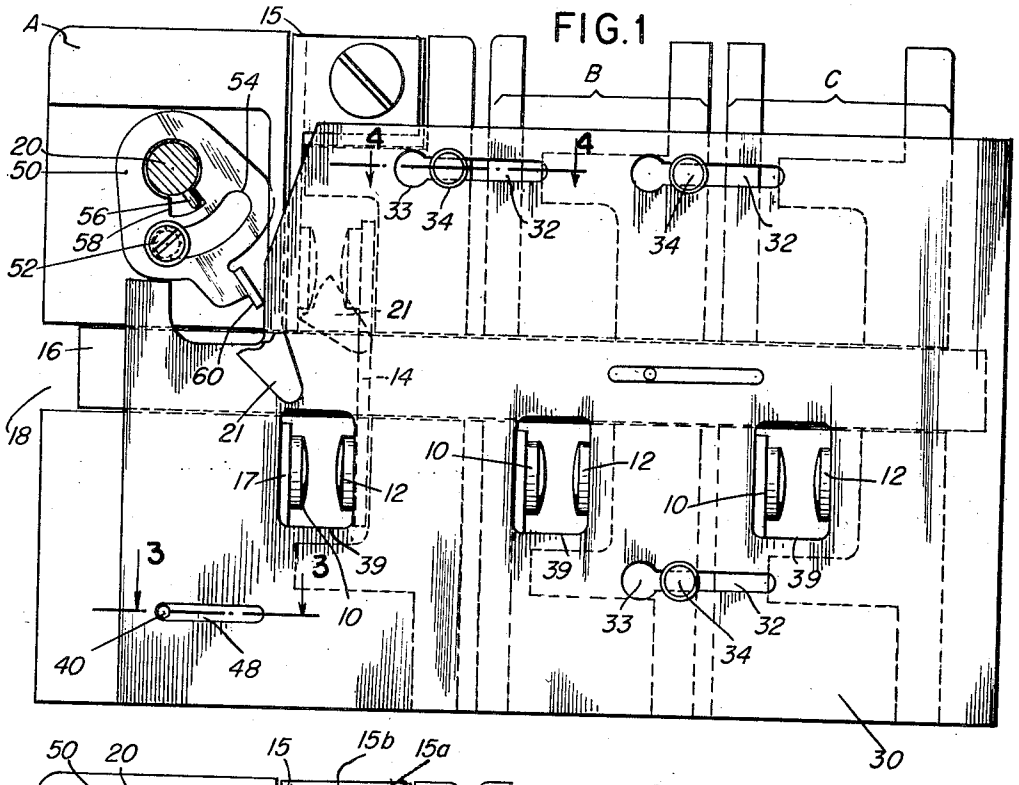


FIG. 2

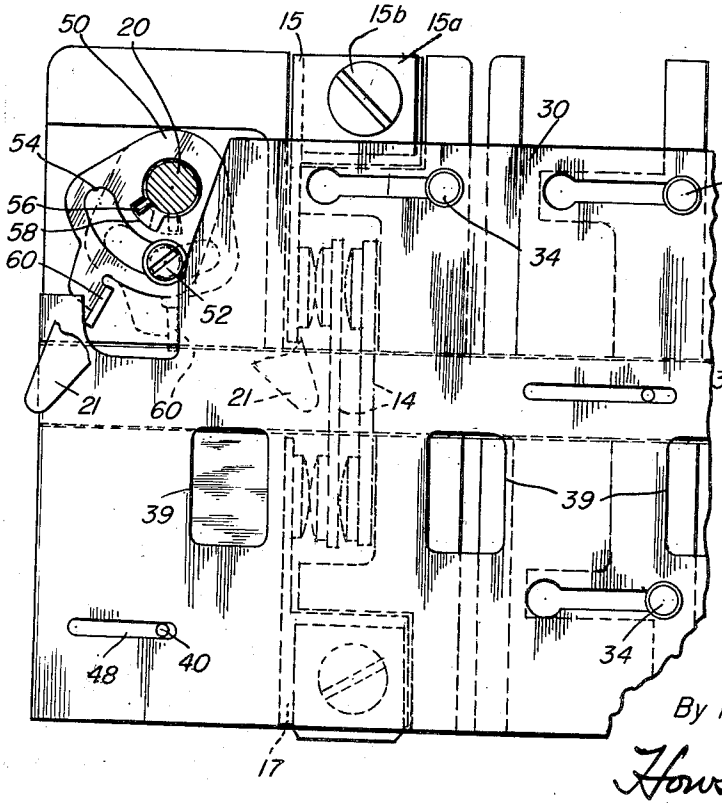


FIG. 3

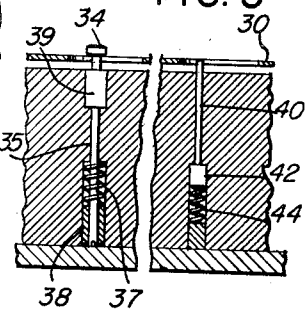


FIG. 4

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SLIDING SHUTTER FOR ELECTRIC SWITCHES

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16 Claims. (Cl. 200—50)

This invention relates to electric switches and more particularly to electric switches which are commonly used as disconnect switches and are operated from the front by a shaft extending forwardly of the switch. The invention is particularly concerned with the provision of a movable shutter or insulating plate which normally covers up the contacts, but which is provided with windows through which the contacts may be observed as the shutter moves when the switch handle is moved past the open-circuit position for the purpose of inspection.

It is desirable in some uses of electric switches, particularly switches known as disconnect switches, that the contacts be enclosed in an insulating chamber during the normal opening and closing of the switch. At the same time, it is desirable that the contacts be available for inspection when desired. Such switches are commonly mounted within a metallic switch box which is commonly provided with a lock which requires that the switch handle be moved not only to off-position but past off-position in order to release the cover of the box. In order that the contacts will be available for inspection when the box cover is opened, the means which encloses the contacts within the base should have been moved to uncover the contacts so they may be seen as soon as the box cover is opened. In that way, the operator is assured that the switch is open by his visual observance of the separated condition of the contacts.

Therefore, it is an object of the invention to provide a sliding cover upon an insulating base of an electric switch which will cover and enclose the contacts in their chamber during normal opening and closing, but which will be moved to permit the contacts to be observed when the handle is moved past the normal open-circuit position.

Another object of the invention is to provide a sliding shutter arrangement of the aforesaid type in which the person operating the switch will be entirely relieved of the necessity of separately reclosing or of opening the shutter in addition to his operation of the switch.

Another object of the invention is to provide a sliding shutter of the aforementioned type in which the sliding of the shutter will automatically be caused by movement of the switch handle to closed-circuit position and which will automatically move the shutter to uncover the contacts when the handle is moved to an extreme position past normal switch-open position.

Another object of the invention is to provide a sliding shutter for electric switches which will be unmoved during the normal operation of the switch between opened and closed positions, but which may be moved to an inspection position by continued movement of the handle past the switch-open position.

A related object is to provide means for causing the shutter to automatically cover over the contacts when the switch is moved from switch-open to switch-closed position.

Other objects and advantages of the invention will become apparent as it is described in connection with the accompanying drawing.

In the drawing:

Fig. 1 is a plan view of an electric switch to which the invention has been applied, the switch handle being broken away for clarity.

Fig. 2 is a plan view similar to Fig. 1 showing the switch in closed position.

Fig. 3 is a fragmentary section view vertically through the switch of Figs. 1 and 2, the section being taken along line 3—3 of Fig. 1.

Fig. 4 is a fragmentary section view taken along line 4—4 of Fig. 1.

Referring to the drawing, the switch parts are mounted in an insulating base which may be made of one solid piece of molded insulation or may be made up in several sections, as illustrated in the drawing. In the drawing, one section of the switch which contains the switch operating mechanism and one set of contacts is made from molded insulation in generally rectangular form as designated by the reference character A. A second section of the switch designated by the reference character B is similar to a third section designated by the reference character C. Both of the sections B and C are made preferably from molded insulating material and contain fixed and movable contacts 10, 12 which are engageable and disengageable as the switch operating mechanism is actuated. Since the fixed and movable contacts in all three sections are identical, description of the contacts in section A will suffice. It will be understood, however, that the invention is applicable to switches having the number of sets of fixed and movable contacts suitable to the requirements of usage.

The movable contact may comprise a bridging bar 14 of copper or other conductive metal adjacent the opposite ends of which are affixed the contact buttons 12 facing in the same direction. The contact bar is resiliently supported in conventional fashion upon an insulating contact carrier which may consist of a bar 16 molded from insulating material and having a rectangular cross section and sliding in a channel 18 in the switch base, the channel running transversely of the several sections which make up the base in the switch as illustrated. The contact carrier is moved rectilinearly to and fro in the channel by switch operating mechanism, not shown, as the switch handle is operated. As the contact carrier moves from open-circuit position shown in Fig. 1 to the position shown in Fig. 2, the movable contact buttons 12 are moved into engagement with a pair of fixed contact buttons 10 in register therewith. The fixed contact buttons are mounted upon separate contact supporting bars 15, 17 which may be stamped from sheet metal and located in recesses or slots edgewise as viewed in Figs. 1 and 2. The ends of the bars may have terminal lugs 15*a* bent at right angles thereto in which may be mounted terminal screws 15*b* of conventional form. The particular form of the switch contacts and terminals forms no part of the present invention.

The switch is actuated by a shaft 20 extending perpendicularly from the base and having a conventional handle 21 mounted on the end thereof in such fashion as to cause the shaft to turn when the handle is moved. Only the end of the handle is visible to show its different positions, the handle being broken away for clarity. Lying on top of the base is a flat sheet insulation plate 30 of generally rectangular form with one corner thereof cut away to provide for movement thereof by operating means, as will hereinafter more fully appear.

In order that the cover plate or shutter may be held slidably upon the top surface of the insulating switch base and yet may be removed therefrom when desired, three key-hole slots 32 are provided at spaced points in the plate. Passing through the slots are three pins 35 having

enlarged heads 34 adapted to overlie the narrow portion of the slots but of preferably the same dimensions as the enlarged portion of the slot so that when the plate is moved to a position where the heads 34 of the pins are in register with the enlarged portions 33 of the slot, the plate may be readily lifted up and removed from the base. The pins preferably are resiliently supported in order that the head of the pin may exert a slight pressure upon the shutter plate. For that purpose, the pins extend through the switch base, the base around the lower end of the pin being bored out to accommodate a coil compression spring 37 one end of which will press upon the end of the bore while the other end presses upon the inside end of a bushing or sleeve 38 which is secured to the bottom or lower end of the pin in any suitable fashion.

In order to limit the movement of the pin under the effort of the spring 37, the upper end of the pin underneath the head is provided with an enlarged portion 39 which slides within an enlargement at the upper or top end of the bore in which the pin is located. Thus, as the end of the enlargement 39 seats upon the shoulder formed at the bottom of the upper enlargement of the bore, the inward movement of the pin under the effort of the spring is terminated.

In order to limit the sliding movement of the shutter, a resiliently supported limit pin 40 is mounted in a bore in the base. The lower end of the bore is enlarged to accommodate a cylindrical enlargement 42 on the lower end of the limit pin. In the enlarged lower portion of the bore beneath the pin enlargement is a coiled compression spring 44 whose inner or upper end presses against the bottom of the pin enlargement and urges the enlargement 42 against the shoulder in the bore. The lower end of the spring 44 is supported upon a filler plug 46 maintained in the lower or bottom end of the bore. The upper end of the limit pin extends into a narrow slot 48 in the shutter plate and limits the sliding movement of the plate to the length of the slot 48. The slot 48 is so located that when the parts are in the position shown in Fig. 1, the enlarged portions 33 of the key-hole slots have not been able to come in register with the heads 34 of the pressure pins. Hence, the shutter is still held by those heads.

In order to permit further movement of the shutter plate so that the enlarged ends of the keyhole slots may register with the heads of the pressure pins permitting the shutter plate to be removed, the limit pin must be depressed against the urge of its spring 44.

In the position shown in Fig. 1, windows or apertures 39 which are punched in the shutter are in position to overlie the switch contacts permitting them to be seen.

In order to move the shutter automatically in response to predetermined movements of the switch operating shaft 20, a stamped sheet metal sectorally shaped operating plate 50 is mounted flat on top of the switch base with the switch shaft passing freely through a circular opening in the apex of said plate. Movement of the operating plate pivotally about the shaft 20 is limited by a pin 52 screwed into the switch base a short distance from and parallel to the shaft 20 and passing through an arcuate slot 54 in the operating plate 50.

The turning motion of the switch operating shaft 20 is transmitted to the shutter operating plate 50 by a drive pin 56 radially extending from the shaft 20 into a small sectoral notch 58 in the periphery of the shaft opening in the operating plate 50. The notch provides lost motion so that a larger arc of movement of the shaft is permissible than would be possible if the operating plate 50 moved identically with the shaft 20.

In order to move the shutter to and frow, there extends from the periphery of the operating plate 50, a lug which has one side upturned at right angles providing a finger 60 for engagement with the opposite edges of a recess 62 in one corner of the shutter. The recess is so shaped that when the switch shaft 20 is in closed position (as shown in full lines in Fig. 2), the finger 60 will be engaged with one edge of the recess (the left edge as illustrated) and will have moved the shutter to cover the contacts. The operating pin 56 on the switch shaft will have engaged one edge (the left edge as illustrated) of the sectoral slot 58 and moved the operating plate to the position shown in full lines in Fig. 2. On movement of the switch shaft oppositely from Fig. 2 full line position to Fig. 2 dotted line position, the switch will open, the lost motion of the pin 56 in slot 58 will have been used up and the operating plate 50 will have moved counter-clockwise without moving the shutter. The shutter did not have to move because the recess is large enough to permit the finger 60 to move between open and closed positions of the shaft. In consequence, the contacts remain covered.

On movement of the switch shaft 20 counter-clockwise past switch-open position (dotted in Fig. 2) into the Fig. 1 position, the drive pin 56 moves the operating plate 50 and its finger 60 counter-clockwise and the finger 60 engages the right edge of the shutter recess pushing the shutter to the right as shown in Fig. 1 wherein the windows 39 overlie the contacts and permit them to be viewed.

Normally, the switch shaft will have a spring (not shown) to return it to the open position when the hand of the operator is removed from the handle 21; but the invention can, as well, be employed in devices not having such a bias.

In returning to switch-open position from the extreme or shutter opening position, the shaft 20 and operating plate 50 do not have to move the shutter since the finger can move in the shutter recess 62 freely on that occasion. The shutter remains open. However on movement of the shaft to reengage the switch contacts, the finger 60 presses against the left edge of the recess 62 and moves the shutter to the left causing the windows 39 to move from over the contacts, thereby covering the contacts again.

From the foregoing, it will be observed that the movement of the switch shaft 20 between switch-closed position and switch-open position and back again (full to dotted line positions in Fig. 2 and vice versa) takes place without opening the shutter so that the contacts remain covered. But on movement of the shaft 20 from switch-open (dotted in Fig. 2) to the extreme or shutter-open position of Fig. 1, the shutter windows will move over the contacts, uncovering them. Thereafter, on movement of the switch shaft to close the switch contacts, the shutter will be automatically shifted to cover the contacts without the need for personnel to perform any other act.

Many modifications within the scope of the invention will occur to those skilled in the art. Therefore, the invention is not limited to the specific embodiment illustrated.

What is claimed is:

1. In an electric switch, a base, relatively movable contacts located on said base, a movable shutter covering said contacts and having an opening therein which in one position of the shutter exposes said contacts, a switch operating member engaging with said shutter to move it between exposing and covering positions, means guiding the movement of said shutter, means holding said shutter slidably on said base but releasing said shutter in a certain position, means normally limiting the sliding of said shutter but releasable to permit its movement to said certain position.

2. The combination as claimed in claim 1 wherein a pin and slot guide the movement of the shutter.

3. The combination as claimed in claim 2 wherein the means holding the shutter on the base comprise heads on the pins overlying the shutter.

4. The combination as claimed in claim 3 wherein the slots are keyhole shaped permitting passage of the heads of the pins in said certain position.

5. The combination as claimed in claim 4 wherein the limiting means comprises a resiliently supported pin depressibly mounted in the base and lying in a slot in the shutter, depression of the said pin permitting the shutter

to be slid over the pin and to move into said certain position.

6. The combination as claimed in claim 1 wherein the limiting means comprises a resiliently supported pin depressibly mounted in the base and lying in a slot in the shutter, depression of the said pin permitting the shutter to be slid over the pin and to move into said certain position.

7. In an electric switch, a base, relatively movable contacts located on said base, a movable shutter covering said contacts and having an opening therein which in one position of the shutter exposes said contacts, a switch operating member engaging with said shutter to move it between exposing and covering positions, means actuated by said operating member and having a lost-motion engagement with said shutter, said operating member when moved into one position causing movement of said shutter into covering position, said operating member on movement into another position causing said shutter to move into exposing position, and said operating member being movable into a third position without causing change of the condition of coverage or exposure by said shutter of said contacts.

8. In an electric switch, a base, relatively movable contacts located on said base, a movable shutter covering said contacts and having an opening therein which in one position of the shutter exposes said contacts, a switch operating member engaging with said shutter to move it between exposing and covering positions, means actuated by said operating member and having a lost-motion engagement with said shutter, said operating member when moved into one position causing movement of said shutter into covering position, said operating member on movement into a third position causing said shutter to move into exposing position, said shutter remaining in exposed position on movement of the operating member from said third to said second position, and said operating member being movable into a third position without causing change of the condition of coverage or exposure by said shutter of said contacts.

9. The combination as claimed in claim 7 having a lost-motion connection between the operating member and said actuated means to reduce the necessary motion of the latter incident to movement of the operating member.

10. The combination as claimed in claim 8 having a lost-motion connection between the operating member and said actuated means to reduce the necessary motion of the latter incident to movement of the operating member.

11. The combination as claimed in claim 7 wherein the lost-motion means comprises a recess in the shutter whose edges are engaged by an extending part on said actuated means.

12. The combination as claimed in claim 11 wherein the lost-motion connection between the operating member and actuated means comprises a radial pin on the operating member engaging the edges of a slot in the actuated member.

13. The combination as claimed in claim 8 wherein the lost-motion connection between the operating member and actuated means comprises a radial pin on the operating member engaging the edges of a slot in the actuated member.

14. The combination as claimed in claim 13 wherein the lost-motion connection between the operating member and actuated means comprises a radial pin on the operating member engaging the edges of a slot in the actuated member.

15. In a switch as claimed in claim 1, the combination with means actuated by said operating member and having a lost-motion engagement with said shutter, said operating member when moved into one position causing movement of said shutter into covering position, said operating member on movement into another position causing said shutter to move into exposing position, and said operating member being movable into a third position without causing change of the condition of coverage or exposure by said shutter of said contacts.

16. The combination as claimed in claim 15 having means to cause said shutter to remain in exposed position on movement of the operating member from said third to said second position.

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