

June 27, 1950

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ILLUMINATED TOGGLE SWITCH

2,512,975

Filed Aug. 14, 1947

2 Sheets-Sheet 1

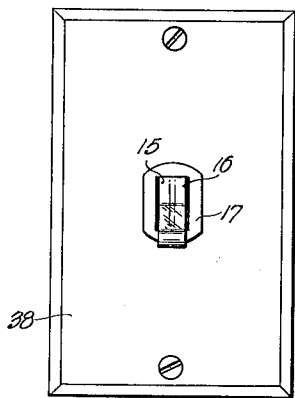


Fig. 1.

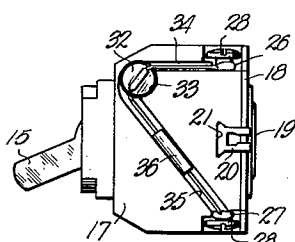


Fig. 2.

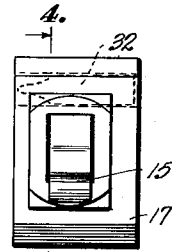


Fig. 3.

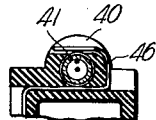


Fig. 8.

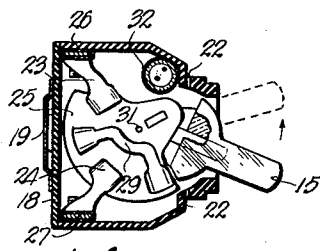


Fig. 4.

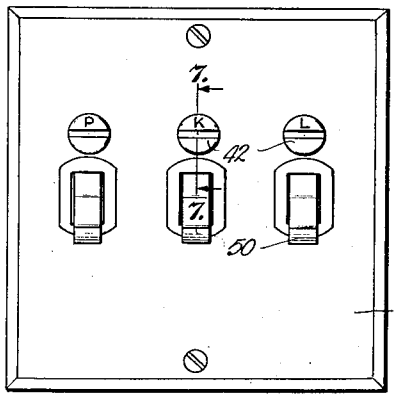


Fig. 5.

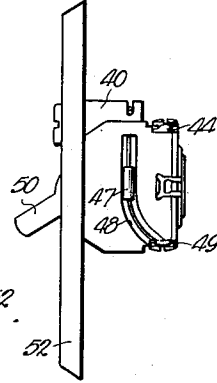


Fig. 6.

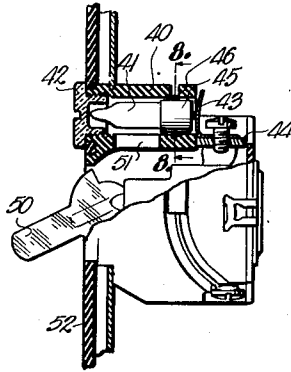


Fig. 7.

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2 Sheets-Sheet 2

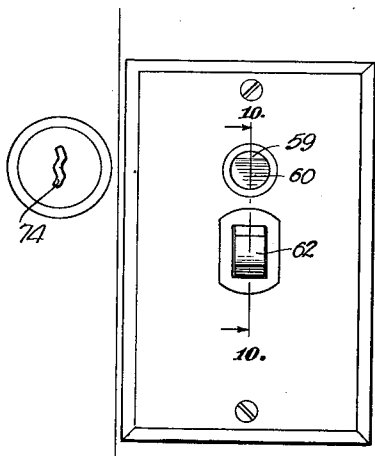


Fig. 9.

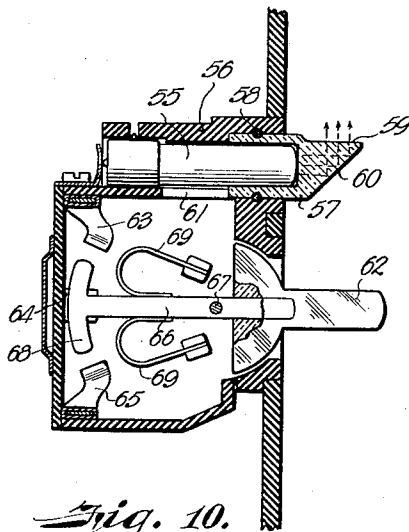


Fig. 10.

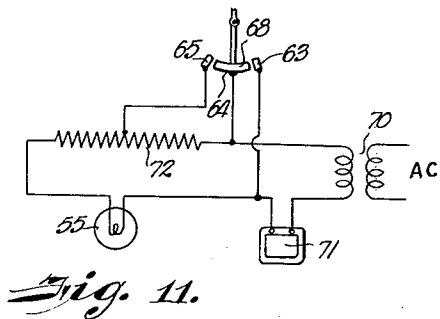


Fig. 11.

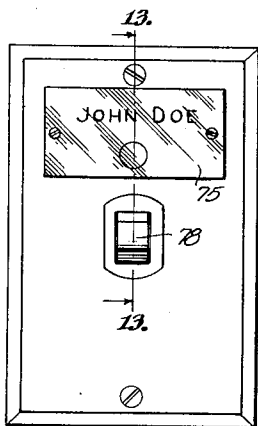


Fig. 12.

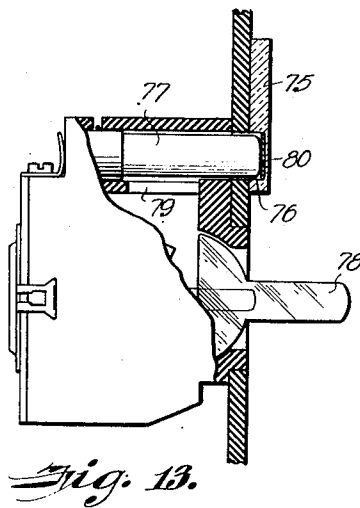


Fig. 13.

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ILLUMINATED TOGGLE SWITCH

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Application August 14, 1947, Serial No. 768,587

13 Claims. (Cl. 200—167)

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The present invention relates in general to electrical switches and it deals more particularly with toggle switches of the type mounting flush with the wall and having an operating lever or handle projecting outwardly therefrom for the purpose of turning the switch on or off.

An important object of the invention is to provide an improved arrangement for artificially illuminating the exposed part of the operating lever or handle so that no difficulty will be experienced in locating same in the dark. I am aware that in the past miniature electric lamps have been placed within the movable operating handle itself in some cases for this purpose, but such arrangements are expensive, complicated and subject to early failure due to the mechanical difficulty of supplying energizing current to the movable light. Moreover, being exposed to the direct view, lamps thus mounted give a harsh light and because of their general unattractiveness are not acceptable from a decorative standpoint in many places.

Broadly speaking, it is the object of the present invention to provide a toggle switch which is free of all of these shortcomings, the operating handle being attractively lighted from a source which is inconspicuous and which nowise interferes with or complicates the switch mechanism. To this end an operating lever or handle of light-conducting material is employed together with a diminutive lamp stationarily mounted within the switch housing adjacent the rear of the handle but out of the direct line of view whereby light permeates the movable handle by transillumination.

According to one feature of the invention the handle may be transparent, translucent or it may have embedded or distributed therein material which is adapted to fluoresce under the influence of the lamp.

Another feature resides in the manner of locating the lamp whereby it is most favorably positioned for illuminating the handle when the latter is in "off" or circuit-opening position.

A further object of the invention is to provide an arrangement facilitating replacement of the lamp employed to illuminate a toggle switch handle from the rear.

Another object is to provide a lamp for not only illuminating a movable toggle switch han-

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dle from the rear but also illuminating a stationary target or name plate bearing a printed legend or other indicia. Another feature resides in the manner in which such a name plate is edge lighted.

Still another object is to provide a single source of light for illuminating the toggle switch handle and also casting a beam of light in any desired direction in respect thereto. A further feature resides in the provision of circuit means for altering the intensity of the light.

Other objects and features will appear in the course of the following description of the invention.

In the accompanying drawings which form a part of the specification and are to be read in conjunction therewith and in which like reference numerals are employed to indicate like parts of the various views,

Fig. 1 is a front elevation of a preferred embodiment of my toggle switch together with the escutcheon or switch plate associated therewith, showing the assembly as it appears when mounted on the wall,

Fig. 2 is a side elevation of the toggle switch unit properly drawn to a larger scale,

Fig. 3 is a front elevation of the toggle switch unit,

Fig. 4 is a cross sectional view taken substantially along the line 4—4 of Fig. 3 in the direction of the arrows,

Fig. 5 is a front elevation of a gang of switches employing an alternative form of construction,

Fig. 6 is a side elevation of one of the switches in Fig. 5 and the associated mounting plate,

Fig. 7 is an enlarged cross section taken along the line 7—7 of Fig. 5 in the direction of the arrows,

Fig. 8 is a fragmentary cross section taken along the line 8—8 of Fig. 7 in the direction of the arrows,

Fig. 9 is a front elevation of another alternative form of switch structure,

Fig. 10 is an enlarged cross section taken along the line 10—10 of Fig. 9 in the direction of the arrows,

Fig. 11 is a schematic diagram of a circuit employing the switch of Figs. 9 and 10,

Fig. 12 is a front elevation of still another switch structure embodying the invention, and

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Fig. 13 is an enlarged fragmentary cross section taken along the line 13—13 of Fig. 12.

Referring first to Figs. 2, 3 and 4, these illustrate a toggle switch unit of the type having an operating handle or lever 15 extending outwardly through an aperture 16 in the front of a housing 17. The handle is adapted to pivot about a horizontal axis located inside the housing whereby it can be displaced manually from the position illustrated in Fig. 4 to the position indicated by dotted lines, or vice versa.

On the rear of the housing is a removable cover 18 normally held in place by a dished plate 19 having ears 20 bent forward in such a way as to lock in recesses 21 formed in opposite side walls of the housing. Both the cover and the housing proper are formed of opaque insulating material and a pair of notches 22 are provided in the latter to facilitate mounting the switch on a suitable support, the specific mounting arrangement and cover holding device being of no consequence, however, in so far as the present invention is concerned.

Inside the housing there are two stationary contacts 23 and 24 each comprising a pair of spring members engaging opposite faces of an insulating wafer 25. The upper contact is carried by a terminal 26 and the lower contact by terminal 27, each terminal having a screw 28 by means of which the external circuit of the switch is connected to that terminal. Wafer 25 carries a metallic strip 29 adapted to occupy the position shown when handle 15 is down; when the handle is moved up to its dotted position, however, the wafer turns in a clockwise direction about pivot 31 in order to bring the opposite ends of strip 29 under the stationary wiping contacts 23 and 24 respectively and thus completes a circuit between terminals 26 and 27. The mechanism by which this is done forms no part of the present invention and hence has not been shown in detail. As conventional, it comprises a snap-acting, over-center toggle linkage between lever 15 and wafer 25 such that the wafer remains stationary during approximately the first half of the lever's movement in either direction and then snaps very rapidly to its opposite position as the lever passes dead center.

Above the switch mechanism in the housing is a diminutive lamp 32 which may be of the incandescent filament type but preferably is of the type filled with a gas (such as neon) adapted to glow gently when ionized by the potential connected to its terminals. The lamp is disposed crosswise of the housing with its base in a hole 33 in one side wall thereof. It will be observed that this side wall is made thicker than the opposite wall and it contains grooves or channels 34 and 35 extending from hole 33 to terminals 26 and 27 respectively. One terminal of lamp 32 is connected to switch terminal 26 by means of a pigtail wire disposed in the upper groove; in the lower groove is a resistor 36, one end of which is connected to switch terminal 27 and the other end of which is connected to the second terminal of the lamp. After the parts have been thus connected, the grooves preferably are filled with sealing wax or other suitable insulating material.

From the above it will be clear that lamp 32 and resistor 36 are connected in series between switch terminals 26 and 27 whereby the lamp will glow when the switch is open (i. e., as shown in Fig. 4) due to the potential connected to the switch terminals over the external switch circuit. Should this potential be removed, for example

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due to a fault or failure of equipment in the external circuit, the lamp will be extinguished and hence given warning of the trouble.

Handle 15 may be made of clear or colored transparent material so that the light impinging upon its rear portion will proceed through the body of the handle to the forwardmost extremity thereof. Alternatively, the handle may be translucent or it may have molded therein a material which fluoresces under the influence of the ultraviolet rays emitted by lamp 32 along with visible light (assuming the lamp to be of the ionized gas type). In any of these cases when the switch is mounted for use with a conventional opaque switch plate or escutcheon 38 as shown in Fig. 1 the lighted operating handle makes it possible to locate the switch easily in the darkest room for purposes of closing the switch. When the switch is closed the external circuit will be rendered operative by virtue of contacts 26 and 27 being bridged by metallic strip 29; this strip also serves under these circumstances to short circuit resistor 36 and lamp 32 so that lamp 32 is extinguished.

By positioning lamp 32 as shown it has been found virtually impossible to see the lamp itself from the front of the switch even when a clear transparent handle is employed; nevertheless due to the transilluminative effect achieved by thus positioning the lamp with respect to the handle the glow of the handle may be seen easily from all directions. If desired, all or any selected area of the protruding portion of the handle may be etched or sandblasted to enhance its light-gathering characteristic or to obtain special decorative effects.

Turning to Figs. 5 to 8, inclusive, the switch unit shown therein is essentially like the one already described except for the manner in which the handle-illuminating lamp is arranged.

Above the switch housing proper and preferably integral therewith is a generally tubular auxiliary housing 40 adapted to receive the lamp 41. The forward end of the auxiliary housing is threaded to receive a cap 42 and over the rear end of the housing is contact spring 43 against which the lamp's central terminal is urged when the cap is in place. The latter contact spring connects to the upper switch terminal 44 as shown. The other lamp terminal is an annular collar 45 which is engaged both top and bottom by a contact spring 46 as best seen in Figs. 7 and 8. Spring 46 in turn is connected to the upper end of a resistor 47 disposed in groove 48, the other end of the resistor being connected to the lower switch terminal 49.

Thus lamp 41 and resistor 47 are connected in series between the two switch terminals, and they function circuitwise in the same fashion as the arrangement shown in Figs. 1 to 4, which is to say that the lamp will be lighted when switch handle 50 is in the position shown. Under such circumstances the light passes downwardly through the aperture 51 illuminating the switch handle as hereinbefore described.

Although somewhat more expensive to manufacture the arrangement of Figs. 5 to 8 has certain advantages over the structure of Figs. 1 to 4. In the first place the lamp 41 may easily and quickly be replaced when it burns out simply by unscrewing cap 42 to permit withdrawal of the lamp through the upper aperture in face plate 52. To facilitate screwing and unscrewing cap 42 it may be provided as shown with a slot adapted to receive a screw-driver or the edge of

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a coin; alternatively, the slot may be omitted and the cap provided with a knurled rim to permit it to be gripped easily.

If desired cap 42 may be of opaque material matching switch plate 52 but preferably it is molded of transparent or translucent material bearing a letter, legend or other characterizing mark identifying the circuit controlled by the associated switch. This is particularly useful where several switches are mounted together in a gang arrangement as illustrated in Fig. 5.

Turning now to Figs. 9 and 10, these show a handle-lighting lamp 55 mounted in a lamp housing 56 similar to the one just described. Instead of a screw-on cap for the front of the housing, however, there is provided a rotatable cylindrical lens 57 held in place by a ring 58 occupying registering opposed annular grooves in the lens and housing. The projecting forward portion of the lens has a flat surface 59 parallel to the axis of rotation of the lens and an inclined prismatic surface 60 serving to reflect the light from the lamp 55 through surface 59 as indicated by the arrows in Fig. 10. An identifying mark or legend engraved or etched either on the reflecting surface 60 or the transmitting surface 59 will be plainly visible from above when lens 57 occupies the position shown, or from one side of the switch if the lens is rotated 90° about its axis. Regardless of the position of the lens, light shining downwardly through aperture 61 will illuminate handle 62 as previously described.

The switch shown in Fig. 10 is a single-pole, double-throw switch having a neutral intermediate position and it is intended for the control of, say, an audible signal such as a door bell or buzzer. It has three stationary contacts 63, 64, and 65 and a movable contact 66 adapted to pivot at 67 as handle 62 is moved up or down. Bridging member 68 on the movable contact connects the center contact 64 to the upper contact 63 when the handle is pushed down and connects the center contact to the lower contact 65 when the handle is pushed up. Springs 69 restore the movable contact to the neutral center position when pressure is removed from handle 62.

The preferred door buzzer and lamp circuit is shown schematically in Fig. 11. Assuming the switch to be in its center position as shown, it will be seen that alternating current passing through the step-down transformer 70 will energize the series circuit comprising the secondary winding of the transformer, buzzer 71, lamp 55 and resistor 72. The total resistance in this circuit is such as to maintain the current at a comparatively low value whereby buzzer 71 will not operate but lamp 55 will glow gently. Thus the handle 62 of the switch and the prism 57 will be illuminated. If the handle now is depressed, bridging member 68 will short circuit resistor 72 and lamp 55 and hence connect full voltage of the transformer secondary winding to the buzzer rendering the latter operative. On the other hand, if the handle is raised, bridging member 68 will short circuit a portion of resistor 72 thus increasing the current through lamp 55 and buzzer 71, but not enough to render the buzzer operative.

This increase in current increases the intensity of light given off by lamp 55 which naturally increases the illumination of the switch handle and prism 57. More important, the light reflected by the prism under these cir-

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cumstances forms a directed beam capable of brightly illuminating nearby objects such, for example, as a keyhole 74 disposed in the vicinity of the buzzer switch. The keyhole may be on either side or above the switch, it only being necessary to turn the prism about its axis in order to direct the beam in the proper direction.

Another modification employing the same basic form of switch mechanism is shown in Figs. 12 and 13. In this structure a transparent name plate 75 is fastened to the front switch plate so that the recess 76 in the rear of the name plate receives the tip of lamp 77. Lamp 77, therefore, not only illuminates the switch handle 78 through aperture 79 but also transmits its light throughout the body of the name plate. An opaque coating or insert 80 is placed in recess 76 opposite the end of the lamp to hide the lamp from direct view, the illumination of the name plate being solely the result of light passing from the lamp radial to its axis into the plate through the circumferential edge of recess 76. A name, legend or decorative design engraved or etched on the plate will catch the light thus transmitted and stand out prominently in an easily visible and attractive manner.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinbefore set forth together with other advantages which are obvious and which are inherent to the apparatus.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

Inasmuch as many possible embodiments of the invention may be made without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. A toggle switch for opening and closing electrical circuits, comprising an opaque housing having top, bottom and side walls completely enclosing the space within the housing, a switch-operating lever mounted to pivot about an axis inside the housing, the free end of said lever projecting through an aperture in one wall of the housing, means for artificially illuminating the entire interior of said housing and the inner end of said lever, said means comprising an elongated lamp fixedly mounted in the housing with its axis parallel to the axis about which said lever pivots, said lamp being offset laterally from said lever and positioned beside said aperture substantially against the inside of said one wall, and said lever being of light-transmitting material whereby the light from said lamp passes therethrough and is visible outside said housing.

2. A toggle switch for opening and closing electrical circuits, comprising an opaque housing, a switch-operating lever mounted to pivot about an axis inside the housing, the free end of said lever projecting through an aperture in one wall of the housing, a second aperture in said one wall of the housing, said housing including a stationary socket behind said second aperture, an electric lamp removably mounted in the socket and adapted to shine on the part of said lever inside the housing, said lever being of light-transmitting material whereby the light from said lamp reaches outside the housing, and a removable closure for said second aperture.

3. A toggle switch as in claim 2 wherein said removable closure is a light-transmitting body with indicia thereon.

4. A switch as in claim 2 wherein said removable closure comprises a transparent plate having a recess in one face adapted to receive a portion of the electric lamp, an opaque shield in the bottom of the recess whereby light passes into the plate only through the side walls of the recess.

5. A toggle switch for opening and closing electrical circuits, comprising a switch housing, a switch-operating lever mounted to pivot about an axis inside the housing, the free end of said lever projecting through an aperture in one wall of the housing, a second aperture in said one wall of the housing, said housing including a stationary socket behind said second aperture, an electric lamp removably mounted in the socket and adapted to shine on the part of said lever inside the housing, said lever being of light-transmitting material whereby the light from said lamp reaches outside the housing, and a rotatable closure for said aperture, said closure comprising a prism having one face parallel to the axis of rotation of the closure and another face oblique to said axis.

6. A toggle switch for opening and closing electrical circuits, comprising a switch housing, a switch-operating lever mounted to pivot about an axis inside the housing, the free end of said lever projecting through an aperture in one wall of the housing, a tubular lamp housing adjacent the switch housing with its axis transverse to the axis about which said lever pivots, an elongated lamp in the lamp housing, a contact spring over one end of the lamp housing engaging the end of the lamp and a removable closure over the other end of the housing engaging the opposite end of the lamp, an aperture between the two housings through which light from said lamp is adapted to shine on the part of said lever inside the switch housing, said lever being of light-transmitting material whereby light from said lamp reaches outside the housing.

7. A toggle switch for opening and closing electrical circuits comprising an opaque housing having front and side walls, a switch operating lever mounted to pivot about an axis inside the housing, the free end of said lever projecting through an aperture in the front wall in the housing, an elongated tubular lamp projecting into said housing through an aperture in one side wall of the housing, said last aperture closely encircling the lamp whereby the lamp is supported in and by said one side wall, said last aperture being so positioned in the side wall that the portion of the lamp inside the housing is disposed beside the aperture in the front wall and substantially against the inside of the front wall of the housing, and said lever being of light transmitting material whereby the light from said lamp passes through the lever to the free end thereof.

8. A toggle switch for opening and closing electrical circuits comprising an opaque housing having front and side walls, a switch operating lever mounted to pivot about an axis inside the housing, the free end of said lever projecting through an aperture in the front wall in the housing, an elongated tubular lamp projecting into said housing through an aperture in one side wall of the housing, said one side wall being of appreciable thickness and said aperture therein conforming closely in size to the cross section of said lamp thereby to prevent canting of the lamp, pigtail

terminals on the lamp outside the housing and anchored to the housing to prevent axial movement of the lamp in said last aperture, said last aperture being so positioned in the side wall that the portion of the lamp within the housing is disposed beside the aperture in the front wall and substantially against the inside of the front wall of the housing, and said operating lever being of light transmitting material whereby the light from said lamp passes through the lever to the free end thereof.

9. A toggle switch for opening and closing electrical circuits comprising an opaque housing, a switch operating lever mounted to pivot about an axis inside said housing, the free end of the lever projecting through an aperture in one wall of the housing, the wall of said housing containing a window spaced from said aperture, said lever being of light transmitting material, and an electric lamp within the housing positioned to transmit light through both said window and said lever.

10. A toggle switch for opening and closing electrical circuits comprising an opaque housing, a switch operating lever mounted to pivot about an axis inside said housing, the free end of the lever projecting through an aperture in one wall of the housing, the wall of said housing containing a second aperture, a rotatable closure for said second aperture, said closure comprising a prism having one face parallel to the axis of rotation of the closure and another face oblique to said axis, said lever being of light transmitting material, and an electric lamp within said housing positioned to transmit light through both of said apertures.

11. A toggle switch for opening and closing electrical circuits comprising an opaque housing, a switch operating lever mounted to pivot about an axis inside said housing, the free end of the lever projecting through an aperture in one wall of the housing, said wall containing a second aperture, an electric lamp within the housing and having a portion thereof projecting a short distance through said second aperture, a transparent plate covering said second aperture and having a shallow recess in the inner face thereof to receive the projecting portion of the lamp, an opaque shield in the bottom of the recess whereby light passes from said lamp into the plate only through the side walls of the recess, and said lever being of light transmitting material effective to conduct light from said lamp through said first aperture.

12. A toggle switch for opening and closing electrical circuits, comprising a one piece opaque housing with an integral partition dividing the interior thereof into a switch compartment and an adjoining lamp compartment, said housing having an opening between the two compartments, a switch operating lever mounted to pivot about an axis inside the switch compartment, the free end of the lever projecting through an aperture in the outer wall of the housing, an electric lamp mounted in said lamp compartment and adapted to shine through the opening between the compartments onto the part of said lever inside the switch compartment, said lever being of light transmitting material whereby it conducts light through said aperture to the free end of the lever.

13. A toggle switch for opening and closing electrical circuits, comprising a one piece opaque housing with an integral partition dividing the

interior thereof into a switch compartment and an adjoining lamp compartment, said housing having an opening between the two compartments, a switch operating lever mounted to pivot about an axis inside the switch compartment, the free end of said lever projecting through an aperture in the outer wall of the housing, an elongated electric lamp mounted in said lamp compartment and adapted to shine through the opening between the compartments onto the part of said lever inside the switch compartment, the axis of said lamp being transverse to the pivotal axis of said lever and spaced laterally therefrom, said lever being of light transmitting material whereby it conducts light through said aperture to the free end of the lever.

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