June 12, 1934. F. S. GREEN 1,962,867

DEAD FRONT SAFETY SWITCH

Filed Aug. 18, 1930 3 Sheets-Sheet 1

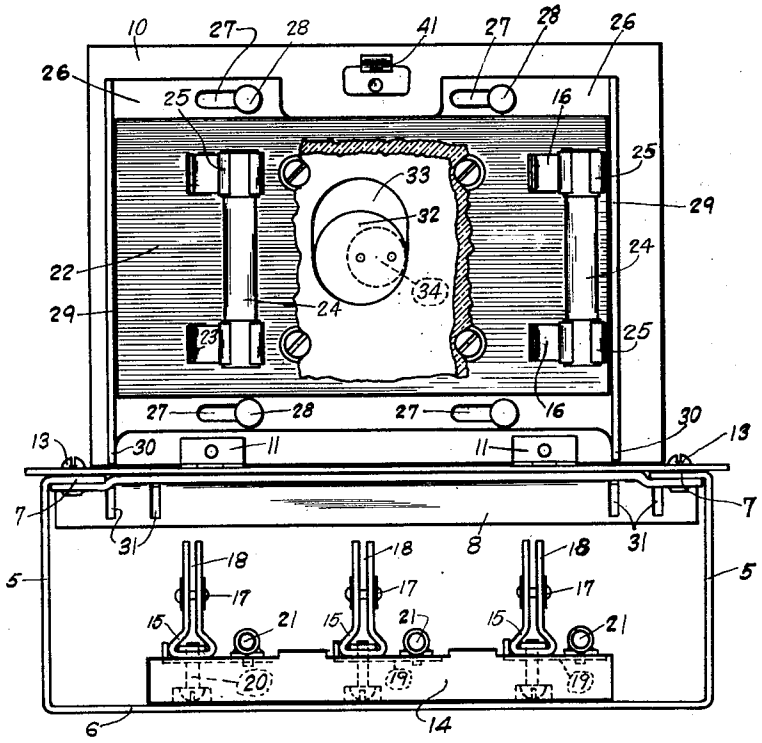


FIG. 1

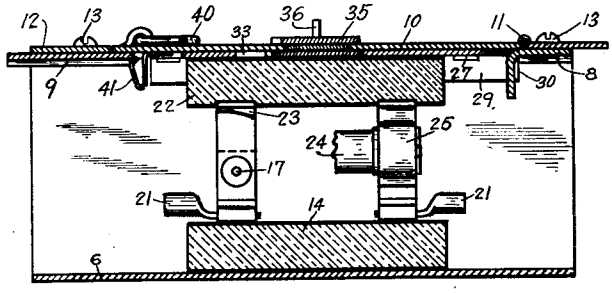


FIG. 2

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DEAD FRONT SAFETY SWITCH

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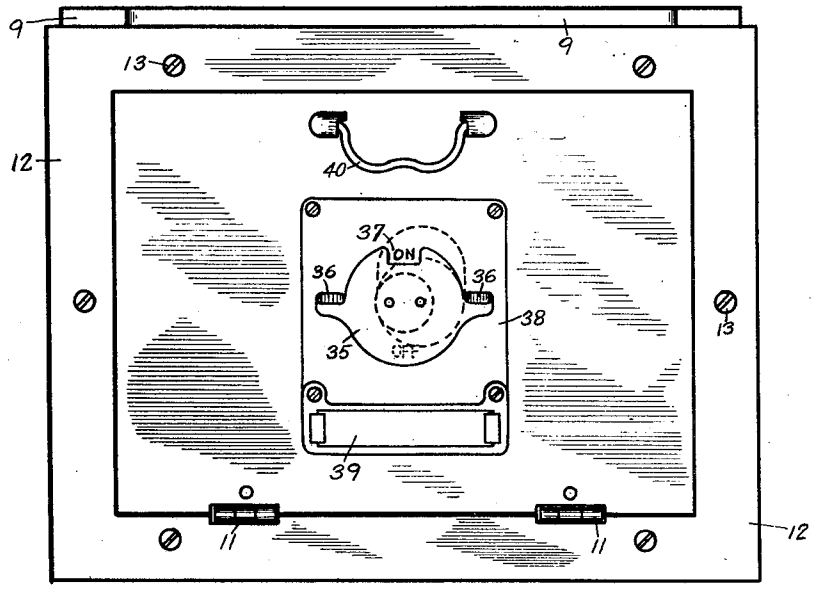


FIG. 4

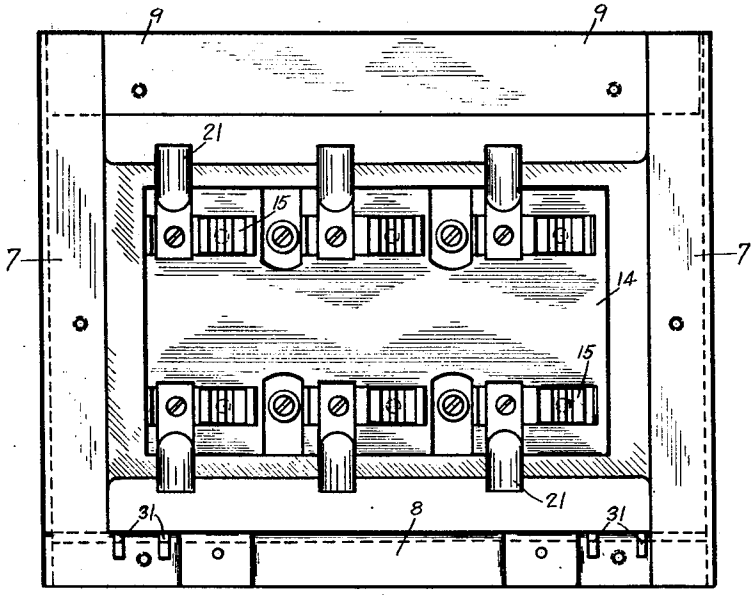


FIG 3

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DEAD FRONT SAFETY SWITCH

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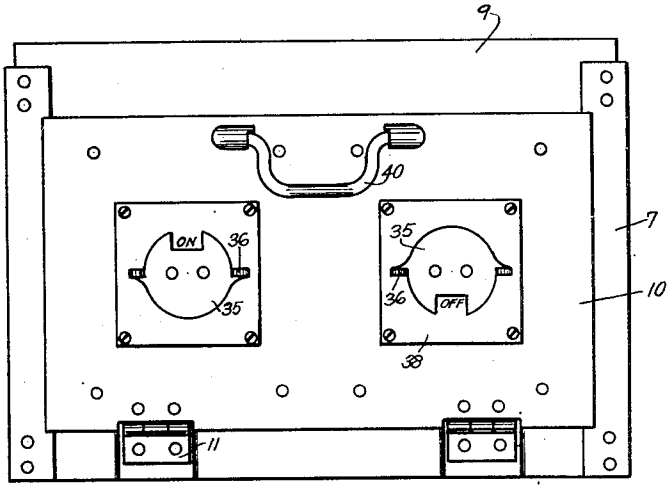


FIG. 5

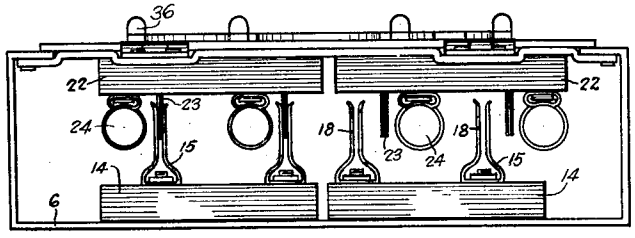


FIG. 6

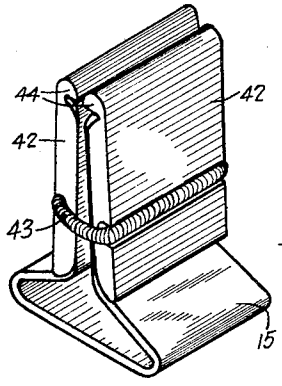


FIG. 7

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UNITED STATES PATENT OFFICE

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DEAD FRONT SAFETY SWITCH

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Application August 18, 1930, Serial No. 475,945

8 Claims. (Cl. 200—114)

This invention relates to dead front safety switches and more particularly to improvements in enclosed switches wherein the operation of the switch is effected by manipulation of the switch door or cover for the switch enclosure.

An object of my invention lies in the provision of improved switch operating means.

A further object of this invention is to provide a fuse switch and enclosure therefor, in which the fuses are mounted on the door of the enclosure and both ends thereof entirely disconnected, by a single movement, from live elements of the device when the door is in open position. In accomplishing this object, as stated above, the fuses are disposed on the inner surface of the door, which, when opened, moves the fuses out of the enclosure and into a position where they may be readily handled without danger of contact with any of the live portions of the switch structure.

Another object of my invention is to provide an enclosed, externally operated fuse and switch assembly, which by reason of the relative disposition of switch and fuse parts, requires less space than the ordinary switches of similar type and capacity.

Yet another object of my invention is to provide improved means, in a switch of the type described, for locking the switch in either "on" or "off" position, the means being operative to prevent actuation of the switch when the switch cover is closed.

A further object of my invention is to provide means, in connection with a switch of the class named, which prevents the door being closed at such times when the switch blades are disposed intermediate their "on" and "off" positions. Thus, in order to close the door, it is necessary that the switch blades be either positioned so that, upon closure of the door, they will make a positive contact with the switch terminals, or, in the "off" condition of the switch, positioned at a suitable, safe distance from the switch terminals.

Still another object is to provide, in combination with switch or fuse elements carried, as by a door of an enclosure therefor, means enabling such elements to be moved between predetermined positions on such door, and yet which positively prevents unintended or casual movements of the switch or fuse elements with respect to the door.

A further object is the provision of a complete, enclosed fuse and switching unit of dead-front, safety type, adapted to be used with companion units for assembly into a switch board or panelboard, in which any one of the units may be inserted or removed without disturbing the remainder of the installation, the units being so constructed as to be of almost universal application in switchboard or panelboard construction. For example, one of such units may be used as a main disconnect, and others thereof disposed in rows or tiers and compactly arranged to utilize to best advantage a limited available space.

An additional object is the provision, in a device of the type above referred to, of means whereby all of the fuse connections are certain to be made or broken together, and with which there is no possibility that some of the poles of the switch and fuse assembly may remain connected while others are disconnected.

These and other objects and advantages will appear as the description proceeds and from the accompanying drawings which illustrate a preferred embodiment of my invention.

Fig. 1 of the drawings is a front elevation of my switch with the door in open position, showing a plan view of the under side of the door and parts carried thereby, a portion being broken away to show certain parts employed for actuating the fuse block; Fig. 2 is a sectional side view with the switch in closed position; Fig. 3 is a plan view, the trim and door having been removed to more clearly show certain structural features of the enclosure; Fig. 4 is a plan view, showing the switch actuating member and indicating means therefor; Fig. 5 is a plan view of a double-throw switch embodying features of my invention; Fig. 6 is a side elevation of the switch shown in Fig. 5, and Fig. 7 is a perspective view of a switch clip in connection with a device known in the art as an "arc snuff-out".

In the present embodiment of my invention, I provide a switch enclosure or housing, whereby my device is readily adaptable for assembly in a panelboard or switchboard. It will be understood, however, that the application of my switch is in no way limited, and may be employed wherever an ordinary knife, or safety-type switch is adaptable. Thus, in the present embodiment, I provide a frame member which supports the door and trim, and encloses the switch on three sides. Side walls 5 extending from a back 6, are provided at each outer margin with inturned flanges 7 which are tied together at the rear or hinged end of the structure by an angulate tie strip 8, and at the front end, by a flat tie strip 9 which serves as a rabbet for the free end of the door. In the particular construction shown, the ends of the switch enclosure are left open, so that when disposed in rows or tiers, a free circulation of air is

permitted through the assembly, for cooling purposes. Obviously, if desired, the switch may be fully enclosed. The door 10 formed of sheet material of a suitable thickness to insure rigidity, is preferably connected by hinges 11 to the angulate tie strip 8, the strip being recessed to permit the hinges to be mounted flush with its upper surface. To give a finished appearance to the structure, I provide a framing-plate, or trim 12, secured to the switch frame at the flange 7, by means of the screws 13. It will be noted that the door is not hinged, or otherwise operatively connected to the trim, a construction commonly employed in the manufacture of panelboards and switch enclosures, hence the trim may be removed without disturbing the door or affecting, in any way, the operation of the switch.

Secured to the back 6, by screws or other suitable means, (not shown), is a switch base 14, preferably of molded insulating material. On the base 14 are mounted switch terminals or clips 15, which are arranged in pairs, as best appears in Fig. 3, and adapted to be engaged by blade members 16, carried by the door, as will hereinafter be described. Pins 17, disposed through jaw portions 18 of the switch terminals, serve to maintain the jaw portions in parallel alignment for full surface engagement with their coacting blade member. The switch terminals are seated on, and directly connected to conducting straps 19; screws 20, inserted, by preference, from the under side of the base block, serving to secure the straps and terminals together, and to the base block. As will appear from Fig. 1, one end of each strap is bent upwardly to engage a side of the terminal mounted thereon, thereby preventing said terminal from turning, and becoming misaligned with respect to its associated knife blade. The opposite end of the strap 19 is provided with a connector or lug 21.

The blade members 16, hereinbefore mentioned, are arranged in pairs on an insulating base 22, and each, by preference, is of angulate construction, having a portion 23 which extends away from the base for engagement by a terminal member. The pairs of blade members are adapted to be connected by fuses 24, the fuses being disposed in suitable fuse clips 25, which are directly secured to the blade members. Although I have described the insulating bases such as 14 and 22, as each formed of a separate single piece of material, it is sometimes desirable in installations of the larger capacities to provide a separate insulating base for each of the terminals and fuse clips.

The base 22 is mounted on a slidable plate 26, adapted for movement, in the present example, parallel to the plane of the door, and transversely to the paired terminal members 15. Thus, the plate is provided with extended apertures or slots 27; and pins 28, disposed through the slots and secured to the door are provided with enlarged head portions serving to maintain the plate against the door, and in movable relation thereto.

By preference, the relative disposition of the parts already described is such that the blade members 16 are in engaging alignment with the terminal members 15, when the plate 26 is in one of its extreme positions with reference to the door. This condition is illustrated in Fig. 1 of the drawings. The plate and parts carried thereby, may be moved (by means to be hereinafter described) to their other extreme position relative to the door, as limited by the extent of the slots, in which position the blade members are moved out of the planes of the terminals, and positioned to clear the terminals by a substantial margin when the switch door is closed.

To prevent the door from being closed when the switch parts are disposed in any other than the two definite positions described above, I provide, on the plate 26, flanges 29, the end portions 30 of which tend to abut the angulate tie strip 8. The tie strip 8 is provided with slotted apertures 31, disposed in pairs, each slot being suitable to accommodate one of the end portions 30 of the flanges 29. The slots comprising each pair are relatively spaced at a distance equal to the length of travel of the plate, hence when the plate is positioned at either of its limits of travel, each flange is in register with one of the slots, and the door may be closed. In closed position of the door, the flanges extend through the slots as shown in Fig. 2.

For actuating and controlling the movement of the plate 26 relative to the door, I provide a circular disc 32, disposed in an extended aperture 33 in the plate. The disc 32 is secured in eccentric relation to a disc 34, and to an actuator 35 disposed on the outer surface of the door. The assembly of actuating members, comprising the disc or eccentric 32, the disc 34 which forms a bearing for the assembly and the actuator 35, is adapted for rotation within the limits of an angle of 180 degrees. Such rotation causes the plate and parts carried thereby to be moved from the switch "on" position to the switch "off" position or vice versa. Obviously, substantial or operating movement of the above mentioned parts can be accomplished only when the door is opened sufficiently to withdraw the flange portions 30, from the slots 31. It will appear that the relation of the plate 26 and disc 32 is such that the disc and associated parts will tend to prevent any casual or unintended movement of the plate, the disc or cam 32 serving to position the plate on the door, except as the plate may be shifted by movement of the actuator 35.

The actuating member 35, in the present example being of disc form, is adapted for manipulation by a pair of projecting ear portions 36. Also, as means for indicating the switching position of the blade members, I provide a notch 37 in the actuator 35, which renders one or the other of the words "off" or "on" visible, depending upon the relative position of the switch parts. These words, or other suitable indicia of switching conditions, are registered, one diametrically opposite the other, on the upper surface of a name plate 38, the words being disposed within the area covered by the actuating member 35. Also the indicia are arranged relative to the limit positions of the notch 37, so that one or the other legend will necessarily be uncovered when the door is closed. In addition to the indicia showing the position of the switch blades, a suitable card holder or the like 39, may be employed to designate the particular circuit to which the unit is applied.

A handle 40, or other suitable door manipulating device is arranged at the outer or free end of the door, and in the present embodiment of my invention, I provide a non-locking, staying device 41 which coacts with the tie strip 9 for maintaining the door in closed position. I may, however, provide any other suitable means for keeping the door closed, such as a key actuated lock, (not shown), mounted in addition to the staying device 41, or a pair of eye members, for receiving a padlock or the like. Such a provision, in connection with the switch construc-

tion herein described, is particularly advantageous, since, by locking the door in closed position, the switch parts, which are automatically locked upon closing the door, cannot be actuated until the door is again unlocked and opened.

The features of my invention may be embodied in a double-throw switch in a number of different ways which, from the foregoing description, will at once be apparent to those skilled in the switch art. In Figs. 5 and 6 I show, mounted in a single frame, a two pole, double-throw switch comprising a pair of single throw switches, such as are shown in the figures heretofore described. In this device, means are provided which prevent individual switching units from being in the "on" position simultaneously. Further means, preferably of the nature described in connection with the single pole switch, are provided, which permit of the door being closed only when both units are in "off" position, or when one is in "off" and the other in "on" position. This provision may correspond to the arrangement of slots 31 and strip portions 30, discussed above and appearing in Fig. 1. Both sets of contacts are prevented from concurrent engagement, in the construction of Fig. 6, by the fact that the setting of the blocks 22 on the door, is such that when either is in the "on" position, it acts as a stop, to prevent the other from being brought into the "on" position. This arrangement will clearly appear from Fig. 6, showing the switch to the right of the figure in "off" position, and that on the left, in the "on" position. It is clear that the spacing between blocks 22 being less than that between the companion blade 23 and clip 15, the open switch cannot, in this situation, be closed.

While the arrangement of double sets of blocks and contacts is preferred solely for manufacturing reasons, it will appear obvious that the structure of Figs. 1 et seq., may be utilized as a double throw switch simply by providing an extra set of clips, and a suitable range of lateral movement of the single block 22.

The "arc snuffer" shown in Fig. 7 is preferably employed in the switches herein described, and comprises a pair of blocks 42, of insulating, heat-resisting material, which are flexibly held to the switch clip 15 by means of a garter spring 43. The blocks have portions 44 formed to overlie the upper or entering edges of the clips and these portions are separated by a space less than the thickness of a switch blade 23. In operation, when the switch blade is withdrawn from the clip, the portions 44 under the action of the garter spring are moved into the path of the blade and the arc drawn between the blade and clip is quickly extinguished.

From the foregoing description it may be seen that I provide a fuse switch of simple construction which, by reason of the relative disposition of fuses and switch blades, requires less space than ordinary switches of its type, and which allows a re-fusing operation to be accomplished without danger to an operator.

While I have shown and described a single particular embodiment of my invention, I realize that many changes may be made, that certain parts may be added, dispensed with or interchanged without departing from the spirit and full intended scope of the invention.

I claim:

1. In a switch assembly, a switch frame having an insulating base, with switch terminals mounted thereon, a hinged cover, blade carrying means, carried by and movable relative to said cover, and rotatable means carried by said cover for effecting movement of the blade-carrying means along the cover, and indicia of switching condition as an exterior portion of said cover, said indicia being adapted, in accordance with the position of said rotatable means, to indicate the switching relation between said switch terminals and the switch blades.

2. In a switch assembly including a housing, stationary contacts, a closure hingedly associated with the housing, movable contacts carried by the closure, said movable contacts arranged for switch actuating movement in a plane transverse to the closure, and camming means carried by the closure and having an operating portion extending through said closure, said means being operable only when the closure is in open position, for positioning the contacts, selectively, with respect to said plane, and maintaining the position of said movable contacts, relative to the closure.

3. In a switch assembly including a housing and stationary contacts within the housing, a door for the housing, complementary contacts carried by the door, means for moving said last named contacts relative to the door, said means being operable to move said door contacts only when the door is in open position, means preventing closure of the door, except in predetermined positions of the contacts on the door, and indicia of switching condition on said door for indicating the switching relation between said door-carried contacts and said stationary contacts, the visibility of said indicia being determined by the position of said contact moving means.

4. In a dead-front switch unit of a type adapted to be assembled with companion units in an electrical control assembly, an open-end housing constituting a frame for the switch, and including a back, an insulating base removably secured to the back, and contacts mounted on said base; a door for the housing, a flanged plate slidably carried by the door, an insulating base on said plate between the flanges thereof, complementary contacts carried by the base on the flanged plate, said plate having a cam-receiving slot formed therein, an eccentric cam within said slot, a cam actuating element extending through, and operable exteriorly of said door, and means associated with the frame and door for preventing closure of the door except when the last named contacts are disposed in a predetermined position on the door.

5. An electric switch including an enclosure, a hinged cover therefor, stationary contacts within the enclosure, a member carried in slidable relation by said cover, contacts carried by and movable with the slidable member, and rotatable means adapted for slidably actuating said member only when said cover is in open position, said rotatable means including an eccentric cam, and a cam operating element disposed for access exteriorly of the cover.

6. A switch assembly including a housing, a door hingedly attached to the housing, paired switch terminals within the housing, paired blade members slidably carried by the door, and arranged for engagement with said terminals and means extending through the door, for effecting shifting movement of the blade members when said door is in open position, whereby to predetermine switching condition, upon movement of the door toward the housing.

7. A circuit switching device including a housing having a hinged cover, means for controlling a plurality of supply circuits, said means including stationary contacts carried by the housing, and a pair of separately operable groups of movable contacts carried by the cover, an eccentric cam for moving each of said cover-carried contact groups relative to the cover, the contact groups being arranged for selectively de-energizing all of said supply circuits, or energizing only one of said supply circuits.

8. A multi-position switch including a housing, a hinged closure for the housing, means for controlling a plurality of supply circuits, said means including stationary switch contacts, carried by the housing, and a pair of separately operable groups of movable contacts carried by the closure, manual control means for moving each of said closure-carried contact groups relative to the closure, the contact groups being arranged for preventing energization of the supply circuits controlled by one of the contact groups, while the supply circuits controlled by the other of said contact groups are energized.

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