

D. PETERS

3,560,950

WARNING SIGNAL FOR SWINGING DOORS

Filed March 2, 1967

2 Sheets-Sheet 1

FIG. 1

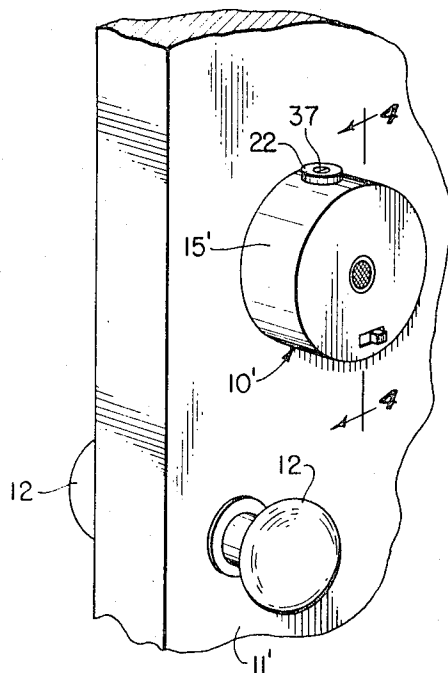


FIG. 2

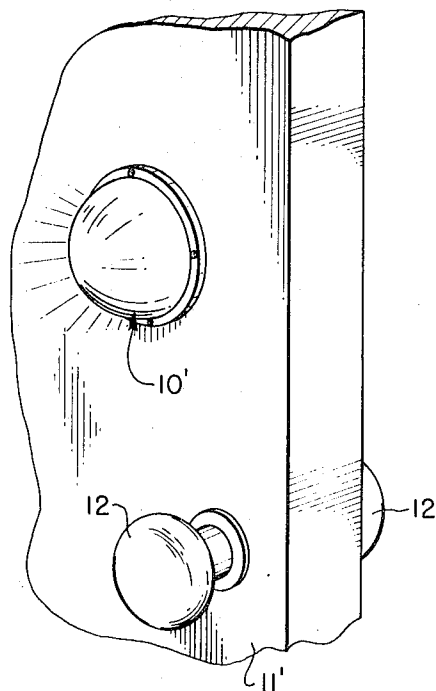


FIG. 3

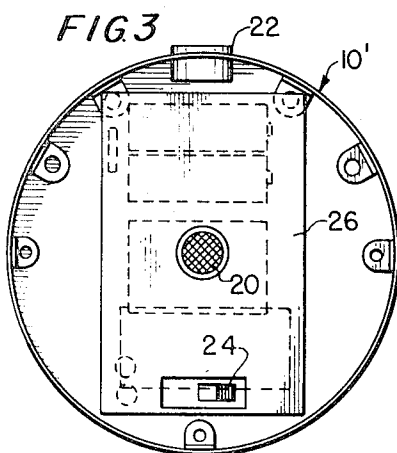
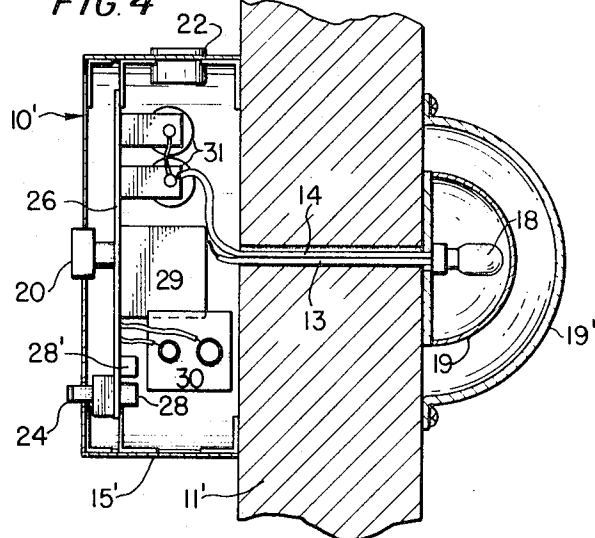


FIG. 4



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3,560,950

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Filed March 2, 1967

2 Sheets-Sheet 2

FIG. 5

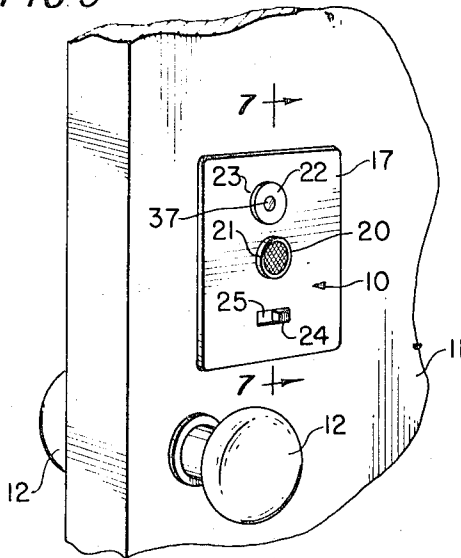


FIG. 6

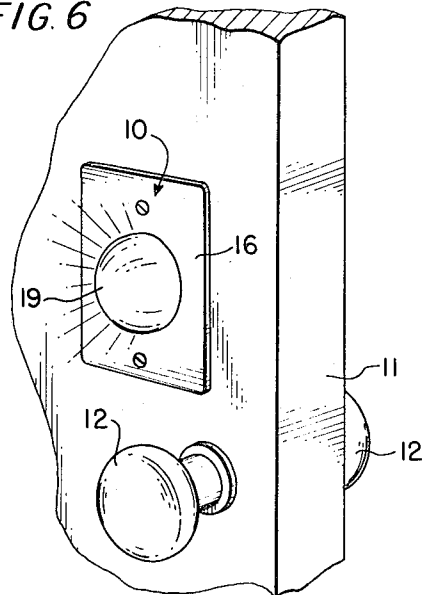


FIG. 7

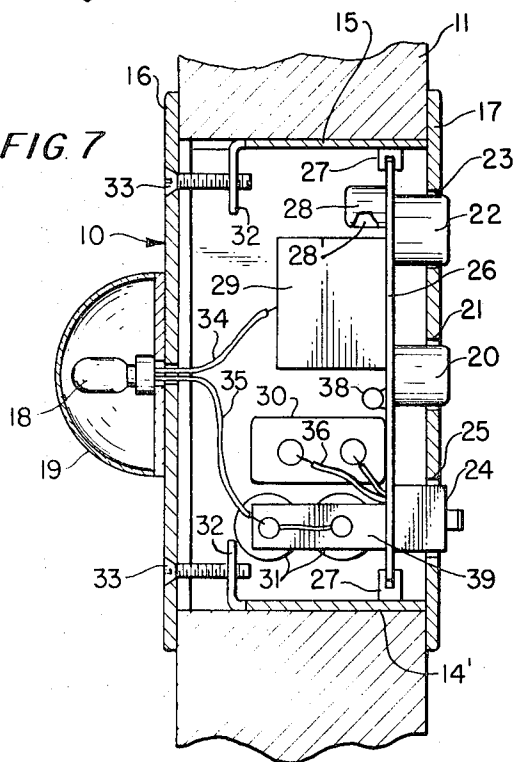
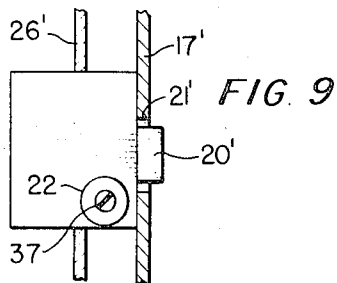
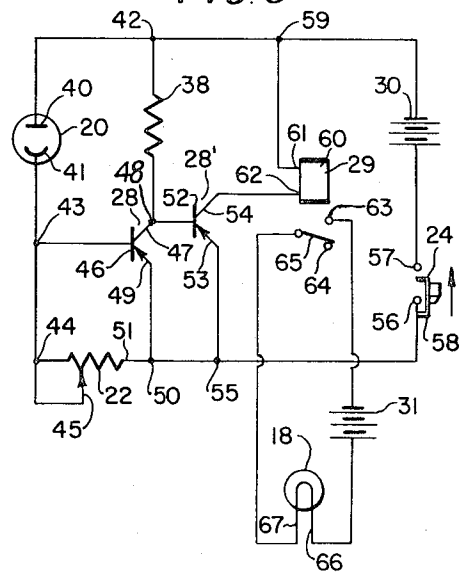


FIG. 8



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1

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WARNING SIGNAL FOR SWINGING DOORS

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4 Claims

ABSTRACT OF THE DISCLOSURE

A warning signal provided on one side of a swingable door is operable by automatic means provided on the other side of the door, to warn a person on the signal side of the presence of a person near enough to the other side for opening the same even before the door is actually being opened, whereby to prevent accidental forcible contact with the door, operation of the signal being either by casting a shadow on a light sensitive photo-electric cell or by a thermal responsive switch on a door knob or door plate.

This invention relates to a warning signal for swinging doors, intended for application in places wherever the door is used to a great extent by people going both ways, as, for example, in a restaurant kitchen, where the sudden opening of the door from the other side could cause a tray of dishes to be spilled and even cause personal injury, this being a serious problem in so many instances where, due to limited space, it is not possible to install a second door so that people traveling in opposite directions may use different doors. While it is old to incorporate a mechanically operated switch on the door knob to indicate when it is being turned, that is not satisfactory because in many instances there is no door knob and, if one is provided, the signal is operable substantially simultaneous with the opening of the door, so that it is not effective. The present invention, in its preferred form provides a photo-electric cell on one side of the door and a warning signal, such as a light bulb, buzzer, or the like, on the other side, to indicate when a person has approached the door close enough to open it, thus giving a sufficient interval between the signaling and the opening to avoid accidents. A similar effect is obtainable with a highly sensitive thermal switch on the door knob or plate normally contacted in the opening of the door, to cause the signal to be operated with a sufficient interval between the actual signal and the opening of the door.

The invention is illustrated in the accompanying drawings, in which:

FIGS. 1 and 2 are perspective views of the inner side and the outer side of a door, respectively, showing the photo-electric cell on the one side in FIG. 1 and the warning signal light on the other side in FIG. 2 that is operated in response to the shadow cast on the cell by anyone approaching the door preparatory to opening it;

FIG. 3 is a face view of the photo-electric cell unit with the face plate removed;

FIG. 4 is a cross-section on the line 4—4 of FIG. 1 showing the tie-up through a small hole in the door between the photo-electric cell unit on one side of the door with the warning signal on the other side;

FIGS. 5 and 6 are views corresponding to FIGS. 1 and 2 showing the preferred construction in which the entire warning signal unit is set in an opening in the door;

FIG. 7 is a cross-section on the line 7—7 of FIG. 5;

FIG. 8 is a wiring diagram for FIGS. 1—7, and

FIG. 9 is a fragmentary sectional view along the lines of FIG. 7 but showing the highly sensitive thermal switch which may be used in lieu of the photo-electric cell of FIGS. 1 to 7.

2

Similar reference numerals are applied to corresponding parts throughout the views.

Referring to FIGS. 5, 6 and 7, and related wiring diagram FIG. 8, the warning signal is indicated generally by the reference numeral 10. It is preferably mounted in the door 11 slightly above the level of the door knobs 12 and close enough thereto to be certain of its photo-electric cell being shaded by a person approaching a door to swing it open. While door knobs have been shown it should be understood that a plate may be provided on each side of a two-way swinging door at the proper level for convenient engagement by the person opening the door. In the related embodiment shown at 10' in FIGS. 1 to 4 on the door 11' the warning signal components are mounted on opposite sides of the door so that only a small hole 13 need be drilled through the door to extend the wiring therethrough as indicated at 14. However, in the preferred embodiment shown in FIGS. 5 to 7 a larger hole 14' is cut through the door to receive the warning signal 10 in a housing 15 between two face plates 16 and 17, plate 16 being on the outer side of the door where the warning signal light 18 is provided inside a suitable translucent shield 19, while plate 17 on the inner side has the light sensitive photo-electric cell 20 extending through a center hole 21 provided therein. There is also a potentiometer 22 extending through another hole 23 provided in the plate 17, and slide switch 24 projecting through a third hole 25 provided therein. The photo-electric cell 20, potentiometer 22 and slide switch 24, are all carried on a printed circuit board 26 suitably mounted inside the housing 15 in insulated relationship thereto on suitable diametrically opposed supports 27. The printed circuit board 26 also provides support on its other side for two transistors 28 and 28', a relay 29, a 9-volt battery 30 for operating the relay, and one or two 1½ volt batteries 31 for lighting bulb 18. The housing 15 is suitably secured to the inner side of plate 17 so as to be readily insertable in and removable from the hole 14' by means of the plate 17. Plate 16 is fastened to diametrically opposed lugs 32 in housing 15 by means of screws 33, and when these screws are tightened, the plates 16 and 17 are forced into tight contact with opposite sides of the door. Due to the printed circuit on the board 26, a minimum amount of wiring is needed, as, for example, the wires 34 and 35 extending to the signal light bulb 18 from the relay 29 and the batteries 31. Other wires are indicated at 36 extending from the battery 30 to the switch 24. A screw 37 is readily accessible from the outside of the warning signal 10 as seen in FIG. 5 to enable fine adjustment of the potentiometer with a screwdriver, to make the signal more sensitive, or less, as the circumstances seem to require, so that the warning signal will be operated only when the photo-electric cell 20 is shaded sufficiently, as when a person about to open the door gets close enough to the door knob 12 or plate 17 to make it advisable to have the signal operated. In passing, it will also be noted in FIG. 7 that a fixed resistor is indicated at 38 as mounted on the back of the printed circuit board 26. Also there is a spring clip 39 which serves the double function of mechanically holding batteries 31 in place while electrically connecting the same into the circuit on the board 26.

Referring to FIG. 8, the photo-electric cell 20 has an anode 40 and a cathode 41. Anode 40 is connected to a junction 42, while cathode 41 is connected to a junction 43. Junction 43 has one end 44 of the variable resistor or potentiometer 22 connected thereto, the latter having its variable contact 45 also connected to the same junction. The transistor 28 has a base 46, which is connected to the junction 43, in addition to a collector 47 that is connected to a junction 48, and an emitter 49 that is connected to a junction 50. The fixed resistor 38 is connected between

3

the junctions 42 and 48. The junction 50 is connected to the other end 51 of the potentiometer 22. Transistor 28' has a base 52, an emitter 53, and a collector 54. The base 52 is connected to the junction 48 and emitter 53 is connected to a junction 55, which is in turn connected with the junction 50. Junction 55 is also connected to the fixed contact 56 of switch 24. A second fixed contact 57 of switch 24 is connected to the positive terminal of the 9-volt battery 30. The fixed contacts 56 and 57 of switch 24 are electrically connected or disconnected by means of the sliding contact 58. The negative terminal of 9-volt battery 30 is connected to a junction 59, which is in turn connected to the junction 42. Relay 29 has an energization coil 60, which has a pair of terminals 61 and 62, two fixed contacts 63 and 64, and a movable contact 65, which is activated by the energization of coil 60. Terminal 61 of coil 60 is connected to junction 59, while terminal 62 is connected to the collector 54 of transistor 28'. The fixed contact 63 of relay 29 is connected to the negative terminal of the 1½ volt battery 31. The fixed contact 64 has no connections thereto. The positive terminal of the 1½ volt battery 31 is connected to a terminal 66 of the bulb 18, and a second terminal 67 of the bulb 18 is connected to the movable contact 65 of the relay 29. The relay 29 acts as a current sensitive switching means, which completes a circuit between the bulb 18 and the 1½ volt battery 31 when sufficient current flows in the coil 60. Relay 29 is only one example, as many other circuits could be used to equal advantage. For the same reason, the bulb 18 and its energizing battery 31, it must be understood, are only one example of the warning signal that might be used, as, of course, instead of a visual signal light, one might employ a buzzer, a horn, or a bell for an audible signal. In operation, when the photo-electric cell 20 has sufficient light impinging on the cathode 41 it is conducting and the junction 43 has a negative voltage thereon with respect to junction 50. The amount of this negative voltage depends upon the setting of the potentiometer 22. Since the junction 43 has a negative voltage thereon the transistor 28 is conducting and junction 48 is positive with respect to junction 42 or substantially equal to the voltage on junction 55, whereby the transistor 28' is maintained cut off or non-conducting. Since the transistor 28' is non-conducting there is no current flowing through the coil 60 and the relay 29 is deenergized, placing the movable contact 65 in the position shown or in engagement with the fixed or dead contact 64. Since the movable contact 65 is in engagement with the fixed contact 64 there is no complete circuit for the 1½ volt battery and bulb 18, and, therefore, bulb 18 is not lighted. Now, if a person approaches door 11 and casts a sufficient shadow on the photo-electric cell 20 so that there is sufficient reduction in light impinging on cathode 41 this reduces the conduction of the photo-electric cell 20, thereby making the voltage at the junction 43 positive, since most of the 9 volts of battery 30 are dropped across the photo-electric cell 25. Since the junction 43 has a positive voltage thereon, the base 46 of transistor 28 is positive or substantially the same voltage as the emitter 49, and the transistor 28 is cut off or non-conducting. When the transistor 28 stops conducting, junction 48 becomes negative, since most of the nine volts between junctions 42 and 50 are dropped across transistor 28. Since the junction 48 is negative, the base 52 of transistor 28' is negative, or there is a large negative voltage on the base 52 with respect to the emitter 53, and transistor 28' conducts. When transistor 28' conducts, a current flows through the coil 60 and the relay 29 is energized, moving the movable contact 65 from engagement with fixed contact 64 into engagement with fixed contact 63. Engagement of movable contact 65 with fixed contact 63 completes a current path for the 1½ volt battery 31 through bulb 18, and bulb 18 is accordingly lighted, indicating that a person has approached door 11 and it is about to be opened. In that way accidents are avoided, without involving too much ex-

4

pense for the installation of the warning signal. There is no need of any actual physical contact between the person approaching the door and the door for operation of the signal, as in certain prior art patents. It is obvious that with very few additions the warning signal could be made to operate from either side of a two-way swinging door, utilizing all of the components shown in the circuit but having photo-electric cells on both sides of the door and warning signals on both sides.

The other embodiment shown in FIGS. 1 to 4, as previously pointed out, involves the mounting of the housing 15' on the surface of the door instead of in the hole 14'. With that arrangement the variable resistor or potentiometer 22 can be mounted on the peripheral wall of the housing, if desired.

The highly sensitive thermal switch shown in FIG. 9 at 20' is the modified form of my invention and projects through an opening 21' in the face plate 17' and is mounted on the printed circuit board 26'. This switch is substituted for the photo-electric cell 20 and is adapted to close a circuit through the bulb 11 in response to a slight rise in temperature caused by the proximity of a person or persons who are close enough to the door to open it, the closing of this thermal switch giving the alarm signal sufficiently in advance of the opening of the door to be effective in preventing a collision with the opening door by someone on the other side. Obviously this switch would require a simple bell ringing series type circuit with 1½ volt batteries like those shown at 31, and the complete signal unit would therefore be made available at a much lower cost. If preferred, the thermal switch could be installed on the door in sufficiently close proximity to the door knob or plate on the door to be more certain of its operating the signal light, because it would then be operated in response to the temperature of the hand in the opening of the door. Here again, it is obvious, that thermal switches could be provided on both sides of the door, each operating its own signal light on the other side in the case of the two-way swinging door.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims have been drawn to cover all legitimate modifications and adaptations.

I claim:

1. A warning device for swinging doors comprising:
 - (a) light sensitive means adapted to be mounted on a door so as to be shadowed when a person is about to open said door and providing a signal in response to said shadow or change in light impinging thereon;
 - (b) means for controlling the current in a circuit in response to a predetermined signal;
 - (c) means connecting said light sensitive means and said current controlling means in circuit for providing a normally low current in said circuit and providing a relatively high current in said circuit when said light sensitive means is shadowed;
 - (d) current sensitive switching means connected in said circuit containing said current controlling means and having a first condition for said low current and a second condition for said high current; and
 - (e) indicating means connected in circuit with said current sensitive switching means so as to be responsive to said first and second conditions for indicating when said light sensitive means has light impinging thereon and when it is shadowed.
2. A warning device for swinging doors comprising:
 - (a) light sensitive means adapted to be mounted in one side of a door so as to be shadowed when a person is about to open said door and providing a signal in response to said shadow or change in light impinging thereon;
 - (b) means for controlling the current in a circuit in response to a predetermined signal;
 - (c) means connecting said light sensitive means and said current controlling means in circuit for provid-

5

ing a normally low current in said circuit and providing a relatively high current in said circuit when said light sensitive means is shadowed;

(d) current sensitive switching means connected in said circuit containing said current controlling means and having a first condition for said low current and a second condition for said high current; and

(e) a light source mounted in said door on the side opposite said light sensitive means and connected in circuit with said current sensitive switching means so as to be de-energized when said switching means is in said first condition and energized when said switching means is in said second condition.

3. A warning signal device for swinging doors comprising:

(a) switch means carried on one side of said door responsive to the approach of a person immediately prior to such person opening said door to close an electrical circuit in which said switch means is connected;

(b) the electrical circuit for said switch means includes a photo-electric cell which normally has light of a predetermined value impinging thereon sufficient to keep the switch means open and is therefore affected sufficiently by the shadow cast thereon by a person approaching the door to open the same to cause the closing of said switch means; and

(c) electrical signal means carried on the other side of said door and included in said circuit with a source of current supply so as to be energized upon the closing of the aforesaid switch means.

4. A warning signal device for swinging doors comprising:

(a) switch means carried on one side of said door responsive to the approach of a person immediately

6

prior to such person opening said door to close an electrical circuit in which said switch means is connected;

(b) the electrical circuit for said switch means includes a photo-electric cell which normally has light of a predetermined value impinging thereon sufficient to keep the switch means open and is therefore affected sufficiently by the shadow cast thereon by a person approaching the door to open the same to cause the closing of said switch means, the circuit for said photo-electric cell including also a manually adjustable variable resistor, whereby to make operation of the signal means more sensitive to light change relative to said photo-electric cell or less sensitive to such light change; and

(c) electrical signal means carried on the other side of said door and included in said circuit with a source of current supply so as to be energized upon the closing of the aforesaid switch means.

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U.S. Cl. X.R.

35 307—117; 340—274