Feb. 29, 1944. W. H. FRANK 2,342,852

SWITCH

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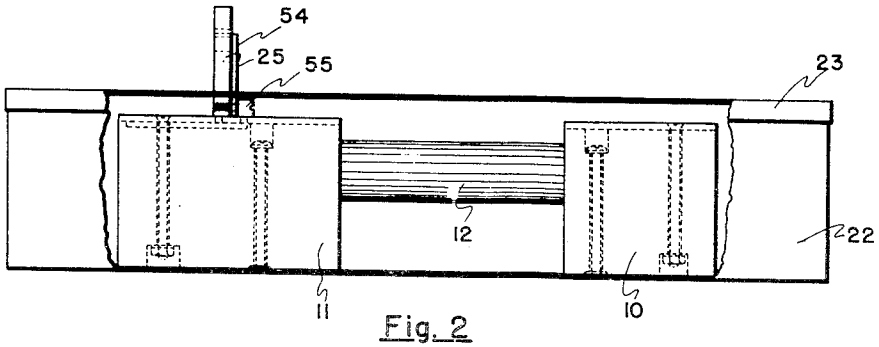


Fig. 2

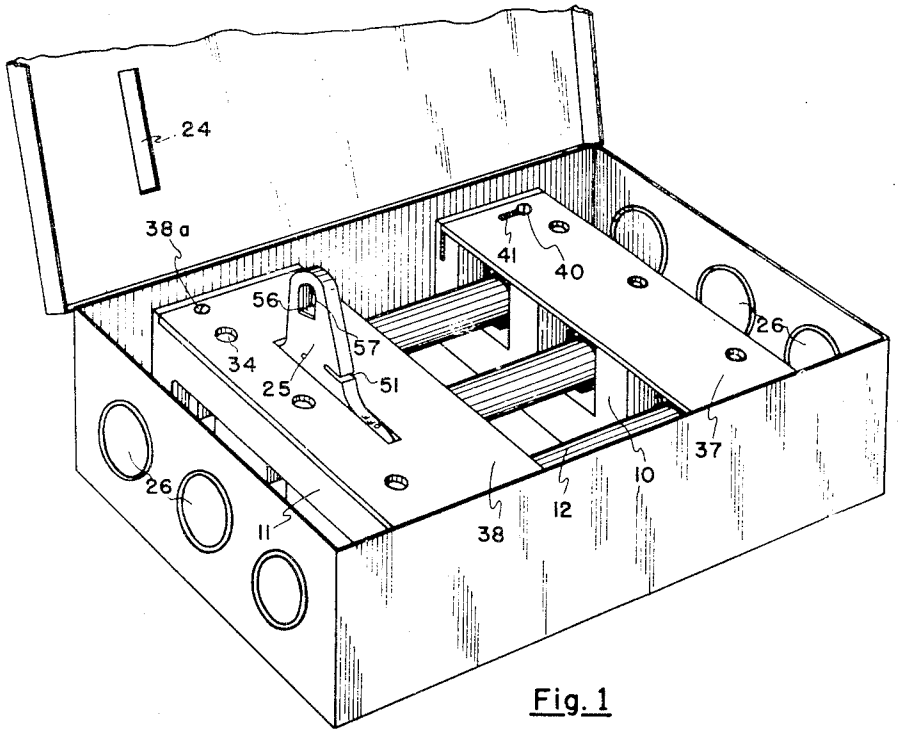


Fig. 1

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SWITCH

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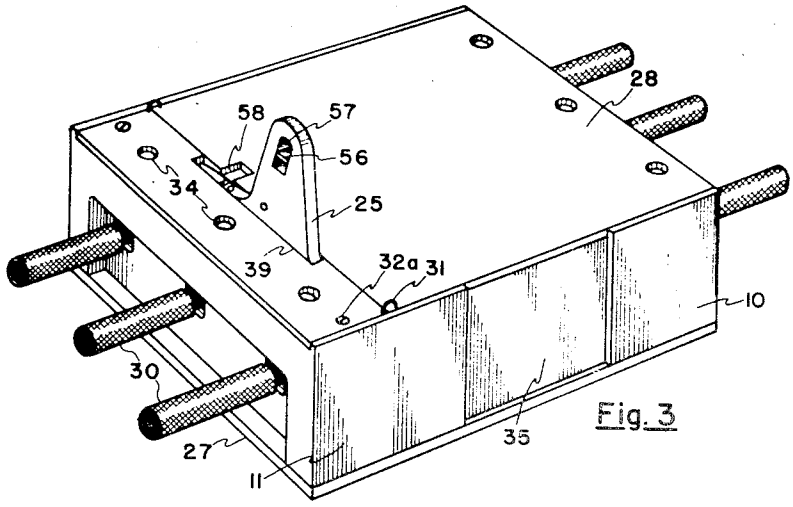


Fig. 3

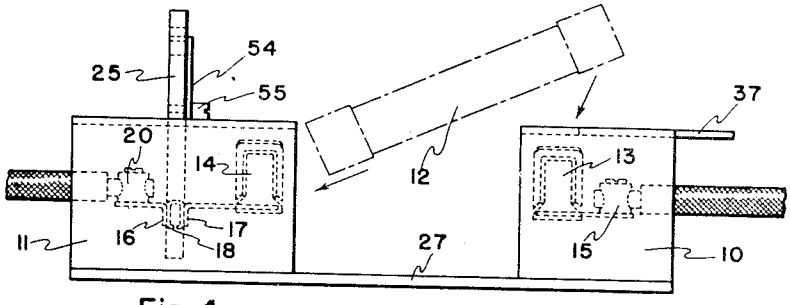


Fig. 4a

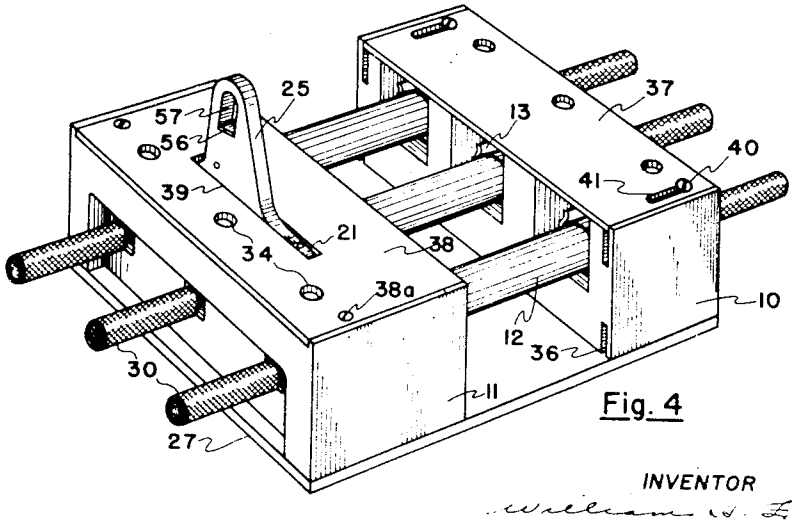


Fig. 4

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SWITCH

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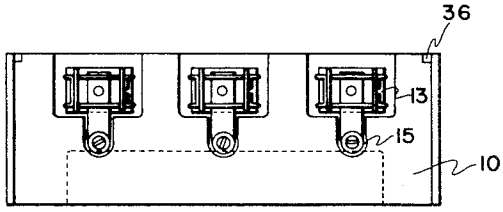


Fig. 5

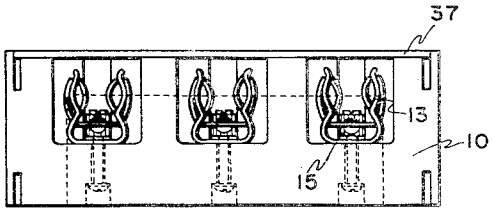


Fig. 6

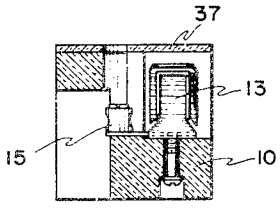


Fig. 7

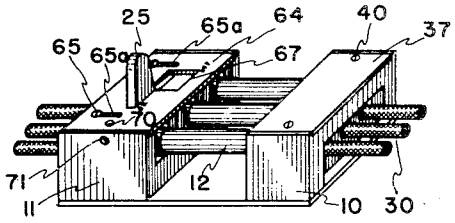


Fig. 8

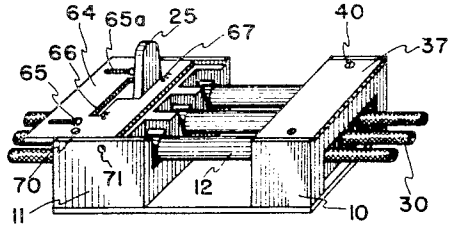


Fig. 9

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SWITCH

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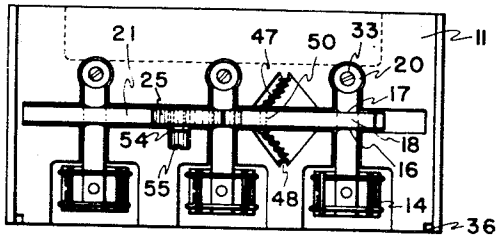


Fig. 10

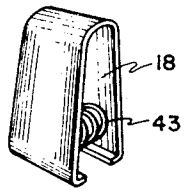


Fig. 13

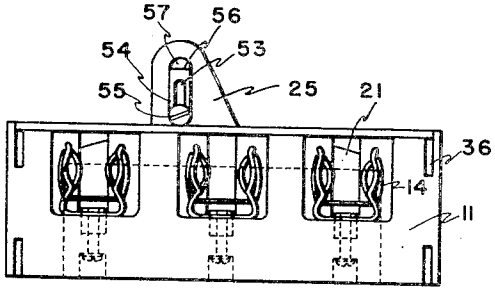


Fig. 11

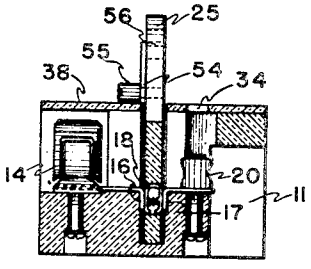


Fig. 12

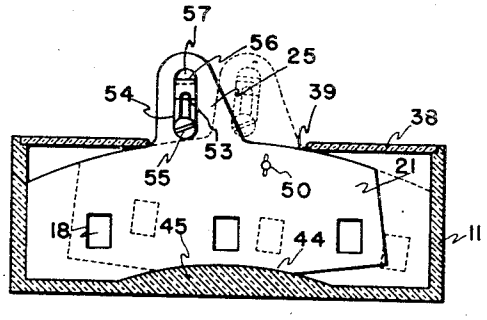


Fig. 14

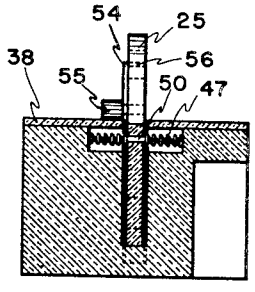


Fig. 15

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Patented Feb. 29, 1944

2,342,852

UNITED STATES PATENT OFFICE

2,342,852

SWITCH

William H. Frank, Detroit, Mich., assignor to Bulldog Electric Products Company, Detroit, Mich., a corporation of West Virginia

Application November 19, 1942, Serial No. 466,092

3 Claims. (Cl. 200—50)

This application relates to switches.

An object of the present invention is to provide a dead front safety switch having all of the desirable characteristics now included in the better class of enclosed switches, but wherein the enclosure or box commonly used to obtain such characteristics is eliminated to conserve materials without sacrifice of such characteristics; although elimination of enclosure is an objective, it will be understood that the switch hereof can be used in an enclosure if desired, although the same is not necessary. Among the desirable characteristics which are incorporated in the switches hereof are the following: the switch is dead front, its front not exposing live parts, all live parts being protected against accidental contact; its arc rupturing characteristic is good, and arc rupture does not endanger the operator; switch actuation and access to fuses of the switch, are suitably interlocked; suitable lockoff provision is made.

The switch hereof is a unitary dead front safety switch and requires no enclosure or box. For manufacturing expediency, especially in the larger sizes, the body or block of the switch may be made in several separate parts, fastened to one another, although in the smaller sizes it is preferred to form it of one integral switch block.

Another object of the invention is to provide a novel switch, particularly for controlling three poles, wherein the actuator of the switch, though constructed as a slide plate, is guided to rotate, whereby the structural advantages of a slide plate and as well the operation or mechanical advantages of a rotary plate are attained.

Switches of the invention are shown in the appended drawings. In these drawings,

Fig. 1 shows a switch of the invention disposed within a box.

Fig. 2 is another view of the switch of Fig. 1.

Fig. 3 shows the switch in a form intended for use without a box but with all live parts completely enclosed.

Figs. 4–4A show the switch in a form without a box and all live parts enclosed but with the insulated (not live) parts of the fuses thereof exposed.

Figs. 5, 6, and 7 are plan, elevation and section views respectively of a load block of the switch formed having means for binding load conductor terminals and having fuse holders for ferrule ends of cartridge fuses.

Figs. 8 and 9 are different position views of an interlock arrangement whereby access to the interior of a covered switch for fuse manipulation is controlled by the positions of the circuit controlling switch handle.

Figs. 10, 11 and 12 are respectively plan, elevation and section views of a line block of the switch having binding means for line conductor terminals, fuse holders for ferrule ends of cartridge fuses, and a switch for controlling the connection of the line conductor terminals to the fuses.

Fig. 13 is a detail view of a movable switching contact.

Figs. 14 and 15 are elevation section and transverse section views of the switch and particularly of its handle, an interlock being shown in these figures as well as in Fig. 3, different in detail from the interlock shown in Figs. 8 and 9.

A switch of the character described in this application consists of a base or body made up of two separate blocks or bases, a load block **10** (Figs. 5–7) and a line block **11** (Figs. 10–15); cartridge fuses **12** are shown for connecting fuse holders **13** of the load block **10** with fuse holders **14** of the line block **11**. The load block fuse holders or connectors **13** in turn are connected to load terminal connectors **15**. The line block fuse holders or connectors **14** are connected through stationary contacts **16**, **17** and movable contacts **18** to connector terminals **20** for line conductors and the movable contacts **18** are mounted in an actuator **21** which may be moved for switching action, moving the movable contacts **18** into and out of registry with the stationary contacts **16** and **17** for controlling the circuit from line connectors **20** through the fuses to the load connectors **15**.

If desired, the line block **11** alone may be used as a switch, fuseless of course, with fuse holders **14** being replaced by connectors like those at **20** for conductor terminals.

The blocks **10—11** may be disposed within boxes **22** having conventional hinge covers **23** slotted at **24** to permit the manipulating or handle portions **25** of the actuators to project through and be accessible for manipulation, the boxes also having the usual knock-outs **26** for the line and load conductors, whose terminals are connected to the line and load connectors **20** and **15** respectively. If, however, as is here suggested, it is desired to save critical materials such as that commonly employed for boxes, it is possible and even desirable to mount the load and line blocks upon suitable mounting plates **27** and to provide suitable block covers or block cover portions for the exposed live parts of the switch

and thus create complete and satisfactory dead front safety switches without using any enclosing boxes. Such suggestions are embodied in Figs. 3 and 4 in two different forms.

Fig. 3 shows load and line blocks mounted upon a mounting surface 27. The front exposed recesses containing the connectors and contacts are shielded or covered by a cover construction including a large cover plate 28 covering the load block 10 and the space between the blocks, line conductors being shown at 30. The cover plate 28 terminates in line with the handle 25 and wire spring loop hinges 31 are shown as hingedly connecting the cover plate 28 to a small supplemental cover portion 32 which covers the line connector terminals 20 whose binding screws 33 are exposed through holes 34 of the cover portion 32, the latter being held down on the head block 11 by screws 32a. Side covers 35 are used to close the sides of the switch between the load and line blocks, these covers having edges fitting within grooves 36 of the blocks (the grooves are shown in Fig. 4). The switch of Fig. 3 can be seen to be an integral, unitary, complete and self-contained dead front, safety switch, despite the absence of the conventional enclosure box.

It may be considered desirable, to save materials, to form the switch in a manner to conceal only the live parts, and thus to exposed such non-live parts as the barrels of the cartridge fuses, which barrels are of insulating material, and such a construction is shown in Fig. 4. This form resembles the form of Fig. 3 to a considerable extent; however, the cover consists of portions 37 and 38; the cover 37 is slidably mounted on the load block 10 by means of screws 40 fitting in slots 41; the cover 38 is held down by screws 38a, has a slot 39 for the handle 25, has access holes 34, and is extended to cover fuse clips 14 also.

Fuse insertion and removal requires the sliding of cover 37 along block 10 sufficiently to enable the fuses to have their line ends thrust into clips 14 and then their load ends swung down into clips 13, as indicated, without disturbing cover 38.

Switching actuation is provided by an actuator 21 having an exposed handle portion 25 and mounting movable contacts 18 for connecting stationary contacts 16—17. The actuator is in the form of a plate of insulation having openings 42 containing the contacts 18 which are of U form and enclose compression springs 43.

The spring 43 in the movable contact is a contact pressure spring. The movable contact itself is so formed that it tends to bow out under the magnetic forces of increased currents and tends to increase the contact pressure and eliminate arcing at the contacts under current surges.

Making the movable contact flexible in this manner also permits the stationary contacts to be rigid and short, thus conserving critical materials and reducing resistance of the contacts.

The contact construction, where switching action takes place, is completely enclosed in insulation and thus arcing is minimized by the interposition of solid insulation between the contacts and further by closely surrounding all contacts within an insulated enclosure, with the rupture zone being far removed from the handle portion of the actuator, the entire construction providing safety switching and good rupturing ability, with a minimum of parts of critical materials.

The actuator has an arcuate lower edge 44 riding on an arcuate bearing 45 formed on the bottom of the line block 11 whereby a sliding rotating movement for the actuator is assured merely by moving the handle portion 25 back and forth across the line block in a slot 39 of the cover portion 32.

It will be observed that the provision of an arcuate bearing for the handle causes the handle to function as a rotating handle, the center of rotation being an imaginary point well outside the switch and the handle thus having a long lever arm of rotation despite the comparatively shallow handle and line block employed, these features serving to conserve space and material while retaining the leverage and other mechanical advantages of a long rotating handle.

The handle needs no separate pivot, the arcuate bearings 44—45 journalling the handle.

The pivotless rotatable handle provides the compactness of a sliding handle while retaining the mechanical advantages and low friction characteristic of a rotating handle.

Overcenter snap action for the actuator is provided by the use of coiled compression springs 47 disposed in compartments of the line block and bearing on bearing points 48 of the latter and on ends of a bearing pin 50 disposed in the actuator 21. This provides a simple, balanced, low friction construction using minimum critical materials.

Suitable interlocking arrangements are provided for the various switch forms shown.

Fig. 1 shows an interlocking arrangement consisting of a slot 51 formed in the exposed handle portion 25 and adapted to hook over an end of the cover slot 24, when the handle 25 is in circuit closing position, to prevent lifting of the box cover 23 when the circuit is closed but permitting opening of the cover 23 when the switch is open.

A second form of interlock is shown in Figs. 3, 4, and 11–15. Slidably mounted on the handle portion 25, and slotted at 53 is a bar 54, through whose slot passes screw 55: the bar has a guide lug 56 riding in a slot 57 of the handle portion 25. For cooperation with the bar 54 and screw 55 there is formed in cover 28 of Fig. 3 or cover 38 of Fig. 4, a notch 58. In the open circuit position of the parts the handle 25 is so disposed that screw 55 will register with cover notch 58 to permit opening of cover 28 or 38. In the closed circuit position of the parts the handle portion 25 is so disposed that screw 55 is out of registry with cover notch 58 to block cover 38 or 28 from being lifted up to expose the interior of the switch.

With the switch open, it is feasible to adjust the interlock bar 54 by loosening screw 55 so that the bar 54 drops into notch 58 and prevents handle movement, and guide lug 56 clears the handle slot 57, which it blocks in closed circuit position, to permit that slot 57 to receive the hasp of a padlock whereby the switch handle may be locked against movement out of the open circuit position, while at the same time permitting the covers 38 or 28 to be moved for exposing the interior of the switch for inspection, fuse replacement, or maintenance.

A third form of interlock is shown in Figs. 8 and 9. Here the load block cover 37 is without slots (like 41) for the screws 40 and though removable is not slidable. The line block cover 64 is slidably mounted on the line block, being held down by a screw and slot connection 65—65a to the line block. A slot 66 in cover 64 has an

enlargement 67 whereby the cover 64 may be slid on the line block 11 but only when the switch handle 25 is in the open circuit position. Such movement of the cover 64 clears the blocked line ends of the fuses.

Alined holes 70—71 of the cover 64 and line block 11 respectively are formed to receive the hasp of a padlock to lock the switch cover against being opened.

If considered desirable, it is possible to mold the load and line blocks 10—11, the mounting plate 27, and the side plates 35 integral, whereby to form a switch and fuse block adapted to be covered by an insulating cover, wholly, as in Fig. 3, or in part, as in Fig. 4, or left uncovered and used in a box, as in Fig. 1.

If desired, the cover 37 of Fig. 1 may be omitted, and the cover 38 may be reduced in width to include only enough to cover the switch actuation parts, such as the springs 47, and to provide a slot for the handle 25, terminating at such handle, and exposing the fuse holders 14. This would save cover material and also facilitate fuse removal. Safety could be obtained by the box cover 23.

Now having described the constructions disclosed, reference should be had to the appended claims.

I claim:

1. A dead front safety switch comprising a base having front accessible recesses, connectors in certain of said recesses, stationary contacts cooperating movable contacts, and a movable actuator therefor in another of said recesses, the latter being formed to provide a guide for the actuator movement, and a front removable cover covering said recesses and the front exposed live parts therein and shielding them from front access, the cover having an opening alined with the actuator recess, the actuator having an exposed handle portion projecting from the actuator part in the recess, through the cover opening, to a point beyond the cover, the cover opening being closed by the actuator, the cover being in the form of a plate secured directly to and overlying the front of the base, the switch including a second base also having front accessible recesses, connectors in these recesses, and a front removable cover covering these recesses and the front exposed live connectors therein and shielding them from access, the second cover also being in the form of a plate secured directly to and overlying the front of the second base, certain of the connectors of both bases being for wiring conductor terminals and others being for holding fuse terminals, with the conductor wiring connectors being nearer the outer ends of the switch, and exposed at such ends, and the fuse holding connectors being nearer and exposed to the facing ends of the bases, the bases being spaced as required to provide a space between them for elongated fuses whose terminals are received in the fuse holding connectors.

2. A dead front safety switch comprising a base having front accessible recesses, connectors in certain of said recesses, stationary contacts cooperating movable contacts, and a movable actuator therefor in another of said recesses, the latter being formed to provide a guide for the actuator movement, and a front removable cover covering said recesses and the front exposed live parts therein and shielding them from front access, the cover having an opening alined with the actuator recess, the actuator having an exposed handle portion projecting from the actuator part in the recess, through the cover opening, to a point beyond the cover, the cover opening being closed by the actuator, the cover being in the form of a plate secured directly to and overlying the front of the base, the switch including a second base also having front accessible recesses, connectors in these recesses, and a front removable cover covering these recesses and the front exposed live connectors therein and shielding them from access, the second cover also being in the form of a plate secured directly to and overlying the front of the second base, certain of the connectors of both bases being for wiring conductor terminals and others being for holding fuse terminals, with the conductor wiring connectors being nearer the outer ends of the switch, and exposed at such ends, and the fuse holding connectors being nearer and exposed to the facing ends of the bases, the bases being spaced as required to provide a space between them for elongated fuses whose terminals are received in the fuse holding connectors, and means interlocking the actuator and certain of the covers whereby actuation movement and access to the terminals of the fuses are relatively interdependent for safety.

3. A dead front safety switch comprising a base having front accessible recesses, connectors in certain of said recesses, stationary contacts cooperating movable contacts, and a movable actuator therefor in another of said recesses, the latter being formed to provide a guide for the actuator movement, and a front removable cover covering said recesses and the front exposed live parts therein and shielding them from front access, the cover having an opening alined with the actuator recess, the actuator having an exposed handle portion projecting from the actuator part in the recess, through the cover opening, to a point beyond the cover, the cover opening being closed by the actuator, the cover being in the form of a plate secured directly to and overlying the front of the base, the switch including a second base also having front accessible recesses, connectors in these recesses, and a front removable cover covering these recesses and the front exposed live connectors therein and shielding them from access, the second cover also being in the form of a plate secured directly to and overlying the front of the second base, certain of the connectors of both bases being for wiring conductor terminals and others being for holding fuse terminals, with the conductor wiring connectors being nearer the outer ends of the switch, and exposed at such ends, and the fuse holding connectors being nearer and exposed to the facing ends of the bases, the bases being spaced as required to provide a space between them for elongated fuses whose terminals are received in the fuse holding connectors, certain of the covers concealing the space between the bases as well as the bases themselves.

WILLIAM H. FRANK.