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3,084,239

PUSH-BUTTON OPERATED SWITCH WITH ILLUMINATED PUSH BUTTON

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Fig. 2.

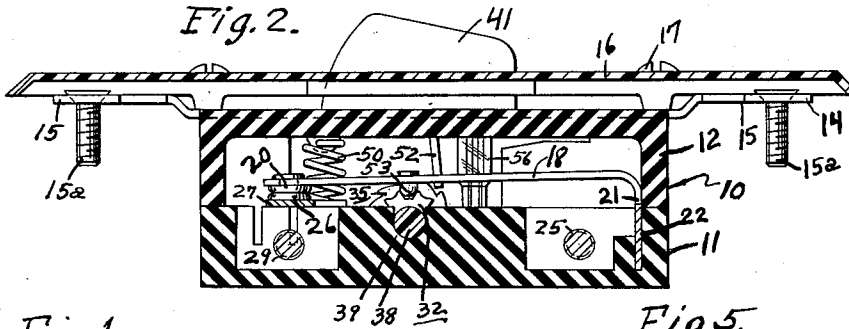


Fig. 1.

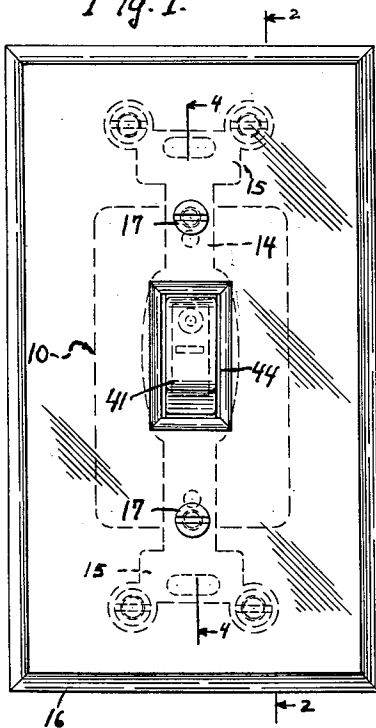


Fig. 5.

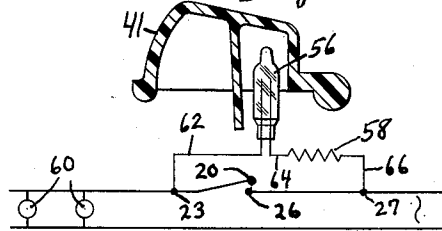


Fig. 3.

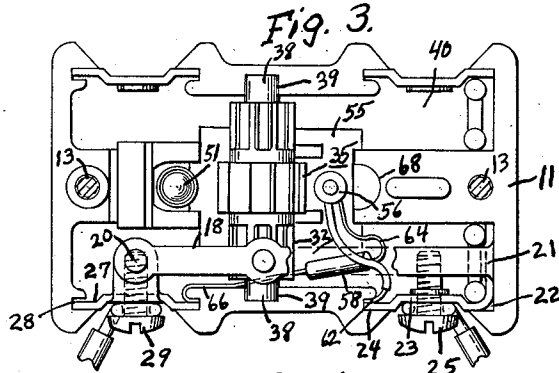


Fig. 4.

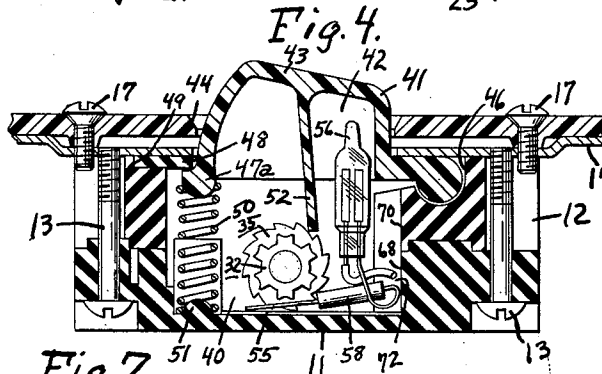


Fig. 7.

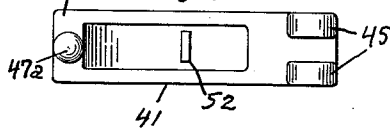
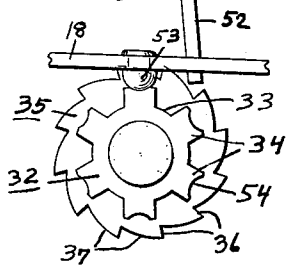


Fig. 6.



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1

3,084,239

PUSH-BUTTON OPERATED SWITCH WITH ILLUMINATED PUSH BUTTON

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5 Claims. (Cl. 200-156)

This invention relates to electrical switches and particularly to illuminated push-button operated type switches.

In the past, various means have been employed to illuminate electric switches in order that they might be readily located in the dark. Such prior illuminated electric switches have required substantial modification or rearrangement of the existing switch elements in order to accommodate the illuminating means, which normally is a miniature low voltage type lamp, and therefore such prior structures have been relatively expensive and bulky. This has been particularly true of push-button operated electrical switches, because of the inherently more complex nature of push-button operated electrical switch constructions.

It is an object of this invention to provide a simplified electrical switch construction having improved means for illuminating the switch.

It is another object of this invention to provide an improved illuminated switch, as set forth in the preceding paragraph, which is push-button operated.

The objects of this invention are achieved in one form by providing an illuminating means in an electrical switch and disposing it therein in such a manner that the existing switch elements of the switch are in no way disturbed, and yet, the switch is illuminated effectively in a superior manner to that heretofore effected.

Other objects and further details of that which we believe to be novel in our invention will be clear from the following description and claims taken with the accompanying drawing wherein:

FIG. 1 is a front elevational view of an improved electrical switch embodying the invention, illustrated as it appears when finally mounted on a wall;

FIG. 2 is a sectional view taken substantially on line 2-2 of FIG. 1;

FIG. 3 is a plan view of the base of the switch and the parts which it supports after the switch cover and push button have been removed;

FIG. 4 is a sectional view taken substantially on line 4-4 of FIG. 1;

FIG. 5 is a schematic wiring diagram of a domestic lighting circuit which includes the improved switch;

FIG. 6 is a fragmentary side elevational view of some of the operating mechanism for the switch, and

FIG. 7 is a bottom plan view of the push button.

The drawings illustrate the preferred embodiment of the invention.

The improved illustrated switch comprises a body 10 composed basically of a base 11 and a cover 12, which are made of a dielectric material, as by being molded of an appropriate plastic, which are designed to cooperate to form the unitary chambered body 10, as by being secured to each other by screws 13 which pass through the base and cover and are threadedly received in threaded openings formed in a metal mounting yoke 14, which is disposed adjacent to the front of cover 12 when the switch is wall mounted as shown in FIG. 1. The yoke 14 is provided with conventional mounting ears 15 at its opposite ends which are designed for use with suitable screws 15a for mounting the entire body in a standard wall outlet box (not shown) of the usual house wiring system. Cover plate 16, which may be aesthetically attractive, may be secured to the yoke 14 by screws 17, and when

2

in fully mounted position, it is disposed to cover the opening in the wall box and the opening in the wall surface to provide a finished appearance.

In the illustrated form of the invention, the switch includes electrical switching means which may comprise a movable switch member 18 in the form of an elongated electrical conducting spring strip which carries a suitable electrical contact 20 at its free end, and is securely mounted at its other end 21 in the base 11 of the body. The mounting of movable switch member 18 may be effected by bending its other end 21 and seating it in a slot 22 which is formed in the base 11. The bent end 21 may have a laterally extending plate portion 23 which is seated in a recess 24 in a side of the base 11 and functions as a binding plate and receives the usual binding screw 25 to form a terminal for connection of a lead wire thereto. Adjacent the opposite end of the movable switch member 18 is disposed a stationary electrical contact 26 which is carried by angle plate 27 which is mounted in a recess 28 in a side of the base 11. One wall of the plate 27 functions as a binding plate and receives a binding screw 29 to form a terminal for connection of another lead wire. With this arrangement, the movable electrical contact 20 may be shifted during operation between a position of engagement with the electrical contact 26 and another position of disengagement. The foregoing switch structure is generally the same as that disclosed and claimed in the co-pending patent application Serial No. 632,369 of Harvey Hubbell and Ernest R. Carlson, filed January 3, 1957, now Patent No. 2,933,578, and assigned to the assignee of the instant patent application.

The following switch structure for selectively operating the movable switch member 18 between its two principal operating positions is also generally the same as the corresponding structure in the referred-to copending patent applications. The structure for operating the movable switch member 18 comprises a rotary wheel 32 provided at its periphery with a series of alternate axial notches 33 and axial ribs 34 extending longitudinally thereof. At one axial end of wheel 32 there is formed a toothed ratchet member 35 comprising an enlarged disk-like member having a series of spaced shoulders 36 facing in one peripheral direction and inclined curved surfaces 37 connecting the bottom of each shoulder with the top of the next adjacent shoulder. The wheel and ratchet may be formed integrally and are mounted for joint rotary movement by suitable end bearings 38 which seat in bearing notches 39 formed in opposite side walls of the base 11 that surround recess 40, which is formed in the base. Means is provided for selectively rotating the ratchet member 35 and the rotary wheel 32 with a step-by-step movement to thereby shift the movable switch member 18 and the electrical contact 20 carried thereby to its alternate positions. This means comprises push button 41 which is preferably molded of a suitable plastic material, such as nylon or the like.

The push button 41 has a cavity 42 formed therein which opens through one side of the push button and has an outer wall 43 the outside surface of which may be manually contacted by the thumb or finger of the user to depress the push button to operate the switch. The portion of the push button which includes the wall 43 extends through a suitable opening 44 in the cover plate 16 where it is accessible to the user. At one of its ends the push button 41 is provided with laterally spaced pivot lugs 45 which seat in suitably spaced recesses 46 formed in the outer side of the switch cover 12 to provide a pivotal mounting for the push button 41 when the switch is fully assembled. At its other end, the push button is provided with an extending lug 47 and is adapted to engage under a soft resilient bumper plate 48 mounted in a recess 59 formed in the outer side of the switch cover

12 and retained in the recess by the yoke 14 when the switch is fully assembled. The bumper plate 48 may be made of a soft resilient material, such as rubber, and functions to limit the outward movement of the push button lug 47 and also as a sound deadener for the push button to effect quiet operation of the switch. The push button 41 is normally held in an outwardly projecting position by coiled compression spring 50 which seats at its inner end on a suitable bump 51 formed on the inner face of the bottom wall of the base 11 which forms the recess 40. The upper end of the spring 50 seats over a similar bump 47a formed on the lug 47 of the push button. It will, therefore, be apparent that the push button 41 is normally biased to its outwardly projecting position by the spring 50, but that it is capable of being moved to an inner position by manual pressing on the push button to overcome the bias of spring 50.

An elongated spring finger 52 is formed integrally with the push button 41 and extends therefrom through the push button cavity 42 and has its free end in contact with toothed ratchet member 35 for operating the latter. The resilient nature of the spring finger 52 is functionally important during operation of the switch, for its free end is capable of flexing laterally, when the push button is depressed, to maintain constant contact with the toothed ratchet member 35, with the result that the free end of the spring finger alternately makes driving engagement with the shoulders 36, when the push button is depressed, to cause partial rotation of the ratchet member 35, and on release of the push button and its consequential movement to its outer projected position, the free end of the spring finger 52 snaps into the next notch of the toothed ratchet member 35 to be poised for driving engagement with the next shoulder 36 on the next occurrence of the push button being depressed.

The movable switch member 18 is operated by the rotary wheel 32 and also functions to provide discrete angular positions of the toothed ratchet member 35, because it constantly exerts a bias on the rotary wheel 32. The particular cooperative relationship of the rotary wheel 32 and the movable switch member 18 is effected by a button 53 which is provided on the member 18 and positioned to alternately seat in the notches 33 and in the seats 54 formed in the tops of the ribs 34 of the rotary wheel 32. When the button 53 is mounted in the notches 33, the movable switch member 18, due to its inherent bias in toward the rotary wheel 32, moves to its position wherein its electrical contact 20 engages the electrical contact 26 (FIG. 1 condition). When the button 53 is seated on the tops of the ribs 34, movable switch member 18 is thereby forced to its position wherein the electrical contact 20 is out of engagement with the electrical contact 26 (FIG. 6 condition). As can best be seen in FIG. 6, the teeth on the ratchet member 35 are designed in proportion with respect to the notches 33 and ribs 34 on the rotary wheel 32 so that each successive operation of the toothed ratchet member by the push button 41 shifts the rotary wheel 32 the angular distance between the center of a notch 33 and the center of the top of an adjacent rib 34; with this relationship, on successive operation of the push button 41, the button 53 on the movable switch member 18 alternately seats in notches 33 and in the seats 54 formed in the ribs 34. It will be understood that the seats 54 in the tops of the ribs 34 may be preferably concavely formed, so that the rounded end of the button 53 will conveniently and securely seat therein and avoid unseating of the button 53, due to the inherent spring action of the movable switch member 18 in urging the button 53 toward the rotary wheel 32. If desired, an indexing locking spring such as the flat spring 55 may be disposed between the ratchet member 35 and the bottom wall of the base 11 which forms the recess 40 and caused to function to urge the ratchet member 35 constantly toward and into operative contact with the

spring finger 52, and simultaneously to urge the rotary wheel 32 into contact with the button 53.

From the above it will be understood that a simple and effective push-button operated switch has been provided wherein alternate successive depression of the push button results in shifting the movable switch member 18 between its "on" and "off" positions (contacts engaged and disengaged conditions). Substantially this switch is disclosed and claimed in the referred to copending patent application, and it will be understood by those skilled in the art that slight modifications of the electrical switch elements, that is, the electrical contacts and their supporting means, may be made to achieve slightly different operating results, e.g., if desired, plural sets of electrical contacts and supporting means therefor may be incorporated in the switch to control plural circuits.

The instant invention is generally concerned with providing an effective illuminating means for an electrical switch, principally by providing an arrangement wherein the switch will be satisfactorily illuminated in the dark when the electrical contacts thereof are disengaged. It is a particular purpose of the invention to incorporate such illuminating means in a push-button operated electric switch. Reference to FIG. 5 will facilitate an understanding of the preferred manner of wiring the preferred form of improved electrical switch in a domestic lighting situation. It will therein be observed that the illuminating means 56, which may conveniently take the form of a miniature low voltage type lamp, such as the gaseous discharge variety which is filled with neon gas, is mounted in a circuit with a resistor 58 of any well known type, for example, a carbon resistor, so as to be in series circuit relation with the main power supply lines and the conventional domestic lamps 60, which are being controlled by the electrical switch. The electrical switch is capable of selectively having engagement and disengagement of its electrical contacts caused by depression of the push button 41 to thereby energize and de-energize the lamps 60. The lamp 56 and its associated resistor 58 are in parallel relation with the electrical contacts 20, 26 of the electrical switch. Therefore, if the electrical contacts 20, 26 are engaged, the circuit to the lamps 60 will be completed and they will illuminate, but due to the substantial resistance of resistor 58, no substantial amount of electrical current will pass through the lamp 56, and therefore, it will not emit any significant amount of light. However, when the electrical contacts 20, 26 are disengaged, the lamp 56 and its resistor 58 will receive all the current, and therefore, the lamp 56 will be illuminated. With the foregoing wiring arrangement, the electrical switch when fully mounted in operative position will function to be illuminated by the lamp 56 when the domestic illuminating lamps 60 are out, and thereby facilitate the location of the push button to actuate the switch in the dark when it is desired to illuminate the lamps 60.

The general idea of providing an illuminated electric switch is broadly not new. However, it is a purpose of this invention to provide such a switch of such construction that disruption of the existing switch elements is avoided, notwithstanding the fact that means for illuminating the switch are incorporated therein, and further to incorporate the illuminating means into the switch in such a manner that maximum utilization of the light emitted by the illuminating means is achieved.

The purpose of the invention is achieved as follows: The push button 41 is formed of a light-transmitting material and may be conveniently molded of a suitable translucent plastic. The lamp 56 and resistor 58 are mounted in the switch body 10 in such a manner that they do not disrupt the existing switch elements either physically or electrically, do not require any additional mounting means, and locate the lamp 56 so as to have a substantial portion thereof disposed in the cavity 42 of the push button, and yet not interfere with the push button when it is used.

5

As can best be seen in FIGS. 2 and 4, when it is finally assembled position, the lamp 56 extends generally perpendicularly to the main plane of the cover plate 16. The lamp 56 and resistor 58 are connected to each other and to the terminals formed by binding plates and screws by the electrical leads 62, 64 and 66. It will be understood that one or more of these leads may be appropriately insulated electrically so as not to interfere with any of the switch elements. The electrical lead 62 is illustrated as connecting the lamp 56 and one of the terminals; the lead 64 is illustrated as connecting the lamp 56 and the resistor 58, and the lead 66 is illustrated as connecting the resistor 58 and the other terminal. A convenient physical manner of effecting the electrical connection of the leads 62 and 66 to the terminals can be clearly seen in FIG. 3, wherein it will be observed that these leads are mounted by inserting them with their associated binding plates 23, 27 and pressing them down into recesses 24 and 28 respectively, at the same time the binding plates are assembled to the base 11. This method of assembly eliminates the need for soldered connections.

In order to facilitate the mounting of lamp 56, the base 11 and cover 12 of the switch may be formed with co-operating notch portions 68 and 70, respectively, which form a longitudinally extending pocket 72 into which a side portion of the lamp 56 may conveniently reside. The need for special or additional supporting structure for the lamp 56 is obviated by appropriately bending the two lamp leads 62 and 64 to form somewhat of a resilient bent wire support for the body of the lamp 56, as can best be seen in FIG. 4.

In view of the foregoing the construction and operation of a preferred embodiment of the invention will be apparent, as it will be apparent that the objects of this invention have been achieved.

As will be evident from the foregoing description, certain aspects of our invention are not limited to the particular details of construction of the example illustrated, and we contemplate that various and other modifications and applications will occur to those skilled in the art. It is, therefore, our intention that the appended claims shall cover such modifications and applications as do not depart from the true spirit and scope of our invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In an illuminated push-button operated electric switch; a switch body having a substantially flat front wall; a switch member movably mounted in said body between different operative conditions; a rotary operating wheel for said switch member disposed in said body and having a series of alternate high and low portions on its periphery; means on said switch member which is seatable alternately on said high and low portions for thereby positioning said switch member in different operative conditions; means for rotating said wheel comprising a rotatable ratchet member having a series of peripherally spaced shoulder forming teeth; a push button made of a translucent material pivotally mounted on said body, said push button having a cavity accessible from the interior of said body and manually engageable portions extending through said front wall and accessible from the exterior of said body; a spring finger on said push button positioned within said body and arranged to cooperate with said ratchet member to rotate it with step-by-step movement on successive manual depression of said push button; and a miniature illuminating lamp positioned in said body so as to be generally perpendicular to said front wall and having a substantial portion thereof positioned in

6

said cavity in said push button, said lamp being electrically wired in said switch in such a manner that during certain operative conditions it is energized and thereby causes a substantial portion of said push button to glow and be visible from the exterior of said body.

2. A switch as defined in claim 1 wherein said body has portions formed to accommodate said push button and recessed portions adjacent to said first-named portions and spaced from said spring finger for accommodating said lamp between said recessed portions and said spring finger in such a manner that a substantial portion thereof conveniently extends into said cavity in said push button.

3. A switch as defined in claim 2 wherein said body is formed by two dielectric parts, one of said parts has means for pivotally mounting said push button, and both of said parts have said recessed portions for receiving said lamp which are disposed adjacent to said push button mounting means.

4. An illuminated electrical switch comprising: a body made of a dielectric material and including a base and a cover which are secured to each other to form an internally chambered support for the remaining elements of said switch; electrical switch means in said body; means for adjusting said switch means comprising a manually operated push button which is mounted in said body for movement, extends through a flat wall of said cover and is accessible from the exterior thereof; said push button being made of a translucent material and having a cavity formed therein; a miniature illuminating lamp mounted in said body and having a substantial portion thereof extending into said cavity in said push button; said electrical switch means including a pair of main electrical terminals that are adapted to have electrical power leads secured to them; said terminals comprising binding plates that are frictionally held in slotted portions of said body; and said lamp having a pair of leads which are individually solderlessly connected to said terminals by being disposed between said binding plates and said slotted portions.

5. An illuminated electrical switch comprising: a body made of a dielectric material and including a base and a cover which are secured to each other to form an internally chambered support for the remaining elements of said switch; electrical switch means in said body; means for adjusting said switch means comprising a manually operated push button which is mounted in said body for movement, extends through a flat wall of said cover and is accessible from the exterior thereof; said push button being made of a translucent material and having a cavity formed therein; a miniature illuminating lamp mounted in said body and having a substantial portion thereof extending into said cavity in said push button so as to be substantially perpendicular to the flat wall of said cover; and said lamp has a pair of leads that are bent into a resilient support for said lamp and aid in maintaining said lamp in proper position in said body and in said cavity in said push button.

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