Aug. 27, 1963 M. H. PELOSI, JR., ETAL 3,102,176

SAFETY DOOR SWITCH

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FIG. 1

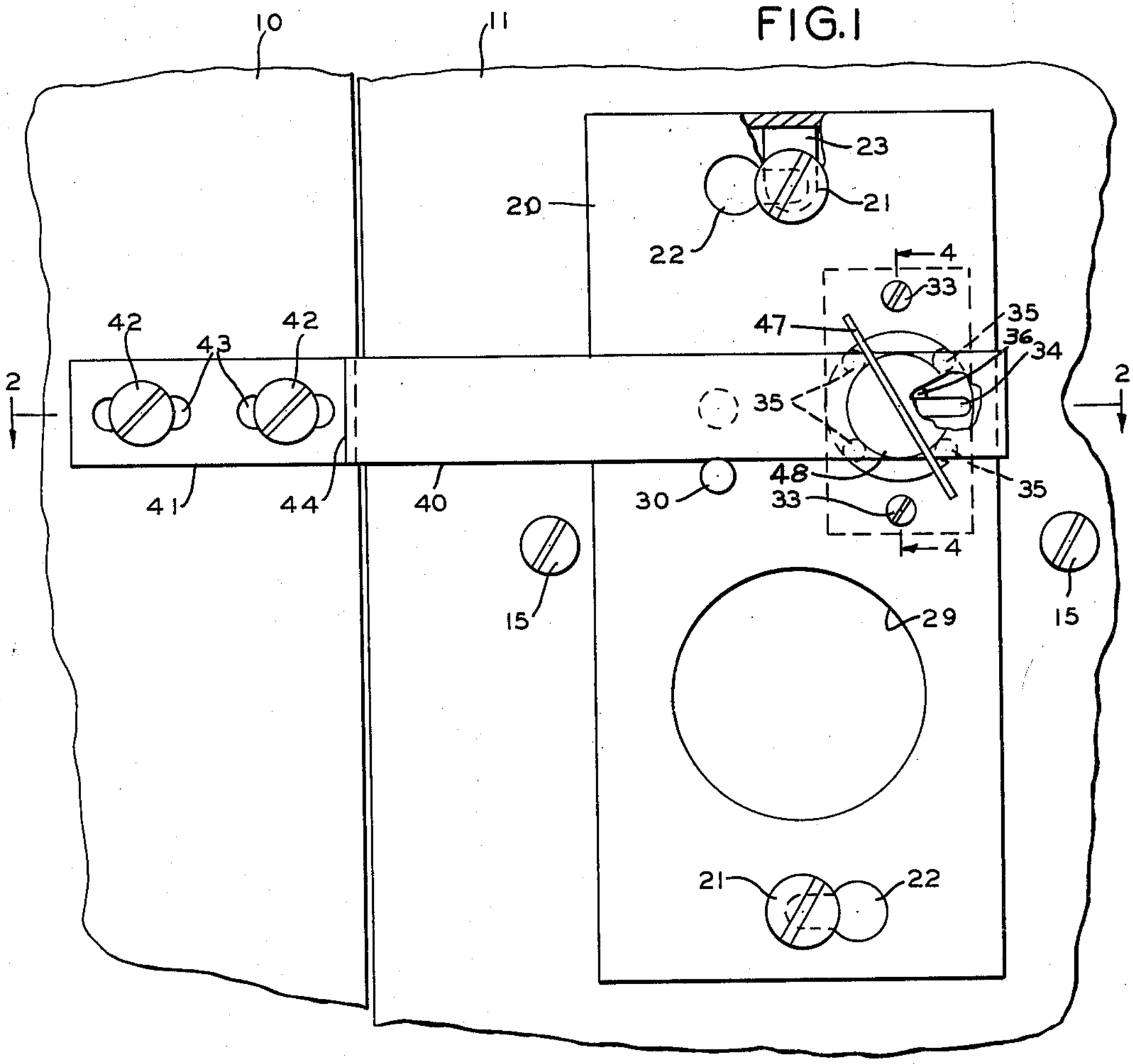

FIG. 4

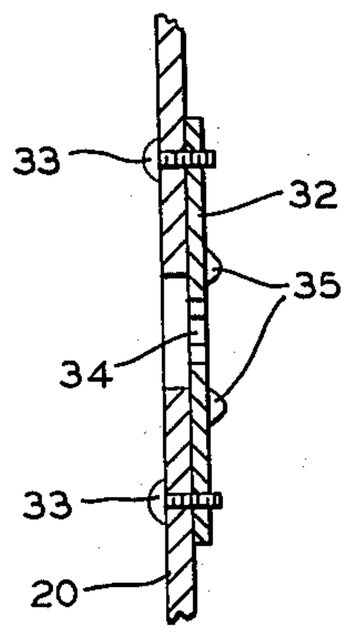

FIG. 5

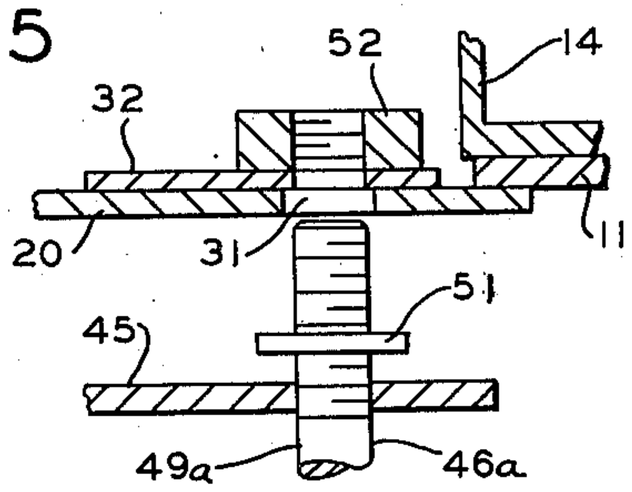

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FIG. 2

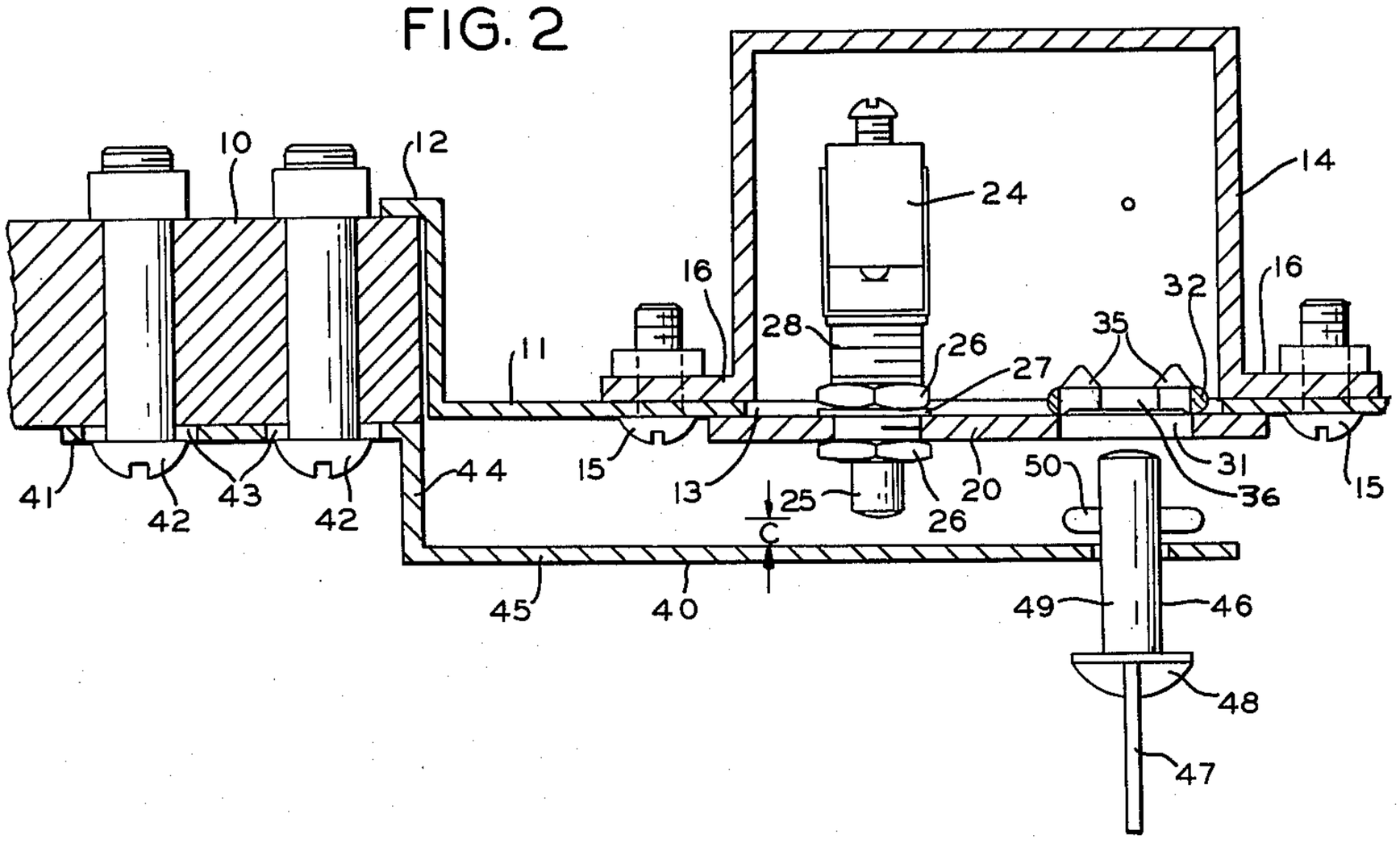

FIG. 3

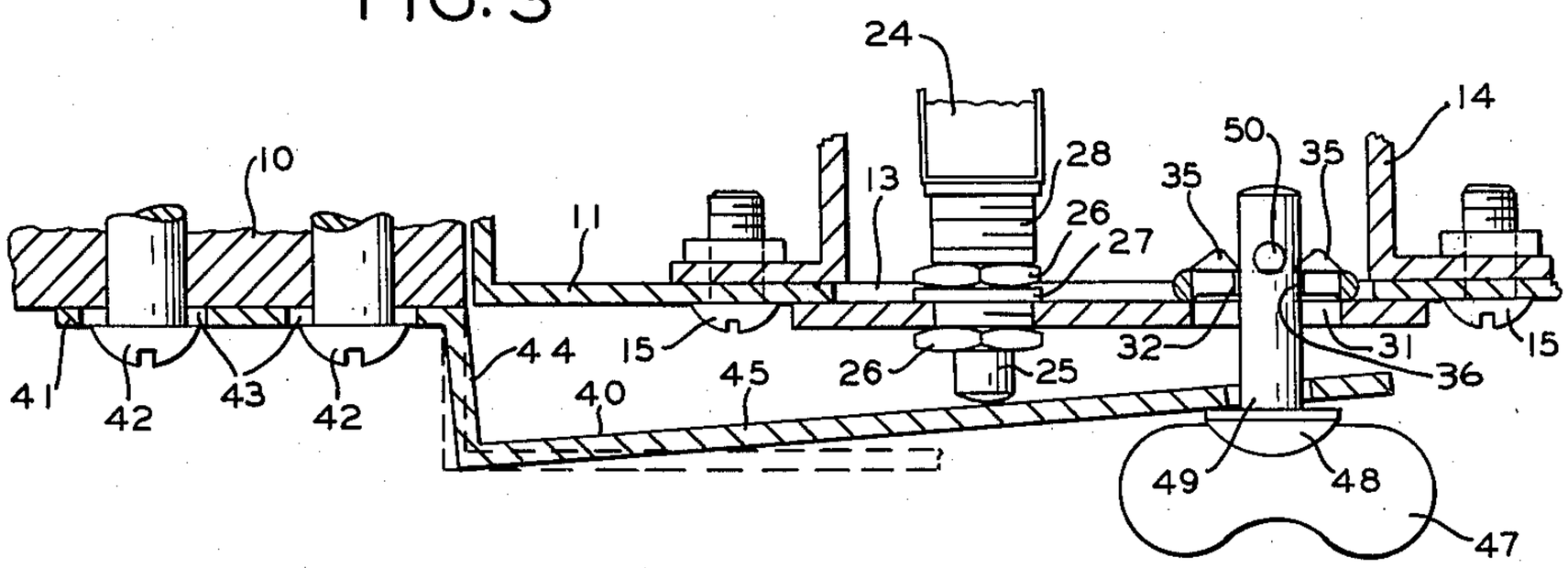

FIG. 8

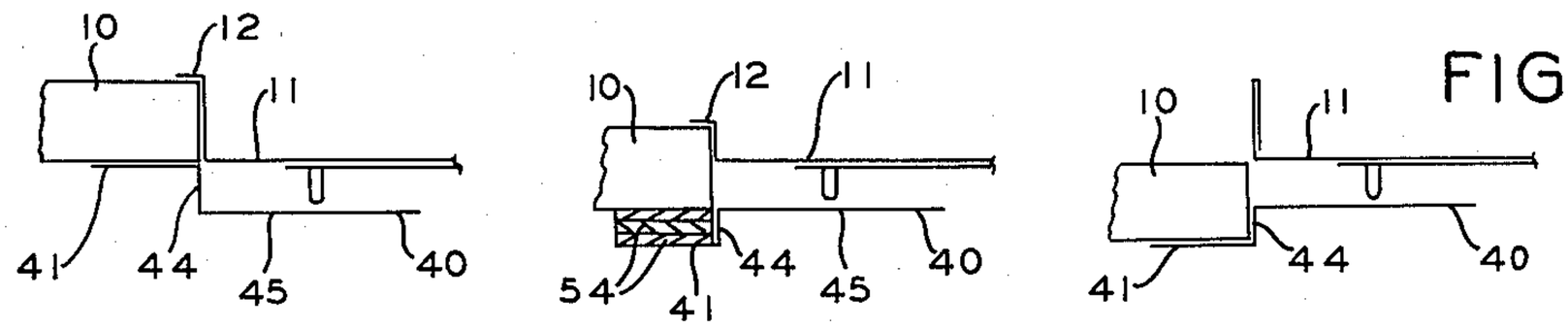

FIG. 6 FIG. 7

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SAFETY DOOR SWITCH

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This invention relates to safety door switches.

Severe hazards exist on certain types of electrical or electro-mechanical equipment, incldng air plenums or air ducts in which electrical equipment is installed.

It has been proposed to install safety switches on access doors or access panels which must be opened and reached through or walked through in order to repair, inspect or service electrical equipment operating at high voltage or high current or both, of sufficient magnitude to cause injury or death. Such switches were disposed directly in the power circuit or connected through a relay so that when the access door or panel was opened the electrical energy supply to the equipment was interrupted by the mechanical action of the switch.

Various switches and switch control mechanisms have heretofore been proposed for use as aforesaid but none of these has proven wholly satisfactory.

In one type of switch heretofore available, the switch itself is not locked and when the door is opened the pressure of a flat piece of metal onto the switch actuating mechanism is released. If the door should accidentally close or be pushed closed, power would immediately be turned on, endangering the life of anyone who might enter the chamber and be unaware that the power was on. This type of switch normally has a reset feature so that when the door is closed the switch locking mechanism is released for the next open door cycle.

It is the principal object of the present invention to provide a safety door switch which has safety features not heretofore available, and which is free from likelihood of accidental actuation by undesired door closing whether occasioned by impact of air currents or by pushing in some other manner.

It is a further object of the present invention to provide a safety door switch which must be manually unlocked before the door can be closed and must be manually locked before power is resumed upon closing of the door.

It is a further object of the present invention to provide a safety door switch which cannot be locked in "on" position with the access door open.

It is a further object of the present invention to provide a safety door switch which is easily adaptable for mounting on the right hand side, the left hand side, the top or the bottom of access doors or panels as desired.

It is a further object of the present invention to provide a safety door switch having an actuating lever which is adjustable to vary the safety clearance to accommodate various access door overhang.

It is a further object of the present invention to provide a safety door switch having a safety clearance which can be adjusted in the field without requiring additional parts or special tools.

It is a further object of the present invention to provide a safety door switch having an actuating lever and in which the lever actuating mechanism can be selected, varied or modified as desired.

Other objects and advantageous features of the invention will be apparent from the description and claims.

The nature and characteristic features of the invention will be more readily understood from the following description, taken in connection with the accompanying drawings forming part thereof, in which:

FIGURE 1 is a fragmentary front elevational view of a portion of an access door and duct or cabinet wall having a safety door switch in accordance with the invention mounted thereon;

FIG. 2 is a horizontal sectional view taken approximately on the line 2—2 of FIG. 1 and showing the door closed and the switch unlocked;

FIG. 3 is a horizontal sectional view similar to FIG. 2 showing the door closed and the switch locked;

FIG. 4 is a fragmentary vertical sectional view taken approximately on the line 4—4 of FIG. 1;

FIG. 5 is a fragmentary view showing another form of delayed opening lock in unlocked position;

FIG. 6 is a diagrammatic view showing the disposition of the actuating lever for no door overhang;

FIG. 7 is a diagrammatic view showing the disposition of the actuating lever with spacers to accommodate a range of overhang; and

FIG. 8 is a diagrammatic view showing the disposition of the actuating lever for a predetermined overhang.

It should, of course, be understood that the description and drawings herein are illustrative merely, and that various modifications and changes can be made in the structure disclosed without departing from the spirit of the invention.

Like numerals refer to like parts throughout the several views.

Referring now more particularly to the drawings, an access door or panel 10 is shown in position in a duct or cabinet wall 11, the wall 11 having an inner rim 12 for limiting the inward movement of the door or panel 10.

The wall 11 has a suitable opening 13 therethrough behind which a switch housing 14 is mounted and held in position by screws 15 which extend through outwardly extending rim portions 16 and have nuts 17 on their inner ends. The switch housing 14 can be of any desired material, such as metal or synthetic plastic.

A cover plate 20 is provided for the housing 14, is detachably mounted at the front of the housing 14 with its margins in overlapping relation to the wall 11, and is held in position by screws 21 which extend through keyhole type openings 22 in the plate 20 and into ears 23 on the housing 14.

The cover plate 20 has mounted thereon an electric push button switch 24 of the type having a switch actuating button 25, normally spring impelled to open position and movable to closed position with the button 25 held at an inner position. The switch 24 is held on the plate 20 by spaced nuts 26 and washer 27 on a threaded exterior portion 28 thereof.

The cover plate 20 can have an opening 29 therethrough for conductors (not shown) for connection to the switch 24 and a lever positioning pin 30 is preferably mounted thereon for purposes to be explained.

On the rear face of the cover plate 20 and rearwardly of an opening 31 therethrough a locking plate 32 is provided and is held in position by screws 33.

The locking plate 32 has an elongated pin opening 34 therethrough disposed on opposite sides of an enlarged stem opening 36, and has circumferentially spaced holding cam projections 35 extending rearwardly therefrom.

A switch actuating lever 40 is provided, of resilient material, having a mounting portion 41 secured to the access door 10 by bolts 42 extending through elongated slots 43 which permit horizontal adjustment of the position of the lever 40. The positioning pin 30 also aids in the proper locating of the lever 40. The lever 40 has a perpendicular offset portion 44 and has a main

arm portion 45 extending perpendicularly therefrom and parallel to the mounting portion 41.

A hinging action is available at either or both ends of the offset portion 44, and the main arm portion 45 can also have a moderate degree of springiness between the ends.

A locking stud 46 is provided having a handle 47 for manual operation with a head 48. The stud 46 has a stem portion 49 freely pivotally mounted on the main arm portion 45 contiguous to the free end thereof. The stem 49 has a transversely disposed pin 50 carried thereby which is insertable through the pin opening 34 upon insertion of the stem portion 49 through the opening 36 and upon springing inwardly of the main arm portion 45 by manual pressure thereon. The stem portion 49 and the pin 50 can then be moved a quarter turn where the pin 50 is held and retained by the projections 35 against accidental displacement.

The main arm portion 45, in unlocked position, is in spaced relation to the switch button 25 by an amount indicated at *c*, representing the safety clearance.

Upon inward movement of the free end of the main arm portion 45, the switch button 25 is moved inwardly to its "on" position and with the locking stud 46 in its locked position the switch button 25 is locked in its "on" position.

It will be noted that unless and until the pin 50 is inserted through the opening 34, the main arm portion 45 is not moved to an extent to actuate the switch button 25 to an "on" position.

In FIG. 5 a different form of locking stud 46*a* is provided having a holding collar 51 and a threaded stem portion 49*a* engageable in a threaded nut 52 carried on the locking plate 32. A plurality of turns of the stud 46*a* will be required either to lock or to unlock the switch thereby introducing a time factor for operation in either direction. A structure is provided in which there is a lack of freedom of access for entrance or for switch actuation except upon turning the locking stud 46*a* a plurality of times. The main arm portion 45 of the actuating lever 40, if free as in FIG. 2 cannot, without flexing, actuate the switch button 25, or if flexed as in FIG. 3 does not permit immediate removal.

In FIG. 6, the mounting of the actuating lever 40 is illustrated where there is no overhang of the door or panel 10 and the duct or cabinet wall 11, the mounting portion 41 being held directly against the outer face of the door 10.

To accommodate overhang of the door 10, and as shown in FIG. 7, spacers or shims 54 can be inserted between the outer face of the door or panel 11 and the inner face of the mounting portion 41. If the overhang of the door 10 is the same as the length of the offset hinging portion 44 the lever 40 can be disposed as shown in FIG. 8.

The mode of operation should be clear from the foregoing but it will be noted that the switch 24 cannot be locked in the "on" position with the door 10 open. If the door should be closed by wind blowing thereagainst or be pushed closed after a man has entered the opening, the switch 24 cannot be energized because of the operating safety clearance *c* which is provided and which prevents contact of the main arm portion 45 with the switch button 25. The switch 24 will require an additional person to operate the same directly at the switch 24 when the door is open and to hold the switch 24 manually in "on" position. The power supply will immediately be interrupted if the second operator should leave the switch 24.

It will also be noted that the switch 24 must be manually unlocked before the door 10 can be opened by turning the locking stud 46 one quarter turn and permitting the retraction thereof by the spring action of the main arm portion 45 or by turning the locking stud 46*a* a plurality of turns to release it from engagement with the nut 52.

It will also be noted that the switch 24 must be manually locked before the power supply is resumed upon closing the door 10.

We claim:

1. A safety door switch for use with a wall and an access member mounted in said wall for access through said wall comprising an electric switch fixedly mounted with respect to said wall and having a movable actuating portion with its outer terminus at an outer location for one condition and at an inner location for another condition, a lever member having a mounting portion mounted on said access member, said lever member having a main arm portion connected to said mounting portion, said main arm portion extending in front of said actuating portion, said mounting portion retaining said main arm portion in spaced relation to said outer terminus for said one condition, the spacing between said main arm portion and said terminus providing a safety clearance for said one condition, said main arm portion being resiliently movable to a position to engage said terminus and being further movable in the same direction for movement of said movable actuating portion to said inner location for said other condition, and a locking device carried by said wall for retaining said main arm portion deflected and engaged with said movable actuating portion and with said actuating portion at said inner location.

2. A safety door switch as defined in claim 1 in which said locking device includes a locking stud carried by said main arm portion having a transverse locking pin thereon, and a wall carried plate is provided having an opening for passage of said pin, and cam members for holding said locking pin against accidental movement.

3. A safety door switch as defined in claim 1 in which said locking device includes a locking stud carried by said main arm portion, said stud has a threaded stem, and a wall carried plate is provided having an internally threaded part for engagement by said threaded stem.

4. A safety door switch as defined in claim 1 in which said mounting portion and said main arm portions of said lever member are disposed in parallel planes and are integral with an intermediate portion connected at its ends to said portions and providing a resilient hinge at at least one of its connections.

5. A safety door switch for use with a wall and an access member mounted on said wall for access through said wall comprising a housing fixedly mounted on said wall, a cover plate for said housing disposed in a plane parallel to said wall, an electric switch mounted on said cover plate and having an actuating portion extending outwardly from said plate, said actuating portion having an outer terminus at an outer location for one condition and at an inner location for another condition, a resilient integral actuating lever member having a mounting portion secured to said access member and having a deflectable main arm portion extending in front of said terminus of said actuating portion in spaced relation thereto for said one condition, the spacing between said main arm portion and said terminus providing a safety clearance for said one condition, said main arm portion being resiliently movable to and from a position to hold said actuating portion at a predetermined operative position for said other condition, and a locking device carried by said wall holding said main arm portion deflected and in engagement with said actuating portion and retaining said actuating portion at said operative position at said inner location.

6. A safety door switch as defined in claim 5 in which said locking device includes a locking stud carried by said main arm portion and a wall carried member is provided with which said locking stud is detachably engageable.

7. A safety door switch as defined in claim 5 in which said locking device includes a locking stud carried by said main arm portion having a transverse locking pin thereon, and a wall carried plate having an opening for

passage of said pin, the plate having cam members for holding said locking pin against accidental movement.

8. A safety door switch as defined in claim 5 in which said locking device includes a locking stud carried by said main arm portion, said stud has a threaded stem, and a wall carried plate is provided having an internally threaded part for engagement by said threaded stem.

9. A safety door switch as defined in claim 5 in which said mounting portion and said main arm portions of said lever member are disposed in parallel planes with an intermediate portion connected at its ends to said portions and providing a hinge at at least one of its connections.

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