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PROTECTIVE SEALING CAP FOR PUSH BUTTONS

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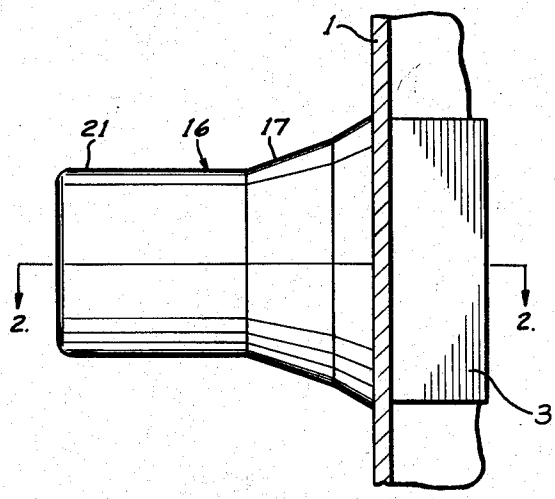


Fig. 1.

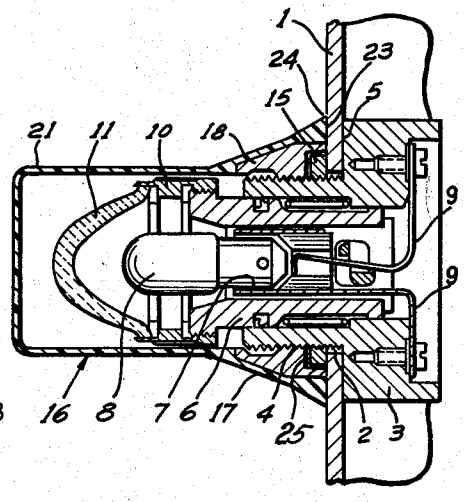


Fig. 2.

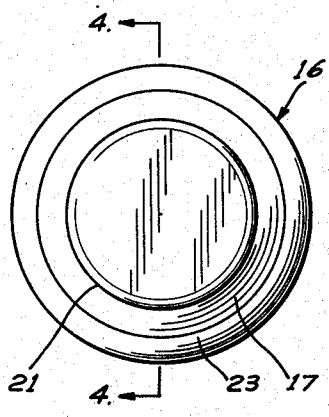


Fig. 3.

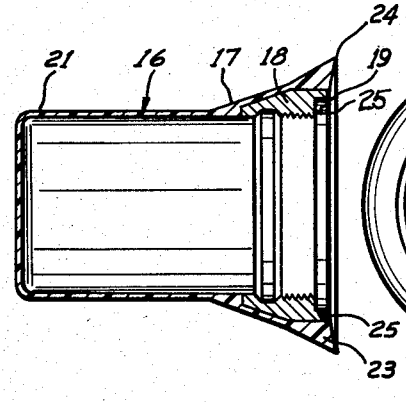


Fig. 4.

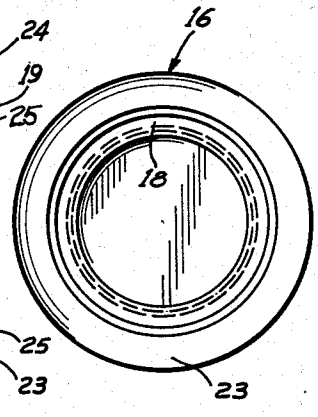


Fig. 5.

INVENTORS.
Robert J. Bowman &
BY Carl Smallberg,

John A. Brown &
Their ATTORNEY.

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PROTECTIVE SEALING CAP FOR PUSH BUTTONS

Robert J. Bowman, Milwaukee, and Earl F. Mekelburg, Wauwatosa, Wis., assignors to Square D Company, Park Ridge, Ill., a corporation of Michigan

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This invention relates to a protective cap for push buttons, such as push-to-test pilot lights and push buttons of electric switches, and particularly to a resilient cap of translucent material which may readily be fastened to, or detached from, a push-to-test pilot light structure so as to shield the structure and space between its relatively movable parts without disturbing the mounting of the structure itself, and which, when secured in place, has sealing engagement with the support on which the push-to-test pilot structure is secured.

For purposes of illustration, the present invention is described in connection with a push button in the form of a push-to-test pilot light such as is described in the copending application of Earl F. Mekelburg, Serial No. 702,940, filed December 16, 1957, now Patent No. 3,090,892, its use in connection with other push button structures being readily apparent from the illustrated example.

As more fully described in the above titled application, push-to-test pilot light structures are generally installed on a support, such as the cover or side wall of a switch enclosure or casing. The support has an opening through which part of the structure extends with the light bulb at the outside, and with a main body of the structure and certain operating mechanisms disposed on the inside of the cover. The pilot light bulb, the part of its support on the main body, and its covering lens are mounted in the body structure with a sliding connection so that they can be pushed actually inwardly of the opening in the cover and relative to the main body structure for testing the pilot light. Because of the sliding connection the foreign matter such as water, chemical fumes, and the like, are apt to contaminate the sliding surfaces or to infiltrate into the casing. Accordingly, translucent resilient caps have been fastened in place on the outside of the cover in shielding relation to the pilot light structure, the cap being provided at its open end with an internally threaded ring nut adapted for threaded engagement with the threaded exterior of a portion of the main body of the pilot light structure so as to draw the body of the structure into firm engagement with the inner face of the cover and secure it in place while at the same time securing the cap in operating position on the outside of the cover.

However, structures of this character are as unsatisfactory in many respects. First, the cap itself holds the pilot light structure in place against the cover, and when the cap is removed for any purpose, the body of the pilot light structure, together with the other parts, is disconnected from the cover and can fall into the inside of the casing through the opening of the cover.

In accordance with the present invention, the pilot light structure is secured firmly in place by means independent of the cap. The cap, in turn, is secured in place on the pilot light structure in a manner such that it firmly seats at its open end against the support or the cover of the casing and forms an effective seal therebetween. The cap can be removed and replaced for servicing the light without disturbing the mounting of the push-to-test pilot structure in the cover. An effective seal is provided at all times between the cap and the outer wall of the cover, this seal being effective to exclude water and other moisture, gases, dust, and other foreign matter.

Various other objects and advantages of the invention become apparent from the following description, in which:

FIG. 1 is a top plan view of a protective cap of the present invention installed over an opening in the cover of a switch enclosure, part thereof being shown in section for clearer illustration;

FIG. 2 is a horizontal longitudinal sectional view taken on line 2—2 in FIG. 1;

FIG. 3 is a left end elevation of a cap embodying the principles of the present invention;

FIG. 4 is a vertical sectional view of the cap taken on line 4—4 in FIG. 3; and

FIG. 5 is a right end elevation of the cap.

Referring to the drawings, the cap of the present invention is shown in connection with a push-to-test pilot light which is mounted in a suitable opening 2 in a cover 1 of an enclosure of an electric switch. The opening affords access from the outside to the inside of the container.

The push-to-test pilot structure comprises a main body 3 which has an externally threaded portion 4 which extends through the opening 2 from the inside to a short distance beyond the outside. The body 3 is provided with suitable outwardly facing shoulders 5 which engage the inner face of the cover to prevent movement of the body outwardly through the opening 2. The body 3 has an axial passage in which a sleeve 6 is mounted in co-axial relation to the body and for movement axially relative thereto. The body 3 carries an electric socket 7 supporting a light bulb 8 to which power is supplied through suitable conductors 9.

The outer end of the sleeve 6 is threaded and receives a bezel 10 in which is mounted a translucent lens 11.

This structure is well known in the art and is disclosed in detail in the above entitled application.

As therein disclosed, the bulb is connected normally to an energizing circuit related to the power circuit of the equipment, so as to monitor the power circuit and equipment and disclose malfunctioning or failure thereof. However, it may be that the bulb itself will fail. Consequently, switch contacts not shown are provided and arranged so that, when the pilot light is pressed axially inwardly of the cover, it becomes connected to a separate testing source of power, thus indicating whether or not the bulb itself has failed. The specific switch and testing connections are described in detail in the above application and form no part of this invention.

Assuming the body 3 is positioned, as illustrated in FIG. 1, so that its threaded portion extends into or through the opening for access from the outside of the enclosure, the customary practice heretofore has been to provide a protective cap and connect it, by a ring nut in its open end, with the threads of the body 3, the end of the cap engaging the outer face of the cover for firmly drawing the body into a position wherein the shoulders 5 bear firmly against the inner face of the cover 1. However, this has a distinct disadvantage in that removal of the translucent protective cap disconnects the body 3 from the cover 1.

In accordance with the present invention, instead of connecting the body 3 in this manner, the body 3 is connected to the cover 1 by means of a separate ring nut 15 which is drawn tightly in place against the outer face of the cover 1 and thereby draws the shoulders 5 firmly against the inner face of the cover 1. Thereafter, unless it is necessary to remove the body 3 for servicing, replacement, and the like, the nut 15 is not disturbed and the body 3 remains mounted on the cover 1. The nut 15 is made relatively thin so that it can be readily installed.

The protective cap of the present invention is then installed, this cap being of special design which affords a more effective seal than those heretofore obtained.

Referring, for example, to FIGS. 3 through 5, the cap, indicated generally at 16, comprises a resilient cup-shaped cap body 17 which may be formed of silicone rubber, polyethylene, or other resilient self-restoring, synthetic translucent organic plastic material. Molded into, or bonded by cement to, the inner peripheral wall of the cap adjacent the open end of the cap is a ring nut 18. The nut is internally threaded and is in threaded cooperation with the outermost threaded end portion of the body 3 so as to draw the cap toward the cover 1.

A suitable cavity or counter-bore 19 is provided in the ring nut 18 at the open end of the cap and opens outwardly toward the open end of the cap so as to accommodate the nut 15 without interference therewith by the nut 18. The cap is of adequate size to accommodate the lens 11, the collar 10, the outer end of the slip sleeve 6, and the outer end of the body 3 with radial and axial clearance. The outer part of the cap adjacent to the lens 11 and collar 10, indicated at 21, has a relatively thin wall which can be collapsed by applying axial pressure inwardly on the outer end of the cap for pressing the push-to-test pilot light inwardly of the body 3. Suitable return means are provided in the pilot light structure, as disclosed in the above application, for returning the pilot bulb, sleeve 6, and parts it supports, to their extended position.

In order to form an effective seal with the outer surface of the cover 1, the cap is provided at its open end with annular sealing portion. This portion is preferably in the form of a radially outwardly extending flange 23 which tapers gradually outwardly to a feathered edge 24. The surface of the flange facing toward the cover 1 slopes, in a direction inwardly toward the axis of the cap, outwardly away from the cover 1 toward the closed end of the cap, so as to assure an effective seal first at the feathered outer margin and edge of the flange.

The ring nut 18 terminates endwise of the cap in spaced relation to the open end in a peripheral shoulder 25, which is spaced in a direction toward the closed end of the cap from the radially innermost margin of the flange 23.

When the cap is installed, the ring nut 18 is rotated to draw the cap firmly toward the outer face of the cover 1. The feathered peripheral edge 24 first engages the cover 1. Thereafter, as pressure increases, the sloping surface 23 is juxtaposed against the cover sufficiently to become effective for sealing. Finally, the entire end face of the cap may be drawn firmly into sealing relation to the outer face of the cover. This can be done without applying any pressure to, or tightening, the nut 15, even to a point such that the shoulder 25 at the outer end of the nut 18 engages the outer face of the cover 1, the cavity 19 being of greater axial length, between the shoulder 25 and outer end of the ring nut 18, than the axial length of the ring nut 15.

With the arrangement thus described, the light can be seen through the translucent cap 16 with the cap in place. When it is desired to depress the pilot light or to move it axially inwardly of the enclosure, all that is necessary is to press the outer end of the cap 16 toward the cover, collapsing it to the extent necessary to cause its end wall

to engage the lens 11 and push the light inwardly for testing. Upon release, the cap is self-restoring, and conventional return means are built into the pilot light to return it to extended position.

If it is necessary to remove the cap, this may be done without disturbing the mounting of the pilot light structure from the cover 1.

It is apparent from the foregoing description that a very effective cap and combination thereof with a support and push button structure, such as a push-to-test pilot light, is provided.

Having thus described our invention, we claim:

1. A protective means for a pushbutton of a pushbutton operated device and comprising a supporting wall having an opening therein, an externally threaded support mounted in the opening and adapted to support the pushbutton for movement axially of the opening, said support extending from one face of the wall through the opening and protruding beyond the other face, abutment means on the support at one end engaging said one face to constrain the support from movement entirely through the opening from said one face, an internally threaded ring nut in threaded engagement with the support at the other face of the wall and cooperable with the abutment means to clamp the support to the wall in position in said opening, a flexible cap for the pushbutton, an internally threaded clamping ring in the cap at the open end thereof and in threaded engagement with the support, said cap having a resilient peripheral sealing flange at its open end disposed outwardly from the ring and normally protruding endwise of the ring beyond the ring in a direction toward the wall for engagement with the adjacent face of the wall, the threaded relation of said ring and support being such that by screwing the ring onto the support the resilient peripheral sealing flange can be held under pressure in sealing engagement throughout its extent, against the wall outwardly from the ring, said ring having a cavity open toward the open end of the cap and accommodating the ring nut in radially and axially spaced relation to the ring and cap when the cap is in said sealing engagement.

2. The structure according to claim 1 wherein the ring has a shoulder at its outer end surrounding the cavity and positioned relative to the flange on the cap to engage said wall in surrounding radially spaced relation to the ring nut when the cap is in sealing position, and said ring and ring nut being free from contact with each other when said shoulder is so engaged with said wall.

3. The structure according to claim 1 wherein the resilient peripheral sealing flange, when unstressed, flares outwardly from the ring axis in a direction away from the closed end of the cap, the outermost margin of the flange is feathered outwardly to its outer edge, and the outer end surface of the flange, facing toward the wall, slopes back toward the closed end of the cap from its outermost peripheral edge toward the axis of the ring.

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BERNARD A. GILHEANY, *Primary Examiner.*

ROBERT K. SCHAEFER, *Examiner.*