March 27, 1956 H. C. KRYDER 2,740,023

PUSH BUTTON SWITCH

Filed May 2, 1952

FIG. 2

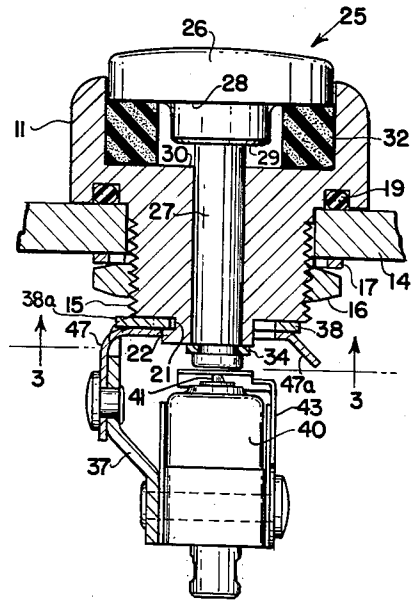


FIG. 1

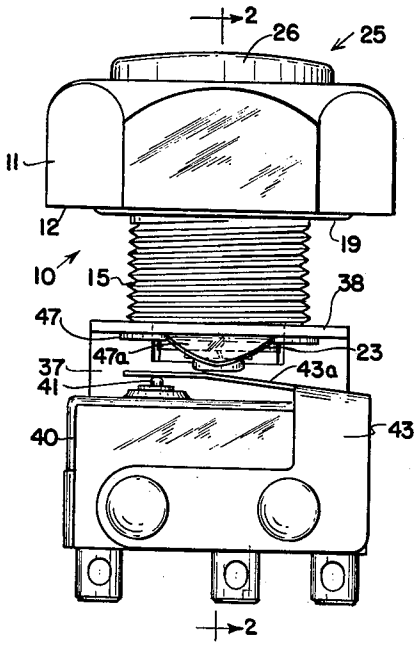


FIG. 3

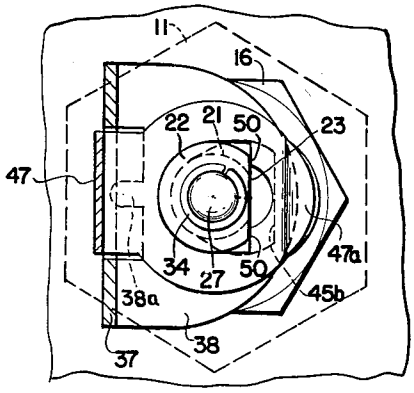


FIG. 4

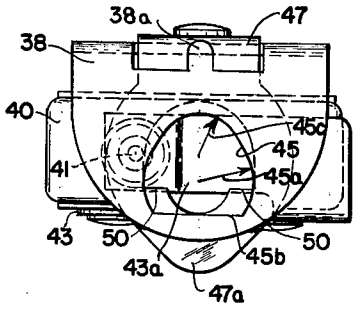
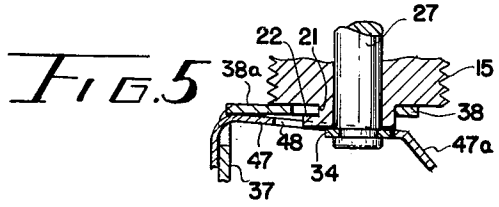


FIG. 5



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PUSH BUTTON SWITCH

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6 Claims. (Cl. 200—168)

This invention is directed to a push button switch suitable for panel mounting and particularly for applications requiring a fluid tight seal between the front of the panel and the mechanism behind the panel.

An object of the invention is to provide a push button switch adapted for single hole mounting in which the switch per se is attached to the mounting means after the mounting means is secured to a panel.

Another object is to provide a push button switch in which a fluid tight seal between the button and the mounting means is obtained by a body of closed cell sponge rubber or other elastomer which is resilient enough to permit switch actuation without requiring excessive force.

Another object is to provide a fluid tight push button switch which is inexpensive to manufacture, is easily mounted and which will have a long and trouble free life. Other objects will be evident from the specification and appended claims and from the drawings in which

Figure 1 is an elevation showing a push button switch in assembled condition,

Figure 2 is a sectional elevation taken generally on line 2—2 of Figure 1,

Figure 3 is a section taken on line 3—3 of Figure 2,

Figure 4 is a plan view of the switch and bracket assembly separated from the mounting member, and

Figure 5 is a fragmentary view showing a step in the assembly or disassembly operation.

A mounting member generally indicated at 10 includes an enlarged portion 11 which has a surface 12 adapted to engage the outer surface of a panel or the like 14. A reduced portion 15 extends through the panel and is externally threaded so that a nut 16 and lock washer 17 may be tightened against the rear surface of the panel to secure the mounting member in place. An O-ring 19 carried in an annular groove in the portion 11 engages the panel to effect a fluid tight seal between the panel and the member 10. The inner end of the mounting member 10, shown lying below the panel 14 in Figure 2, is formed to provide a neck portion 21 and a flange shaped boss 22. Both the boss 22 and the neck portion 21 are generally circular in shape and coaxial with the threaded portion 15 but the circular configuration is modified by removal of a segment to provide a flat surface 23 as shown in Figure 3. The boss and neck portion serve to support and locate the switch as will be apparent below.

The mounting member 10 is axially bored to carry an actuator 25 which includes a button 26 and a rod 27. The button 26 lies partially within a large bore within the enlarged outer portion 11 of the mounting member 10 and has a surface 28 which is parallel to but separated from a surface 30 of the mounting member 10 normal to the axis of the bore. A stop member 29 is disposed intermediate the button 26 and rod 27 and is adapted to engage the surface 30 to limit inward movement of the actuator 25. A ring 32 of closed cell sponge rubber or other elastomer is cemented or otherwise suitably attached to the surface 28 of the button 26. The other generally plane surface of the ring 32 is similarly attached to the

surface 30 of the mounting member 10. The sponge rubber ring 32 is of sufficient axial thickness so that force exerted manually on the button 26 may be effective to compress the ring and permit sufficient axial movement of the rod 27 to actuate the switch. The portion of the mounting member 10 radially beyond the bore acts as a protective rim for both the button 26 and the sponge rubber ring 32 as well as providing an external surface engageable by a wrench. Ring 32 radially fills the bore thereby preventing entry of foreign matter beyond the lower edge of button 26. The inner end of the rod 27 is grooved to accommodate a snap ring 34 which acts as a stop in cooperation with the inner end of the mounting member 10 to limit outward movement of the actuator 25. The parts are so proportioned that when the ring 34 is in engagement with the member 10 the sponge rubber ring 32 will be under slight compression. Thus, the cement used in attaching the sponge rubber ring 32 to the button 26 and to the surface 30 of the member 10 may be applied to the surfaces of these parts, the actuator 25 assembled to the member 10 with the ring 32 in place and the stop ring 34 applied to the rod 27 and the cement suitably dried without the necessity for providing any other clamping force during the drying operation.

A bracket 37 has an angular extension 38 which is supported on the member 10 by engagement of a portion thereof with the boss 22 and the neck portion 21 in a manner to be described below. The bracket 37 carries an electric switch 40 having an actuating button 41. The switch 40 is of the type disclosed in the application of Wilbert A. Martin, Serial No. 209,123, filed February 2, 1951, and its internal construction therefore will not be described. The switch 40 is provided with an operator 43 which includes a resilient strip 43*a* overlying the button 41. The strip 43*a* is adapted to be engaged by the inner end of the rod 27 when the button 26 is depressed, the operator 43 in turn actuating the button 41 of the switch 40.

The bracket extension 38 is formed to provide an opening 45 a portion of which is formed, as seen in Figure 4, with a radius 45*a* which is slightly larger than the radius of the boss 22, a flat portion 45*b* corresponding to the segmented surface 23 of the boss 22 and a portion of smaller radius 45*c* which corresponds to the radius of the neck portion 21. The bracket 37 is applied to the member 10 by placing the opening 45 over the boss 22 with the straight portion 45*b* of the opening in engagement with the segmented portion 23 of the boss 22. This position is shown in Figure 5. The bracket 37 is then slid to the right so that the bracket extension 38 lies between the inner surface of the reduced portion 15 and by the boss 22 so that the portion of the bracket extension adjacent the radius 45*c* of opening 45 embraces the neck portion 21. The axial length of the neck portion 21 is necessarily slightly greater than the thickness of the bracket extension 38. To assure a rigid assembly, an ear 38*a*, originally bent slightly upwardly from the bracket extension 38, is depressed by assembly of the bracket on the mounting member so that the bracket 37 is firmly attached to the member 10. To prevent return to the position shown in Figure 5 a resilient strip 47 is secured to the bracket 37 and is shaped to lie along the inner surface of the bracket extension 38. The strip 47 has an opening 48 therein adapted to receive the boss 22 and is provided with a pair of shoulders 50 adapted to engage the segmented surface 23. When the bracket 37 is assembled in operative position engagement of the surface 23 by the shoulders 50 of the resilient strip 47 prevents lateral displacement of the bracket 37. The resilient strip 47 is provided with a manually depressible ear 47*a* by which the strip can be bent to the position shown in Figure 5 which will permit removal of the

bracket 37 from the mounting member 10. When the strip 47 is so depressed the bracket 37 may be again displaced laterally to the position shown in Figure 5, whereupon the bracket may be separated from the member 10 by axial displacement.

In order to employ the sealing means including the sponge rubber ring 32 most effectively it is so disposed in the assembly that the force applied to actuate the switch exerts only compressive forces on the cemented joints between the ring and the mounting member and between the ring and the button 26. Such construction assures the permanence of the fluid tight seal between these members. Such construction dictates that the enlarged portion 11 of the mounting member be located on the front surface of the panel and the nut 16 is therefore necessarily disposed on the rear surface of the panel. Since the switch 40 is larger than the threaded portion 15 it is not possible to permanently attach the switch to the inner portion of the mounting member 10. The disclosed means of releasably attaching the bracket 37 to the member 10 enables such operation to be performed without the use of any tools whatever, and has the advantage over a threaded connection in that the switch is locked against rotation with respect to the mounting member. The use of a closed cell sponge elastomer sealing ring provides sufficient resilience since it is volumetrically compressible and only a minimum of lateral displacement thereof accompanies axial displacement. Since the sponge elastomer is of the closed cell type it is impervious to the passage of fluid and effectively seals the joint between the actuator and the mounting member. It is appreciated that a diaphragm could be used to effect the same purpose but it would be considerably more difficult to suitably attach both the mounting member and the actuator and would be much less rugged. In addition the disclosed construction permits entry of only a thin film of water between the button and the bore of enlarged portion 11 of the mounting member 10. If this water film should freeze it is possible to operate the switch by applying sufficient force to break the film.

When the switch is to be subjected to a wide range of temperatures and must remain operative throughout that range, the elastomer used to form the ring 32 may suitably be a silicone which will remain elastic at very low temperatures. In applications where the switch must be pressure tight only at low values of pressure, instead of cementing the ring 32 to the surface 28 of the button 26 and to the surface 30 it may effectively be attached thereto by interposed layers of silicone grease. This modification has the advantage that even if very high pressure is applied, which might break a cemented joint, the silicone grease will reseal itself when the pressure is relieved and an effective seal will again be afforded.

I claim as my invention:

1. In a push button switch, a mounting member comprising, an outer abutment portion adapted to engage an outer surface of a panel or the like, a reduced portion adapted to extend through the panel, and a boss separated from said reduced portion by a necked portion, the inner end of said reduced portion and said boss having opposing surfaces separated by the length of said necked portion, said mounting member having a bore extending through said abutment portion, said reduced portion, said necked portion, and said boss, an actuator comprising a button overlying a part of the abutment portion of said member, a rod extending through the bore of said member and stop means on said rod adapted to engage said boss to limit outward movement of said actuator, a ring of closed cell sponge elastomer effectively attached to said button and to said member to prevent passage of fluid between said member and said actuator and to bias said actuator outwardly to the limit established by said stop means, a switch having an operator engageable by the inner end of said rod, a bracket supporting said switch, said bracket having an extension received between the opposing surfaces of said boss and the inner end of the reduced portion of said member and embracing said necked portion, said extension being slidable laterally with respect to said boss and said necked portion to the extent necessary to permit longitudinal separation of said bracket extension from said boss, and a resilient strip secured to said bracket and normally lying along the inner surface of said extension and engaging an edge of said boss to prevent such lateral displacement, said strip being bendable away from said bracket extension to disengage said boss to permit disassembly of said bracket from said member.

2. In a push button switch, a member having an inner portion and a boss separated from said inner portion by a necked portion, said boss and said inner portion having opposing surfaces separated by the length of said necked portion, an actuating rod extending through the inner portion of said member and through said necked portion and said boss, a switch having an operator engageable by the inner end of said rod, a bracket supporting said switch and having an extension received between the opposing surfaces of said boss and the inner portion of said member and embracing said necked portion, said extension being slidable laterally with respect to said boss and said necked portion to the extent necessary to permit longitudinal separation of said bracket extension from said boss, and a resilient strip secured to said bracket and normally lying along the inner surface of said extension and engaging an edge of said boss to prevent such lateral displacement thereof, said strip being bendable away from said bracket extension to disengage said boss to permit disassembly of said bracket from said member.

3. In a push button switch, a mounting member having an inner portion and a boss separated from said inner portion by a necked portion of generally annular configuration, said boss and said inner portion having opposing surfaces separated by the length of said necked portion, and said boss having a portion of its lateral surface which is non-circular with respect to the axis of said necked portion, an actuating rod extending through the inner portion of said member and through said necked portion and said boss, a switch having an operator engageable by the inner end of said rod, a bracket supporting said switch and having an extension received between the opposing surfaces of said boss and the inner portion of said member and embracing said neck portion, said extension being slidable laterally with respect to said boss and said neck portion to the extent necessary to permit longitudinal separation of said bracket extension from said boss, and a resilient strip secured to said bracket and normally lying along the inner surface of said extension and having an edge of a configuration adapted to engage the non-circular lateral surface portion of said boss to prevent both rotary and lateral displacement of said bracket with respect to said mounting member, said strip being bendable away from said bracket extension to disengage said boss to permit disassembly of said bracket from said member.

4. A push button actuator comprising, a mounting member having a portion adapted to engage the outer surface of a panel or the like and a portion adapted to extend through the panel, said surface engaging portion having a groove therein carrying an O-ring of rubber-like material adapted to engage the panel surface to form a pressure seal between said member and the panel, an actuating member including a rod extending through said mounting member and a button overlying part of the outer portion of said mounting member, and a ring of impervious resilient volumetrically compressible material surrounding said rod and having opposed surfaces effectively attached to said button and to said mounting member, said mounting member having an annular surface engaging the periphery of said ring and preventing radial expansion thereof on inward movement of said actuating member.

5. A push button actuator comprising, a mounting member having a portion adapted to engage the outer surface of a panel or the like and a portion adapted to extend through the panel, said surface engaging portion having a groove therein carrying an O-ring of rubberlike material adapted to engage the panel surface to form a pressure seal between said member and the panel, an actuating member including a rod extending through said member and a button overlying a surface of said mounting member, said button and said member having opposed parallel surfaces, and a ring having a substantially rectangular section and made of impervious resilient volumetrically compressible material surrounding said rod and having opposed parallel surfaces effectively attached to the parallel surfaces of said button and said member.

6. A push button actuator comprising, a member having a bore therethrough and a counterbore, an actuator including a rod extending through said bore and a button disposed in the counterbore, and an impervious elastomer ring surrounding said rod but spaced radially therefrom and having opposed axially spaced surfaces engaging said button and said member and a cylindrical lateral surface engaging the lateral surface of the counterbore in said member adjacent said button.

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