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ELECTRIC SWITCH WITH ELECTRO LUMINESCENT SIGNAL

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Fig. 1

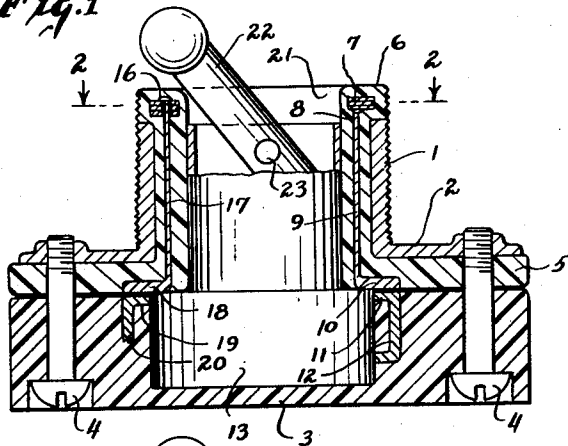


Fig. 2

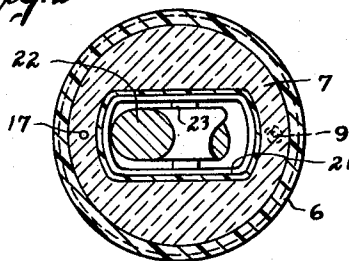


Fig. 3

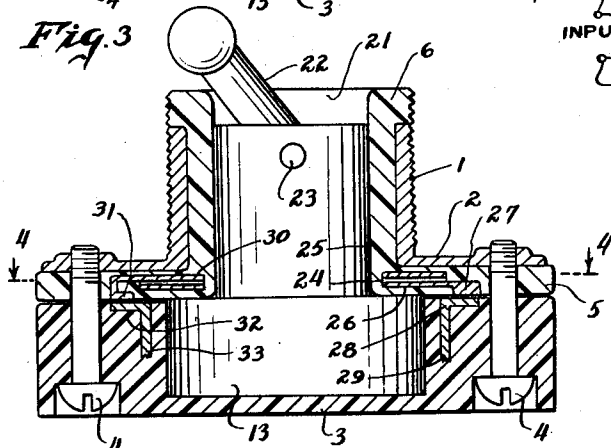


Fig. 5

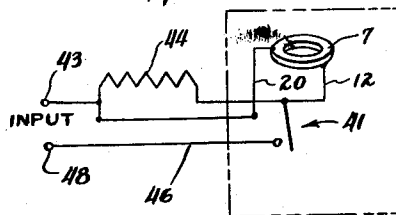


Fig. 6

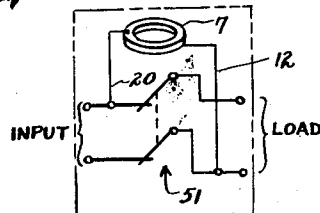


Fig. 4

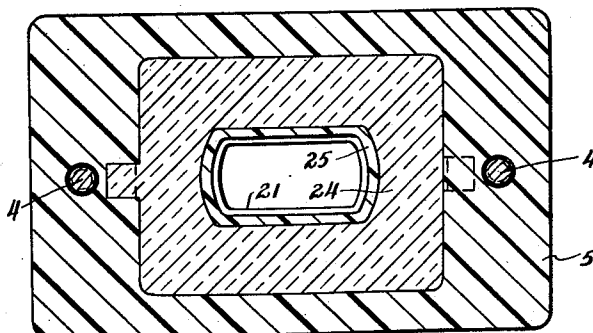
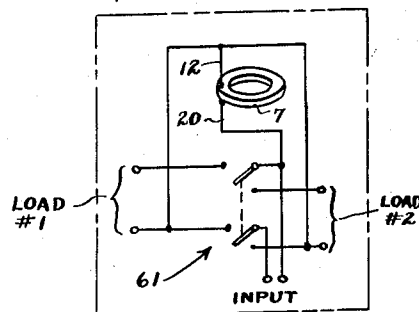


Fig. 7



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ELECTRIC SWITCH WITH ELECTRO LUMINESCENT SIGNAL

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8 Claims. (Cl. 200—167)

This invention relates to electric switches having luminous signal means for indicating the position of the switch. The invention is concerned more especially with electric switches in which the signal is produced by an electroluminescent element.

It is advantageous to have light signals for indicating the position of electric switches and the common practice has been to have small filament lamps as signal means. Such signals are in addition to the switch and with simple switches these signals require extra openings in the mounting panels and provisions for changing the bulbs. The providing of the signal makes the equipment more bulky and increases the cost. It is also subject to the serious disadvantage that small filament lamps have short life, and the burning out of the filament causes the lamp to be extinguished and inaccurate information is conveyed. Neon or other gas filled lamps have the disadvantage of being very bulky.

It is an object of this invention to provide an illuminated signal for a switch with a much more compact construction than has heretofore been possible. Another object of the invention is to provide a switch in which a luminous signal is produced by electroluminescence of a portion of the switch.

Another object of the invention is to provide a switch construction having an electroluminescent wafer or element which is built into the switch and which has a relatively long life, is not damaged by shock, and which is molded into a plastic part of the switch so as to be free from the influence of humidity.

In the preferred construction of the invention, the electroluminescent element is combined with the mounting sleeve of a toggle switch. More especially the mounting sleeve is lined with transparent plastic and the electroluminescent element is imbedded in the front end of the plastic where it is easily visible from in front of the mounting panel, or the electroluminescent element is imbedded in an inner portion of the plastic and light from the electroluminescent element is piped to the front of the mounting sleeve through the plastic which is transparent.

Other objects, features and advantages of the invention will appear or be pointed out as the description proceeds.

In the drawing, forming a part hereof, in which like reference characters indicate corresponding parts in all the views:

Figure 1 is a sectional view, partly diagrammatic, showing a toggle switch equipped with an electroluminescent signal in accordance with this invention;

Figure 2 is a sectional view on the line 2—2 of Figure 1;

Figure 3 is a sectional view, similar to Figure 1, but showing a modified form of the invention;

Figure 4 is a sectional view taken on the line 4—4 of Figure 3;

Figure 5 is a wiring diagram for the invention with a single pole, single throw switch;

Figure 6 is a wiring diagram for the invention when

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connected with a double pole, single throw switch; and

Figure 7 is a wiring diagram for the invention when used with a double pole, double throw switch.

The switch shown in Figure 1 includes a threaded mounting sleeve 1 having a flange 2 at its inner end. This mounting sleeve and its flange are preferably made of metal and are part of the front portion of the switch housing. They are connected to a rearward portion 3 of the switch housing by piling screws 4. The rearward portion 3 of the housing is preferably made of transparent plastic material; the term "transparent" being used herein in a broad sense to indicate material through which light passes even through not water clear. A plastic lining 5 covers the inside of the mounting sleeve 1 and the back of the flange 2; and this plastic lining extends beyond the forward end of the mounting sleeve 1 and has a bead 6 projecting across the front end face of the mounting sleeve. The threads on the outside of the mounting sleeve 1 continue along the outside surface of the bead 6.

An electroluminescent element 7 is imbedded in the bead 6. This electroluminescent element 7 is here shown as a laminated wafer and it is surrounded by the plastic of the bead 6, the structure being made by molding the plastic around the electroluminescent element 7. The plastic of the bead 6 is preferably transparent, or at least translucent, and the plastic in front of the electroluminescent element 7 serves as a window through which the glow of the electroluminescent element 7 is visible.

The electroluminescent element 7 has a rearward conducting surface 8 which is electrically connected by a conductor 9 to a contact 10 at the rearward surface of the plastic lining 5. This contact 10 is exposed and is preferably flush with the plastic surface which surrounds it. The conductor 9 and the contact 10 are imbedded in the plastic lining 5 with only this flush surface of the contact 10 exposed to the air.

There is a contact 11 in the front surface of the rearward portion 3 of the housing; and this contact 11 is in position to register with and touch the contact 10 when the parts of the switch are in assembled relation as shown in Figure 1. A conductor 12 leads from the contact 11 to the circuit of the switch. The actual connections depend upon the type of switch as will be explained in connection with Figures 5, 6 and 7; but for the present it is sufficient to understand that the contact terminals and the operating mechanism for the switch are enclosed in an inner switch housing 13.

The electroluminescent element 7 has a front conducting surface 16 connected to a conductor 17 which leads to a contact 18 in the rearward surface of the lining 5. The conductor 17 and contact 18 correspond to the conductor 9 and contact 10, but are for the other side of the circuit. The contact 18 touches a contact 19 on the front surface of the rearward portion 3 of the switch housing; and this contact 19 is connected by a conductor 20 with the electric circuit of the switch in accordance with the wiring diagrams in Figures 5, 6 and 7, or other wiring diagrams, depending upon the conditions under which the switch is to be used.

In all of the circuits the conductors 12 and 20 are connected so that voltage is applied to the electroluminescent element 10, when the switch is in one position, to cause the electroluminescent element to glow and operate as a signal lamp.

Figure 2 is a sectional view through the bead 6 and the electroluminescent element 7; and this view brings out the substantial area of the electroluminescent element 7 when viewed from the front. This substantial area is made possible by having a slot 21 which is relatively narrow but wide enough and long enough to accommodate

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a switch operating arm 22 which swings on a pivot pin 23 located relatively close to the upper end of the mounting sleeve 1.

Figures 3 and 4 show a modified construction employing an electroluminescent element 24 which is molded into the base or rearward portion of a transparent plastic liner 25. The electroluminescent element 24 is completely imbedded in the plastic liner 25, but it is in a more protected position than in the construction shown in Figure 1. Even if the bead 6 is damaged in the switch illustrated in Figures 4 and 3, no damage is done to the electroluminescent element 24 and the electroluminescent element 24 cannot be exposed as a result of breaking of the bead 6.

Even if the plastic liner 25 is not sufficiently transparent to enable one to see the electroluminescent element 24 through the substantial length of plastic in front of it, the illumination from the electroluminescent element 24 passes through the plastic liner 25 and is in effect piped to the front face of the bead 6. If desired, plastic material which is not transparent, but is translucent, can be used for the liner 5 in Figure 1 or the liner 25 in Figure 3, provided that the material is such that it will pipe the light to the end face of the liner; but in the preferred construction a transparent plastic is used.

In the construction shown in Figure 3, the electroluminescent element 24 preferably has a conducting bottom layer 26 which is transparent, and also a transparent top layer 30. The bottom layer 26 is connected electrically with a contact 27 exposed at the rearward face of liner 25. This contact 27 touches a complementary contact 28 exposed at the front face of the rearward portion 3 of the switch housing, and there is a conductor 29 leading from the contact 28 to the switch circuit within the inner switch housing 13, or to other locations of the switch circuit in accordance with the wiring diagram for the switch.

The top layer 30 of the electroluminescent element 24 is electrically connected with a contact 31 exposed at the rearward face of the liner 25 in position to touch a complementary contact 32 exposed at the front face of the rearward portion 3 of the housing, and there is a conductor 33 for connecting the contact 32 with the switch circuit.

Figure 4 is a sectional view through the electroluminescent element 24, and shows the extent of the glowing area of the electroluminescent element, and the slot 21 through which the switch arm 22 extends.

Figure 5 shows the electroluminescent element 7 connected in the circuit with a single pole, single throw switch 41. The conductors connecting the electroluminescent element 7 to the circuit are indicated by the reference characters 12 and 20, these being the most rearward conductors in Figure 1, and the intermediate conducting elements are omitted for clearer illustration in the wiring diagram.

The switch 41 controls the flow of current from a terminal 43 through a load 44 and back through a conductor 46 to a terminal 48. The switch 41 is connected in series with the load 44. The conductor 12 is connected to the pole of the switch 41. In order to obtain the necessary voltage for causing the electroluminescent element 7 to glow, it is necessary that the other conductor 20 be connected to the side of the load 44 opposite to that to which the switch 41 is connected. Thus with a single pole, single throw switch, as illustrated in the wiring diagram in Figure 5, it is necessary for the electroluminescent element 7 to be connected into the circuit at a location outside of the switch housing. This is not necessary, however, in the case of double pole switches, as illustrated in Figures 6 and 7.

Figure 6 shows the electroluminescent element 7 connected by the conductor 12 to one side of the circuit on the load side of a double pole, single throw switch 51. The other conductor 20 from the electrolumines-

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cent element 7 is connected to the opposite line of the circuit and on the input side of the switch 51. From this wiring diagram in Figure 6, it will be apparent that the circuit to the electroluminescent element 7 is broken when the switch 51 is open; and that the electroluminescent element 7 is connected in parallel with the load when the switch 51 is closed.

Figure 7 shows a wiring diagram for connecting the electroluminescent element 7 in the circuit of a double pole, double throw switch 61. The conductor 12 is connected to one side of the circuit on the input side of the switch 61; and the other conductor 20 from the electroluminescent element 7 is connected to the other side of the circuit on both of the load sides of the switch 61. Thus the circuit to the electroluminescent element 7 is open whenever the switch 61 is open; and the electroluminescent element 7 is connected in parallel with either of the loads to which the switch supplies power in accordance with the side toward which the switch is closed.

The wiring diagrams of Figures 5, 6 and 7 have been described as connected with the switch shown in Figure 1; but it will be apparent that the switch illustrated in Figure 3 can be connected in accordance with these same wiring diagrams of Figures 5, 6 and 7.

The preferred embodiments of the invention have been illustrated and described, but changes and modifications can be made, and some features can be used in different combinations without departing from the invention as defined in the claims.

What is claimed is:

1. An electric switch including a housing, terminals for connecting the switch in an electric circuit, an electroluminescent element carried by the housing, electrical conductors connecting the electroluminescent element in the same electric circuit with the switch and in parallel with a load in the electric circuit, at least one of said conductors being in series with the switch whereby operation of the switch opens the circuit of the electroluminescent element.

2. An electric switch having a housing, a switch operating handle projecting from a front of the housing, an electroluminescent element carried by the housing in position to be visible at the front of the housing through which the handle extends, electrical conductors connecting the electroluminescent element in the same electric circuit with the switch and in parallel with a load in the electric circuit, at least one of said conductors being in series with the switch whereby operation of the switch opens the circuit of the electroluminescent element.

3. The electric switch described in claim 2 and in which there is a plastic window located at the front of the housing and through which the electroluminescent element is visible.

4. The electric switch described in claim 2 and in which there is a mounting sleeve extending from the front of the housing and there is a transparent plastic sleeve within the mounting sleeve and having an end face at the forward end of the mounting sleeve, the electroluminescent element being imbedded in the transparent plastic sleeve and visible through the end face of the plastic sleeve.

5. The electric switch described in claim 4 and in which the plastic sleeve is a lining for the mounting sleeve, and the electroluminescent element is imbedded in the portion of the plastic sleeve which is at the forward end of the mounting sleeve, and there are conductors from the electroluminescent element extending lengthwise of the plastic sleeve to a switch in the housing.

6. The electric switch described in claim 4 and in which the electroluminescent element is located in the housing and the light from the electroluminescent element is piped to the end of the mounting sleeve through said plastic sleeve, and piped to the rear of said transparent plastic housing.

7. An electric switch including a housing having a

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transparent portion, an electroluminescent element imbedded in said transparent portion, conductors extending from the electroluminescent element through the transparent portion and to the surface of said transparent portion, and other conductors of the switch contacting with the conductors which come to the surface of the transparent portion of the housing for connecting the electroluminescent element in the circuit of the switch, contacts in the switch, one of which is movable toward and from the other to close and open the switch, at least one of the conductors from the electroluminescent element being in series with the switch contacts whereby operation of the switch opens and closes the electric circuit of the electroluminescent element.

8. The electric switch described in claim 7 and in which the switch housing is made in two parts and the trans-

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parent portion is the front part of the housing and has conductors therein leading to contacts located on the back surface of the front part, and there are other contacts on the front surface of the back part of the housing in position to register with and contact with the contacts on the back surface of the front part, when the housing is assembled and fastening means that hold the front and back parts of the housing in assembled relation with one another.

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