

United States Patent

[11] 3,590,331

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 [21] Appl. No. **821,373**
 [22] Filed **May 2, 1969**
 [45] Patented **June 29, 1971**
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[54] **PANEL MOUNTED SWITCH ENCLOSURE**
11 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **317/112,**

200/159 A, 317/120

[51] **Int. Cl.** **A02b 1/10,**

H01h 3/12

[50] **Field of Search** 200/159 A,

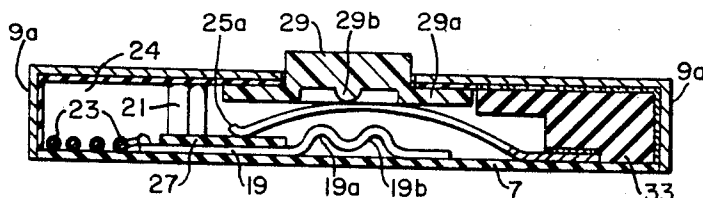
166.1; 317/99, 112, 120, 122

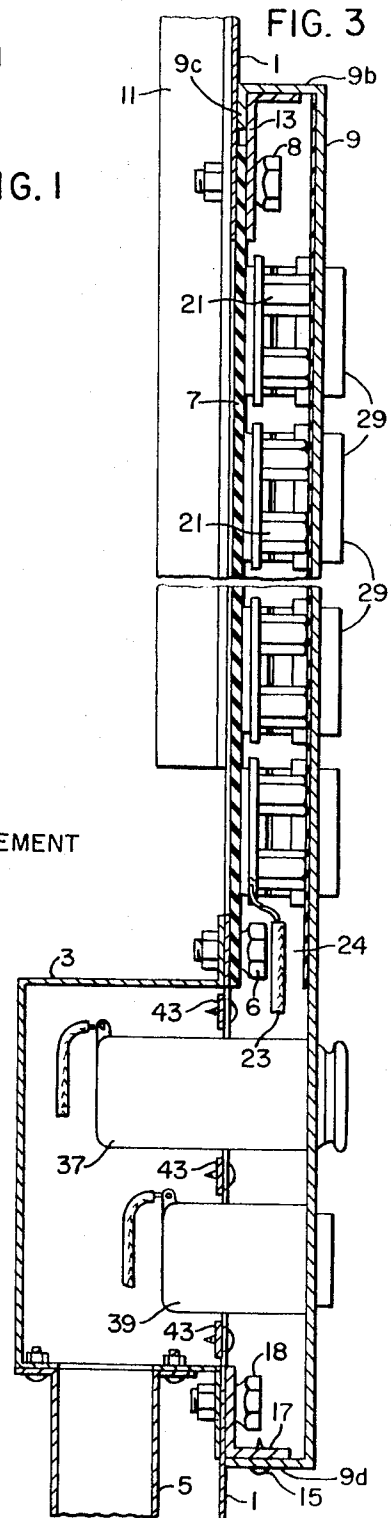
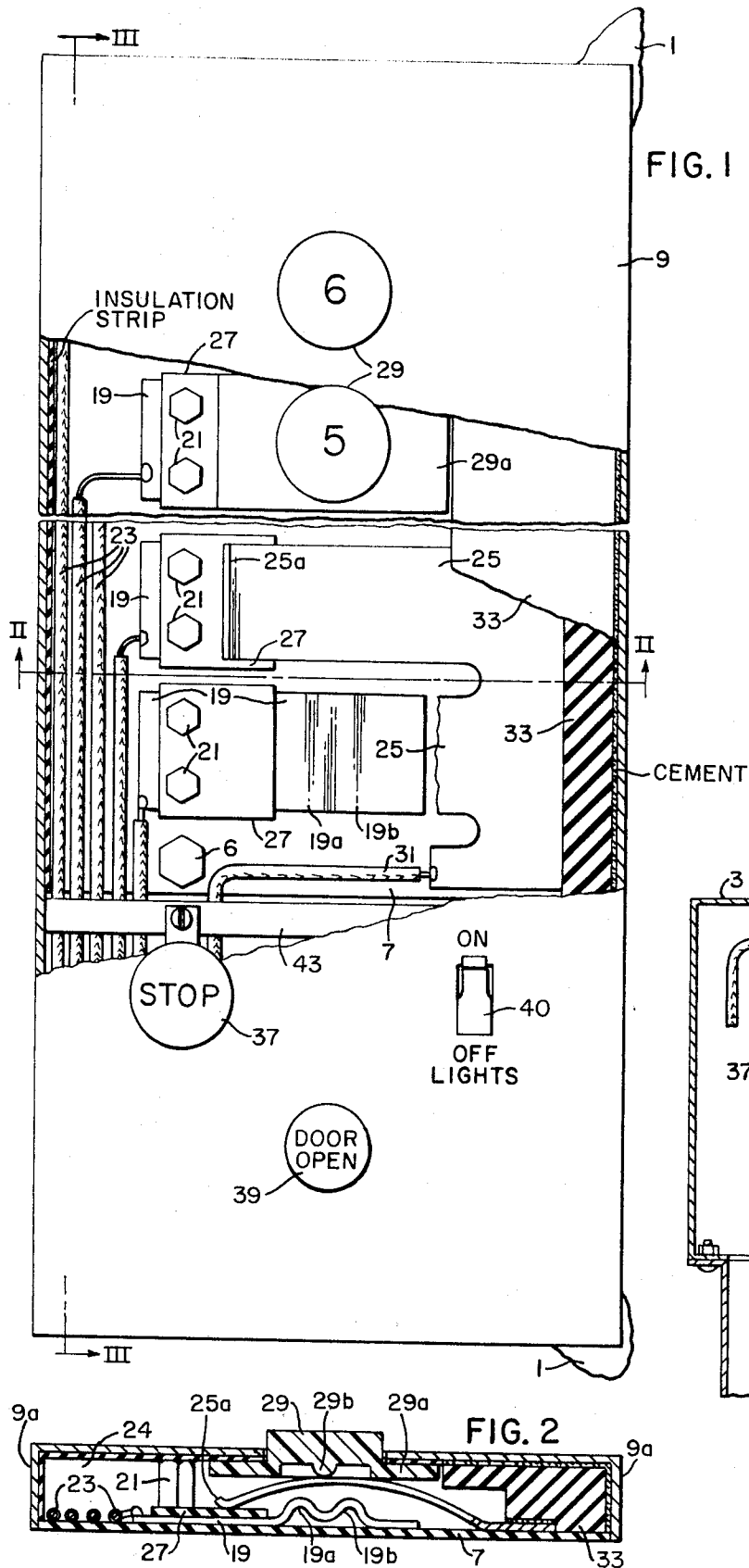
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ABSTRACT: A switch enclosure comprising a broad thin elongated conduit mounted flat against a wall panel can be made of sufficient length to accommodate any desired number of short stroke electrical switches. A standard receptacle which communicates with the conduit and penetrates a standard opening in the panel serves as a conduit for the electrical conductors connected to the switches. Alternatively, the standard receptacle can be made large enough to accommodate other switches too deep to be mounted in the flat conduit.





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PANEL MOUNTED SWITCH ENCLOSURE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to control boxes for housing electrical switches and is particularly applicable to control boxes for installations requiring varying numbers of switches such as elevator car stations.

2. Description of the Prior Art

It is conventional in modern elevator systems to provide a series of buttons in each car with which passengers may select the floor to which they desire to be transported. The control box in which the switches are mounted is commonly referred to as a car station.

A variety of other switches are also normally incorporated into the car station. Elevator safety codes require that an emergency stop button be provided with which the car can be brought to an immediate stop by passengers in the event of an emergency. Usually a door hold button is also provided with which passengers may override the automatic door closing circuits when necessary.

Quite often other switches are provided such as a light switch for the interior lighting of the cab, a fan switch for the cab ventilating system, an out of service switch whereby the particular car can be removed from the automatic group supervisory control and operated independently and/or an M.G. switch whereby the motor generator set which controls the movement of the car can be shut down. In many installations these latter switches are enclosed behind a locked sliding panel so that only authorized personnel can operate them.

In any event the switches other than the car call switches are fairly well standardized for a particular line of elevator systems. For instance, a particular line of car stations may only have the emergency stop button and a door hold button in addition to the car call buttons. All of the car stations in the line would have identical emergency stop and door hold switches, but the number of car call buttons would vary with the number of floors in the building in which the car was installed.

A car call station large enough to accommodate car call buttons for the maximum number of floors in an installation in which the particular line of car call stations is utilized could be made standard but since this number could far exceed the average number of car call buttons required it could be very wasteful. A special car call station can be provided for each installation, however, this becomes expensive when it is considered that since it is common practice to flush mount the car station in the wall of the cab, the cabs themselves have to be customized. Two or three standard size car stations can be provided for each line, but again this requires variations in the construction of the cabs. The car stations are flush mounted not only for esthetic reasons, but also because of the depth of present day car stations, they would take up an inordinate amount of space in the cab if they were mounted flat against the wall.

SUMMARY OF THE INVENTION

In accordance with this invention a switch enclosure with a very slim profile is mounted flat against a structural panel. The slim profile is made possible by short stroke switches which themselves are slim in profile. The unit can be made any length necessary to accommodate a desired number of switches. Therefore, a standard knockout in the panel suffices for switch enclosures with any number of switches.

The switch enclosure is in the form of a broad thin conduit composed of a flat base section fastened to the panel and a cover plate with a U-shaped cross section. The switches are operated through openings in the cover plate. The switch contacts are composed of two flat strips of electrically conductive spring material which overlap end to end. One of the strips is bowed and when it is depressed by a button placed in an opening in the cover plate, it comes into contact with projections on the other strip to complete an electrical circuit. Since one

of the contacts on each switch is for the common voltage lead, a single strip of conductive material may be used for all the switches.

Preferably the stationary contact for each switch is premounted on the base plate. The bowed member or movable contact is cemented to the cover through an electrically nonconducting spacer. The bow in the spring material maintains the button in position. The base plate is fastened to the wall of the cab at the installation. When the cover plate is placed over the base plate, the operating members of the switch are brought into operating position.

The cover plate is long enough to cover the receptacle through which the electrical leads for the switches penetrate the panel. The standard receptacle can be made large enough to accommodate any number of standard switches too deep to be placed in the conduit which in a preferred embodiment of the invention is only slightly more than a half inch deep. Furthermore, certain switches and indicators can be placed in the receptacle behind a locked panel if desired. If no such deep switches or locked panels are required, the receptacle can be reduced to merely a conduit to route the wires for the short stroke switches behind the panel.

It is therefore a first object of the invention to provide an improved switch enclosure for installation requiring varying numbers of switches.

It is a second object of the invention to provide an improved car station for use with elevators installed in buildings with varying numbers of floors which does not require customizing the elevator cab.

It is a third object of the invention to provide an improved car station as described in the second object which protrudes a minimum amount into the cab.

It is a fourth object of the invention to provide an improved car station as described in the previous objects which will also accommodate other standard switches some of which may be protected from unauthorized operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevation view with parts cut away of a switch enclosure according to this invention.

FIG. 2 is a cross-sectional view taken along lines II-II of the switch enclosure shown in FIG. 1.

FIG. 3 is a cross-sectional view taken along the lines III-III in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 3, it will be seen that a standard receptacle 3 is flush mounted behind a standard opening in the panel 1 of an elevator cab. A duct 5 connected to the bottom of the receptacle 3 serves as a conduit for the electrical wiring between the control box and a traveling cable connected to the car. Typically the receptacle 3 may be on the order of 2 inches in depth. The portion of the control box mounted on the outer facing of the panel 1 is composed of a base plate 7 and a cover plate 9 having its edges bent at 90° to form sides 9a (see FIG. 2). When in place the base plate 7 and cover plate 9 form a conduit which communicates with the receptacle 3. Although the conduit thus formed is shown extending vertically upward from the receptacle 3 it is to be understood that this conduit could be orientated in any direction with respect to the receptacle 3.

The bottom of the base plate 7 is secured to the panel 1 by 10-32 hardware 6 which also secures the upper portion of the receptacle 3. The upper end of the base plate 7 is likewise fastened to the panel 1 by 10-32 hardware 8 which also passes through an angle 11 which supports the panel 1. The location of the upper fastener is dependent of the number of switches in a particular control box. The hole through the panel 1 and the angle 11 can therefore be drilled to suit in the field. Another angle 13 is supported by the same hardware and extends above the base plate 7 with its flange extending horizontally outward from the panel 1.

The cover plate 9 in addition to having sides 9a has an upper end section 9b which terminates in a downward extension 9c. The extension 9c fits into the slot between the flange 13 and the panel 1 to serve as the upper support for the cover plate 9. The cover plate is held in place by a screw 15 which fastens the lower end 9d to another angle 17 connected to the panel 1 by 10-32 hardware 18. The depth a of the cover plate 9 may be typically on the order of nine-sixteenths of an inch as in the preferred embodiment described. This slight intrusion into the cab does not detract from the appearance of the car station and presents minimal obstruction.

In order to utilize the slim profile car station a special switch which is relatively thin and has a short stroke must be employed. In the interest of economy, a common contact for each switch can be utilized. In a preferred embodiment of the invention the static member of the switch is composed of a strip of electrically conductive material. Preferably the contact is made of a spring material such as tin plated phosphorous bronze which is preformed to the shape shown in FIG. 2 with ridges 19a and b projecting away from the base plate 7. The contact 19 is secured to the base plate 7 which is constructed of electrically nonconductive material by electrically nonconductive hardware such as nylon screws 21. The heads of the screws 21 are made long enough so that they may serve as an intermediate support for the cover plate 9. A separate stationary contact 19 is provided for each switch. Separate leads 23 are shown soldered to each static contact member 19. Of course, other methods of fastening these leads such as the use of commercially available connectors can be utilized. The leads 23 are routed down through the passage 24 in the conduit and into the receptacle 3.

The movable contact members of the switches are also constructed of electrically conductive spring material such as tin plated phosphorous bronze and are preformed with a bow about a transverse axis. The static contact 19 and movable contact 25 are orientated end to end with a substantial portion of each contact member overlapping the other as can be seen best in FIG. 2. The height of the bow in the movable contact member 25 exceeds the height of the projections 19a and b on the static contact 19 so that these portions of the contacts are not touching when the movable contact 25 is in its preformed condition. A strip of insulating material 27 such as a polyethylene terephthalate tape (available under the name Mylar polyester tape) or nylon is placed between the static contact 19 and the turned up free end 25a of the movable contact to prevent electrical conduction through these portions of the contacts.

Displacement of the movable member 25 is affected by the button 29 which protrudes through an opening in the face plate 9. Conventionally such buttons are circular although any shape button could be used. They are constructed of electrically nonconducting material such as polycarbonate and are held in place by the spring force of the movable member and the flange 29a. Preferably the flange is rectangular as shown in FIG. 1 so that it bears against the insulating block 33 to prevent rotation of the numbered button. When a passenger presses the button 29 the movable member 25 is caused to flatten out until it comes in contact with the projections 19a and b on the associated static contact 19 thereby completing the electrical circuit. The tip 25a of the movable member moves horizontally across the insulating member 27 as the bow in the movable member 25 is flattened out. A knob 29b in the center of the button assists the movable member 25 in making good electrical contact with the projections 19a and b on the static contact. When the button is released the movable member 25 can assume its bowed shape thereby breaking the electrical circuit.

As can be seen from FIG. 1, the movable members 25 of two or more switches can be cut from the same sheet of material. Each bowed section can therefore be displaced independently yet only one return lead 31 is required. Again this lead may be soldered as shown or fastened in some other manner to the common contacts. These common contacts can

be formed in long sheets and then cut to order for the desired number of switches. The common contacts 25 are cemented to the insulating block 33. The base plate 7 is of course made of electrically nonconductive material. Since the cover plate 9 is constructed of stainless steel or some other metal for appearance and durability, the inner surface of the cover plate 9 is covered with insulation such as Mylar insulating tape. This is required by elevator codes which require that certain specified air gaps must be provided between uninsulated electrical conductors and uninsulated surrounding metallic members.

Preferably the insulating block 33 is cemented to the inside of the cover 9 so that the spring action of the movable contacts 25 maintains the buttons 29 in position for assembly. The common strip 25 and cover plate 9 with the appropriate number of holes can be prefabricated in the shop to accommodate any desired number of switches. The back plate 7 with the appropriate number of static contacts 19 can also be assembled in the shop. In addition the cabs are prefabricated with the standard size opening and receptacle 3 already installed. In the field, the holes are drilled through the panel of the cab and the angle 11 at the appropriate point depending on the length of the base plate 7. The angle iron 13 and base plate 7 are then secured to the panel 1. When the lip 9c of the front cover 9 is placed in position over the angle 13 and the lower end 9d is moved into position with respect to the angle 17, the static members 19 and movable members 25 come into operating position with respect to each other.

A number of standard switches can be located in the receptacle 3 with their operating members protruding through an opening in the cover plate 1. Generally these switches are the ones which are too deep to fit in the conduit formed by a back plate 7 and the front cover 9 although they need not be. Such switches could include the emergency stop button 37, the door hold button 39 and the toggle switch for the cab interior light 40 included in the car station illustrated. These switches can be mounted on horizontal straps 43 which are secured to the sidewalls of the receptacle 3. Numerous other switches could be added to or replace those shown. Furthermore, a sliding lockable cover plate could be provided over at least a portion of the receptacle 3 for protecting selected switches, such as the motor generator switch, from unauthorized operation. Alternatively, these switches could be key operated. It is contemplated by this invention; however, that a standard size be established for the receptacle 3 so that either one or at least only a very few cab and receptacle combinations need be established.

It can be seen therefore that with the standard receptacle and opening in the cab wall, the back panel 7 with the associated static contacts and the front cover 9 with its associated movable contacts can be fabricated to any length necessary to accommodate the desired number of car call switches without affecting cab construction. It should be appreciated that all of the switches in this portion of the control unit need not be identical as shown. They may be of different types as long as they fit within the narrow conduit formed by the back plate 7 and the front cover 9. In addition it can be appreciated that all of the car call buttons need not be in a single line. For instance, the buttons could be arranged in two vertical rows with the common contacts 25 all arms of a single sheet of spring conductor with the common connector down the center.

Although the invention has been described as applied to an elevator car station, the principle could be applied to control units used for other purposes. For instance even in the elevator field smaller units could be employed for the up and down hall call switches conventionally provided at each landing. In such use only two switches need be provided and the receptacle could be reduced in size to where it was only a small tube of sufficient diameter for the wiring to pass through. It would therefore be unnecessary to recess the hall call button assembly in the door jamb or wall adjacent the jamb as is now done.

I claim as my invention:

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1. A switch enclosure adaptable for mounting to a panel comprising a receptacle having a front surface which may be substantially flush mounted with an opening in a panel, a front cover for said receptacle, a first electrical switch mounted in the receptacle and operative through an opening in the front cover, a flat conduit extending parallel to the said front surface and communicating with said receptacle, the width of said conduit being several times the height wherein said height is measured perpendicular to said front surface, second switches mounted in said conduit to be operated through openings in the exposed face of the conduit, said conduit being of a length satisfactory to accommodate the desired number of second switches, first electrical conductors for said first switch, second electrical conductors for said second switches, said second electrical conductors being routed through the conduit into the receptacle, and an outlet in said receptacle behind said front surface through which said first and second electrical conductors are routed, whereby a standard opening in a panel will accommodate switch enclosures having varying numbers of second switches.

2. The switch enclosure of claim 1 wherein said height of said conduit is less than 1 inch.

3. The switch enclosure of claim 1 wherein a plurality of said second switches each includes a first operating member comprising an elongated strip of electrically conductive material having a projection on one surface, a second operating member comprising an elongated strip of electrically conductive spring material preformed with a bow about a transverse axis, the height of said bow being greater than the height of said projection on said first operating member, mounting means for mounting the operating members end to end with the bow of the second operating member overlapping the projection of said first operating member, the second operating member being secured only at one end, the other end being free to slide longitudinally, separate of said second electrical conductors being connected to the first and second operating members respectively, said switch being operated to complete an electrical circuit when the bowed operating member is depressed until it comes into contact with the projection on the first operating member.

4. The switch enclosure of claim 3 wherein said first operating

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ing members are also composed of spring material and wherein said projection comprises a transverse ridge in said first operating member.

5. The switch enclosure of claim 3 wherein the corresponding operating members of at least two of said second switches are separate arms of a single electrically conductive strip.

6. The switch enclosure of claim 3 wherein the second operating members of said second switches are parallel bowed arms formed by cutting slots at spaced intervals substantially perpendicular to one edge of a generally rectangular sheet, said slots extending longitudinally along a preformed bow spanning a substantial width of said sheet, a single second electrical conductor being connected to said sheet thereby forming a common lead for all of said second switches.

7. The switch enclosure of claim 6, wherein the conduit is composed of a base plate and a cover plate with its longitudinal edges bent perpendicular to the plane of the base plate to form sides, and wherein the said first operating members are fastened to one of said plates while the second operating members are fastened to the other, said operating members coming into proper operating position when the two plates are joined together.

8. The switch enclosure of claim 7 wherein said cover plate has openings through which said second switches are operated and including buttons for operating said second switches, said buttons being held in place in the openings in the cover plate by the spring action of the associated operating members and by a flange on the button which bears against the cover plate.

9. The switch enclosure of claim 7 wherein the cover plate also forms the front cover of the receptacle.

10. The switch enclosure of claim 1 wherein the front cover for the receptacle includes a movable panel mounted for movement to cover and expose said first switch.

11. The switch enclosure of claim 3 wherein said other end of said second operating member of each of a plurality of second switches overlaps the first operating member, and wherein said switch enclosure includes insulating means for preventing electrical conduction between the overlapping end of said second operating member and said first operating member.

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