

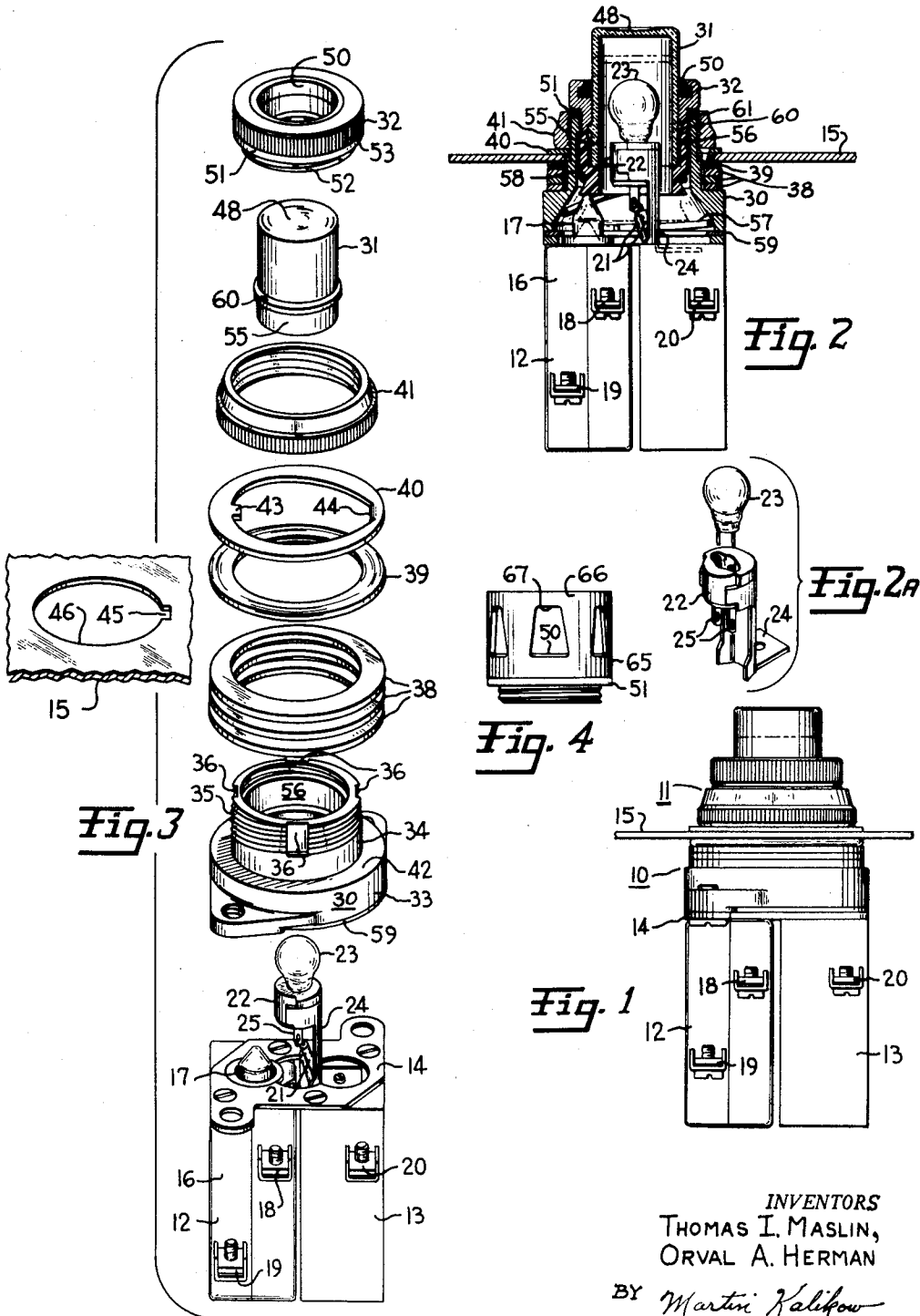
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T. I. MASLIN ET AL

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ILLUMINATED OIL-TIGHT PUSHBUTTON

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INVENTORS
 THOMAS I. MASLIN,
 ORVAL A. HERMAN
 BY *Martin Kalikow*
 ATTORNEY

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ILLUMINATED OIL-TIGHT PUSHBUTTON

Thomas I. Maslin and Orval A. Herman, Bloomington, Ill., assignors to General Electric Company, a corporation of New York

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4 Claims. (Cl. 317—99)

This invention relates to an illuminated pushbutton apparatus for panel mounting and more particularly to industrial illuminated assemblies and switch units having provision for preventing the leakage of oil through the pushbutton assembly or its mounting.

In a co-pending application Serial No. 670,681, filed July 9, 1957, and assigned to the same assignee as the present application, an illuminated oil-tight pushbutton switch unit is disclosed in which a lamp is fixedly mounted on a transformer fastened to the rear of the pushbutton assembly and the lamp extends within a hollow reciprocating light-transmitting pushbutton actuating member. The present invention is an improvement over the pushbutton assembly disclosed in this co-pending patent application Serial No. 670,681.

While the pushbutton apparatus disclosed in this co-pending application solved many of the major problems involved in prior type illuminated pushbuttons, it was found that several inconveniences and troubles still remained in the use of the disclosed apparatus. For example, since one of the oil seals for the reciprocating portion of the pushbutton was located below the operating spring, it was found possible for dirt and oil to accumulate around the spring and impede its proper functioning. Since the pushbutton assembly was formed in two parts screwed together, it was possible for repeated operation of the button to loosen the connection and permit oil leakage. The pushbutton assembly also extended an undesirably great distance beyond the panel to which it was mounted whereby the light-transmitting end of the pushbutton could be easily struck and broken. Moreover, it was found that the use of commercially available transformers made the entire apparatus rather unwieldy and bulky.

Accordingly, one of the objects of the present invention is to provide an illuminated oil-tight pushbutton assembly and switch unit of smaller over-all size in which the lamp may be easily replaced and in which the oil seals are located so that they remain tight during operation and prevent dirt and oil from reaching the interior of the pushbutton assembly or its operating spring.

Another object of the invention is to provide a transformer construction for an illuminated pushbutton apparatus or switch unit which may be mounted closely alongside an electric switch and interchanged or replaced by a similar switch.

A further object of the invention is to provide illuminated oil-tight pushbutton apparatus which may be easily modified to include a shield or guard around the projecting light-transmitting end of the pushbutton actuating member.

In general, in accord with the invention both the stationary and wiping seals of the pushbutton assembly itself are located close to the forward end of the pushbutton assembly thereby permitting the portion of the pushbutton assembly beyond the front panel to be foreshortened and simultaneously protecting all of the moving parts of the pushbutton including the operating spring from exposure

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to dirt or oil leakage. The wipe seal is carried by an annular guide member which surrounds the side wall of the cylindrical light-transmitting pushbutton actuating member and serves also to guide that member in its reciprocating motion while being removable from the base of the pushbutton assembly to permit access to the internal lamp without disturbing the mounting of the pushbutton assembly upon its supporting panel.

In accord with a further feature of the invention, an electric switch and a transformer are mounted alongside one another on the rear of the pushbutton assembly and the transformer is constructed to have the same size and rectangular configuration as the electric switch so as to be interchangeable with the switch, forming together with the switch a generally rectangular block whose cross-sectional area is approximately the same as that of the pushbutton assembly to which it is mounted. In this way a self-contained illuminated pushbutton switch unit is provided having an unusually small size and compact arrangement.

In a modification of the invention the annular guide member surrounding the upper portion of the light-transmitting pushbutton is also constructed to serve as a light-transmitting guard against accidental operation of the pushbutton or breakage of the projecting pushbutton end.

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, together with further objects and advantages thereof, may be easily understood by referring to the following description taken in connection with the accompanying drawing in which:

Figure 1 is a side elevation view of pushbutton apparatus or switch unit embodying one form of the invention;

Figure 2 is a similar view showing the details of the pushbutton apparatus in cross-section;

Figure 2A is a detail view of the lamp and lamp socket of the apparatus of Figure 1;

Figure 3 is an exploded perspective view of the pushbutton apparatus of Figure 1, and

Figure 4 is a side elevation view of a pushbutton guard member which may be used in connection with the apparatus of Figure 1.

Referring to Figure 1, the invention is shown in one form as comprising an illuminated pushbutton apparatus 10 including a pushbutton assembly 11 to the rear of which is attached an electric switch 12 and a transformer 13. A mounting base or plate 14 at the rear of pushbutton assembly 11 serves to hold these three components in assembled relation to one another. Alternatively, plate 14 may be fastened to the rear of switch 12 and transformer 13 and then assembled to the rear surface of an enclosure with the front cover being used to support and position assembly 11 for proper operation of switch 12. The pushbutton apparatus 10 when in use is mounted on a panel 15 in a manner to be described.

As shown in Figures 2 and 3, switch 12 is of the type described in U.S. Patent 2,712,580 with a rectangular housing 16 and a depressible operating member 17 extending through the top of housing 16. Switch 12 has two pairs of terminals 18, 19 extending from opposite sides thereof, the upper terminals being normally bridged when the operating member 17 is elevated and the lower pair of terminals 19 being bridged when the operating member 17 is depressed.

Transformer 13 is preferably also rectangular, as shown, with a pair of primary winding terminals 20 extending from opposite sides thereof and a pair of secondary winding leads 21 extending through the top thereof. The laminations and coils of transformer 13 are preferably embedded in any suitable insulating molded plastic compound such as one kind now gen-

erally known as "Permafil." Transformer 13 also carries a lamp socket 22 and a lamp 23 on a bracket 24 fastened to the top of transformer 13. Lamp 23 is preferably of the pin base type which merely plugs into a pin-receiving socket 22, as shown in Figure 2A. Bracket 24 also provides a shock type mounting for lamp socket 22 thereby reducing breakage of lamps due to vibration. The secondary winding leads 21 are fastened to the terminals 25 of lamp socket 22. Switch 12 and transformer 13 have approximately the same width, each approximately one-half the diameter of the base of the pushbutton assembly 11 to which they are fastened. Switch 12 and transformer 13 thus form a rectangular block whose cross-sectional area is approximately the same as that of the base of the pushbutton assembly 11.

Pushbutton assembly 11 is hollow and open at the bottom and the lamp assembly 22, 23 and the switch operating member 17 extend within the interior of the switch assembly 11 through its open bottom.

The principal components of the pushbutton assembly comprise a cylindrical pushbutton base member 30, clamping means for fastening the assembly to the supporting panel 15, a slidable two-part pushbutton actuating member 31, 56, the outer part 31 being of light-transmitting construction and means for guiding the reciprocating movement of actuating members 31, 56 and for sealing the assembly against oil leakage. Base member 30 comprises a hollow cylindrical base portion 33 and an upper reduced diameter neck portion 34 threaded on both the inner and outer cylindrical surfaces of its upper end. Four rectangular recesses 36 angularly displaced 90° from one another are formed in the outer cylindrical surface of neck portion 34 traversing the outer threads 35 thereof. These recesses aid in the prevention of rotation of the pushbutton assembly when it is fastened down to its supporting panel 15 in a manner to be explained.

The means for fastening the pushbutton assembly 11 to panel 15 comprises a plurality of washers 38, a resilient sealing ring or gasket 39, a retaining or positioning ring 40, and an annular threaded fastening ring or clamping collar 41. Washers 38 and sealing ring 39 are located beneath panel 15 between the panel and a shoulder 42 of base member 30. Retaining ring 40 is located immediately above panel 15 and has diametrically opposed ears 43, 44 extending inwardly a short distance. Ear 43 fits within one of the recesses 36 on the upper end of base member 30. Ear 44, however, is bent downwardly and fits within a key slot 45 extending outwardly from the circumference of an aperture 46 in panel 15 through which the pushbutton assembly is inserted during the mounting operation. Tightening of fastening collar 41 down upon the external threads 35 of base member 30 clamps the washers 38, sealing ring 39 and retaining ring 40 together on opposite sides of the supporting panel 15 thereby sealably to mount the assembly and lock it against rotation thereafter.

Light-transmitting portion 31 of the two part pushbutton actuating member is a hollow cup-shaped cylindrical member open at the bottom and closed at the top. Lamp assembly 22 and 23 extends within the open bottom of this light-transmitting actuating member 31 with the upper end of lamp 23 spaced from the front end 48 of the actuating member 31. Member 31 is supported for sliding reciprocating motion by cylindrical guiding collar 32 threaded to the internal surface of the cylindrical neck portion 34 of base member 30. Annular guide collar 32 carries a resilient wiping seal 50 embedded adjacent its upper end so as to wipe against the outer cylindrical wall of pushbutton actuating member 31. Guide collar 32 also carries a stationary resilient seal or gasket 51 around its lower threaded portion 52. By threading guide member 32 down into base member 30, the sealing ring 51 is clamped between the upper end of base member 30 and the shoulder 53 of the guide

member 32 thereby to tightly seal the two interconnected parts against oil leakage therethrough.

As best seen in Figure 2, the lower end portion 55 of the light-transmitting portion 31 of the pushbutton actuating member engages and fits within a cylindrical actuating sleeve 56 which moves together with pushbutton member 31 to engage and depress or disengage and release the operating member 17 of switch 12. The actuating sleeve 56 is slidably positioned within the pushbutton base member 30. A conical, helical spring 57 is trapped between a ridge 58 on actuating sleeve 56 and a lip 59 fastened to the bottom of collar of base member 30 and serves to bias the actuating sleeve 56 and light-transmitting actuating member 31 toward their normal elevated or outer positions. The outer diameter of actuating sleeve 56 is such as to form a loose fit within the hollow cylindrical base member 30. It will be noted that operating member 17 of switch 12 is located immediately beneath the lower rim of actuating sleeve 56 for engagement thereby and that the internal surface of the base portion 33 of base member 30 is conically tapered outwardly toward the bottom to accommodate the switch operating member 17. The light-transmitting actuator 31 is limited in its outward movement beyond its desired elevated position by an outer ridge 60 formed around the lower portion thereof which hits against an annular shoulder or ridge 61 formed in the lower inner surface of guide collar 32. In addition, outward movement of the actuating sleeve 56 is limited by an internal annular stop shoulder at the upper end of the pushbutton base member 30 (Fig. 2), whereby the guide collar 32 and the light-transmitting actuating member 31 may be removed as a unit without displacement of the actuating sleeve 56.

By this construction a burned out lamp 23 may be easily replaced by merely unscrewing guide collar 32 and then lifting the pushbutton actuating member 31 out of the base member 30 thereby exposing the lamp for replacement. The lamp may be quickly and easily inserted by a simple plug-in motion. It will be observed that the seal 50 wipes against the normally exposed cylindrical walls of the light-transmitting member 31 during operation of the pushbutton thereby tending to keep these walls clean since this seal 50 is located at the upper end of guide member 32. It will further be observed that all of the operating and moving parts of the pushbutton switch are located internal of the switch beyond the oil seals so that they remain free of dirt or oil. A further feature of the construction is that the secondary leads from the transformer are located entirely within the base member 30 of the pushbutton assembly and are therefore protected thereby.

Referring now to Figure 4, there is shown a guarding guide member or guard 65 which may be used in substitution for the guide member 32 where it is desired to protect the exposed end of the light-transmitting pushbutton member 31. Guard 65 is identical to the guide member 32 with the exception that it contains a cylindrical shielding portion 66 which surrounds the upper end of pushbutton member 31 in spaced relation thereto. Shielding portion 66 has apertures 67 formed therein for permitting the passage of light therethrough and also for permitting the escape of oil, dirt and chips. Guard 65 carries the internal wipe seal 50 and the external stationary seal 51 in the same manner as guide member 32 described above.

Although we have described our invention in connection with a specific construction, many modifications may be made. We intend, therefore, by the appended claims to cover all such modifications as fall within the true spirit and scope of the invention.

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

1. An oil tight illuminated pushbutton switch unit comprising an electric switch having a movable operating

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member extending therefrom, a hollow cylindrical pushbutton base member mounted upon said switch with said operating member extending into the bottom of said hollow base member, said base member having an upper portion threaded internally, an annular guiding collar threaded internally into said upper base portion and having an internal guiding surface including a resilient sealing ring, a hollow cylindrical light transmitting pushbutton actuating member reciprocally mounted in said guiding collar in sliding engagement with said sealing ring and extending into said base member to engage and move said switch operating member, said actuating member having on the end within said base member an external annular stop shoulder engaging said guiding collar to limit outward movement of said actuating member, and a lamp socket fixedly mounted within said light transmitting pushbutton actuating member

2. An oil tight illuminated pushbutton switch unit comprising an electric switch having a movable operating member extending therefrom, a hollow cylindrical pushbutton base member mounted upon said switch with said operating member extending into the bottom of said hollow base member, said base member having an upper portion threaded internally, a cylindrical actuating sleeve concentrically and slidably mounted in said base member to engage and move said switch operating member, said internally threaded upper portion of said base member including stop means limiting outward movement of said actuating sleeve, spring means in said base member biasing said sleeve outwardly against said stop means, an annular guiding collar threaded internally into said upper portion of said base member and having an internal guiding surface including a resilient sealing ring, a hollow cylindrical light-transmitting pushbutton actuating member reciprocally mounted in said collar to engage and move said actuating sleeve against its bias and having on its inner end an external annular stop shoulder engaging said guiding collar to limit outward movement of said actuating member, and a lamp socket mounted in said base and extending into said light-transmitting push-button actuating member, said pushbutton actuating member and said guiding collar being removable as a unit to provide access to said lamp socket

3. An oil tight illuminated pushbutton switch unit as claimed in claim 2 in which said light-transmitting pushbutton actuating member includes an external annular shoulder and said guiding collar provides stop means engaging said shoulder to limit outward movement of said pushbutton actuating member.

4. An oil tight illuminated pushbutton switch unit for

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panel mounting comprising an electric switch having a movable operating member extending therefrom, a hollow cylindrical pushbutton base member mounted upon said switch with said operating member extending into the bottom of said hollow base member, said base member having an upper portion of reduced cross section forming a first annular shoulder externally of said base member and said upper portion being threaded internally and providing beneath said threads an internal annular stop shoulder, a cylindrical actuating sleeve concentrically and slidably mounted in said base member to engage and move said switch operating member, spring means in said base member biasing said sleeve outwardly against said internal stop shoulder, an external clamping collar threadedly mounted externally upon the upper portion of said base member whereby said switch unit may be mounted upon a panel clamped between said first annular shoulder and said clamping collar, an annular guiding collar threaded internally into said upper portion of said base member and having an internal guiding surface including a resilient sealing ring, the inner end of said guiding collar being formed to provide a third annular stop shoulder and the outer end of said guiding collar being of enlarged cross section to provide externally thereof a fourth annular shoulder, a sealing ring interposed between said fourth shoulder and the upper end of said base member, a hollow cylindrical light-transmitting pushbutton actuating member reciprocally mounted in said guiding collar to engage and move said actuating sleeve against its bias, said pushbutton actuating member having an external annular shoulder engaging said third shoulder to limit outward movement thereof, and a lamp socket mounted in said base and extending into said light-transmitting pushbutton actuating member, said pushbutton actuating member and said guiding collar being removable as a unit to provide access to said lamp socket.

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