Dec. 9, 1969 H. W. HULTS 3,483,345

COMBINED SEAL AND INSULATOR FOR AN ELECTRIC SWITCH

Filed Aug. 14, 1968

Fig. 1

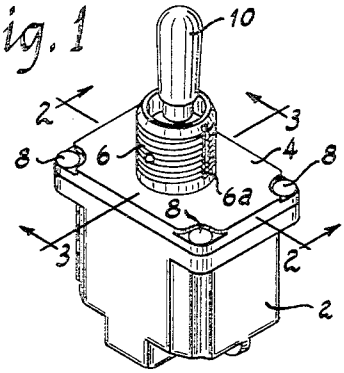


Fig. 2

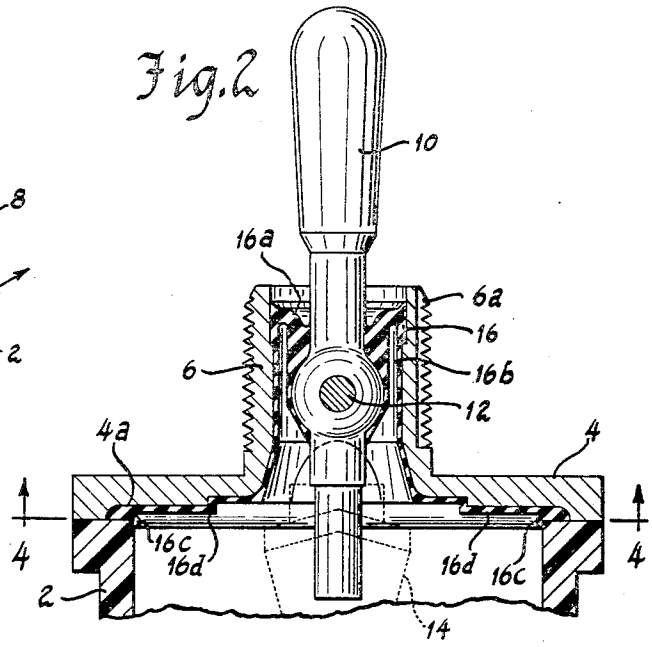
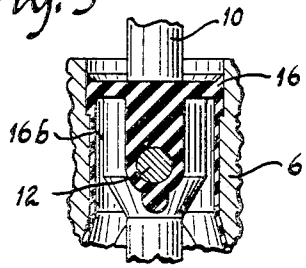


Fig. 5



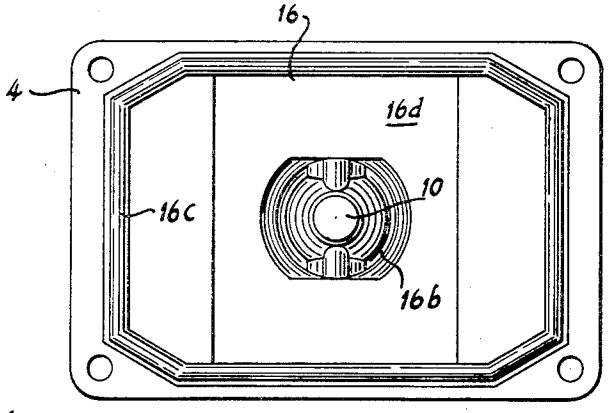
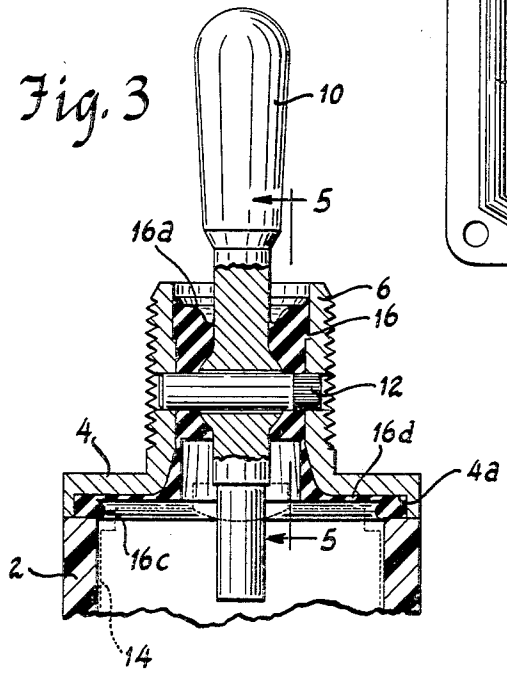


Fig. 4

Fig. 3



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COMBINED SEAL AND INSULATOR FOR AN ELECTRIC SWITCH

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U.S. Cl. 200—168 7 Claims

ABSTRACT OF THE DISCLOSURE

A unitary molded-in-place seal and insulator for an electric switch of the toggle lever type for the combined purposes of sealing the space between the toggle lever and bushing, sealing the cover to the base, and insulating the inner surfaces of the metal cover and bushing from any switching arcs occurring within the base.

BACKGROUND OF THE INVENTION

This invention relates to the art of sealing and insulating an electric switch.

H. W. Hults Patent No. 3,041,430, dated June 26, 1962, assigned to the assignee of this invention, discloses separate seals for sealing the toggle lever to the bushing and for sealing the metal cover or housing member to the insulating base. The lever seal is molded around the toggle lever within the bushing. However, the cover seal is a preformed O-ring that is placed around the base and is compressed between it and the metal cover when the latter is attached. While these prior art seals have been useful and effective for their designed purposes, the present invention is an improvement thereon.

SUMMARY OF THE INVENTION

This invention relates to a combined dual seal and insulator for an electric switch of the toggle lever type.

An object of the invention is to provide improved sealing means for an electric switch.

A more specific object of the invention is to provide a combined lever and cover seal for an electric switch.

Another specific object of the invention is to provide a molded in place combined seal for sealing the space between the toggle lever and the bushing and for sealing the cover to the base in an electric switch.

Another object of the invention is to provide improved sealing and insulating means for an electric switch.

A more specific object of the invention is to provide a one-piece seal and insulator for sealing the toggle lever to the bushing and for sealing the cover to the base and for electrically insulating the inner walls of the bushing and cover.

Another specific object of the invention is to provide a one-piece seal and insulator or the aforementioned type that is molded in place on a switch subassembly that includes a cover, bushing, toggle lever and pivot pin pivoting the lever in the bushing.

Other objects and advantages of the invention will hereinafter appear.

BRIEF DESCRIPTION OF THE DRAWING

FIGURE 1 is an isometric view of an electric switch incorporating the invention;

FIG. 2 is an enlarged fragmentary cross-sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a view like FIG. 2 taken along line 3—3 of FIG. 1;

FIG. 4 is a cross-sectional view taken along line 4—4 of FIG. 2; and

FIG. 5 is a fragmentary cross-sectional view taken along line 5—5 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, there is shown an electric switch of the toggle lever type incorporating the invention. This switch is provided with an insulating base **2** preferably made of molding material or plastic material from which it is molded to provide a switch cavity therein open at the top and terminal connectors at the bottom whereby the switch contacts housed within the base may be connected to an external circuit.

The open top of the base is closed by a frame or cover **4** having a one-hole mounting bushing **6** integrally formed therewith. This bushing is adapted to be received in a hole in a mounting panel and is externally threaded in the usual manner to receive a nut that secures it to the panel. Groove or key seat **6***a* is for receiving the key of a washer or the like to keep it from turning on the bushing when the nut is tightened. A portion of the cover overlying the upper edge of the base is provided with an undercut **4***a* all the way around as shown in FIGS. 2 and 3, blending into the inner surface of the cover, to receive and fix the cover seal hereinafter described. The cover is secured to the base by rivets **8** at the four corners as shown in FIG. 1.

A toggle lever **10** of brass or the like is mounted by a pivot pin **12** of steel or the like in the bushing so that it can be swung in opposite directions to actuate the switch that is preferably of the rocking contact type. A switch having such rocking contact is shown in my prior Patent No. 2,759,075, dated Aug. 14, 1956. As shown in FIGS. 2 and 3, this toggle lever has a handle portion at the top that continues into a reduced portion where it enters the bushing. The toggle lever is provided with a spherical portion through which the pivot pin passes with a similar reduced portion therebeyond up to an annular shoulder. From this annular shoulder the toggle lever has a still further reduced round portion that is received in an insulating contact actuator block **14** shown in dotted lines in FIGS. 2 and 3 and being generally similar to that shown in the aforementioned Patent No. 2,759,075. This annular shoulder forms a stop for the actuator block to fix it relative to the contacts.

A combined seal and insulator member **16** is shown in FIGS. 2 to 5. This member is composed of resilient insulating material such as silicone rubber and is molded in place after the pivot pin has been inserted to assemble the toggle lever in the bushing. In the molding process a bonding agent is first applied to cause the silicone rubber to adhere to the metal frame.

This member is provided with a first portion **16***a* that surrounds the spherical portion of the toggle lever and the pivot pin as shown in FIGS. 2 and 5 and fills the space around the end portions of the pivot pin between the toggle lever and the bushing as shown in FIG. 3. Deep grooves **16***b* are molded in this member between the toggle lever and the bushing laterally of and on two opposite sides of the pivot pin as shown in FIGS. 2 and 5 for ease of pivoting of the lever.

This member is also provided with a second portion **16***c* filling undercut **4***a* in the lower surface of the cover and forming a ridge that is compressed against the upper edge of the base when the cover is secured to the base as shown in FIGS. 2 and 3. This ridge extends in a closed loop all the way around near the edge of the cover as shown in FIG. 4 completely to seal the joint between the cover and the base.

This sealing member is further provided with a third portion **16***d* connecting lever seal portion **16***a* and cover seal portion **16***c* as shown in FIGS. 2, 3 and 4. This

connecting portion lines the entire inner surfaces of the bushing and cover and serves several purposes. Due to the fact that the lever seal portion is securely fixed within the bushing around the pivot pin and spherical portion of the toggle lever, connecting portion **16***d* keeps cover seal portion **16***c* in place. That is, it prevents the cover seal portion from falling out or slipping during assembly as might be the case were portion **16***c* a separate O-ring or the like. Also, the connecting portion forms an insulator to insure that no electrical arcs will hit the cover. This cover is preferably made integrally with the bushing as a metal casting of aluminum or the like that is electrically conductive. This connecting portion or liner portion of the seal along with contact actuator block **14** forms a double insulation structure. That is, the contact actuator block is made of material that insulates the contacts from the brass toggle lever and also fills at least some of the space between the contacts and the cover. As an added precaution, portion **16***d* of the rubber seal insulates all parts of the cover from any arcs within the base. Thus, it would be very difficult, and not likely, for current to reach any conducting parts such as the cover, toggle lever and pivot pin.

While the apparatus hereinbefore described is effectively adapted to fulfill the objects stated, it is to be understood that the invention is not intended to be confined to the particular preferred embodiment of combined seal and insulator for an electric switch disclosed, inasmuch as it is susceptible of various modifications without unduly departing from the scope of the invention.

I claim:

1. In combination with a toggle lever switch having a hollow insulating base open at the top for accommodating the switch mechanism, a metal frame including a cover closing the top of the base and a bushing extending from the cover, a toggle lever extending through the bushing and having means including a pin pivoting the toggle lever in the bushing for limited rocking movement in a plane transverse to the pivot pin, the improvement comprising:

means for sealing the space between the toggle lever and the bushing and for sealing the cover to the base comprising:

a resilient lever seal surrounding the toggle lever and pivot pin and covering the inner wall of the bushing;

a resilient cover seal forming a closed ridge near the edge of the cover that is compressed between the cover and the upper portion of the base when they are attached;

and resilient means connecting the lever seal and the cover seal for holding the cover seal in place as a result of the lever seal being fixed in the bushing.

2. The invention defined in claim **1**, wherein said resilient means comprises:

a thin sheet integral with the lever seal and the cover seal.

3. The invention defined in claim **1**, wherein said resilient means comprises:

a thin sheet integrally formed with the lever seal and the cover seal covering the entire inner surfaces of the bushing and cover therebetween thereby to insulate the cover and bushing from any electrical arcs produced by the switch mechanism.

4. The invention defined in claim **1**, wherein said resilient lever seal comprises:

grooves therein on opposite sides of the pivot pin between the part that surrounds the toggle lever and pivot pin and the part that hugs the inner wall of the bushing, said grooves reducing the cross sectional area thereof that must be deformed thereby to ease the pivotal lever movement while maintaining an effective seal between the switch compartment and the outside.

5. The invention defined in claim **1**, wherein said resilient means comprises:

a thin sheet of insulating material integrally molded with said lever seal and said cover seal, all of which are integrally molded in place.

6. In a toggle switch having a hollow insulating base open at the top for accommodating switch contacts, a metal frame including a cover closing the top of the base and a bushing extending from the cover, the bushing being adapted for one hole mounting of the switch, a toggle lever extending through the bushing and having a pivot pin extending through the toggle lever and bushing allowing limited rocking movement of the toggle lever therein, and an insulating contact actuator block on the end of the toggle lever within the base adapted to actuate a movable contact and to insulate the toggle lever from the latter, the improvement comprising:

combined sealing and insulating means for sealing both the toggle lever to the bushing and the cover to the base and for insulating the inner surfaces of the frame from electrical arcs comprising:

a one-piece molded-in-place resilient member including:

a lever seal portion surrounding the toggle lever and its pivot pin and hugging the inner surface of the bushing;

a cover seal portion including an endless ridge adapted for compression between the cover and walls of the base when the cover is attached thereto;

and an insulating portion connecting the cover seal portion to the lever seal portion for retaining the cover seal portion in place and covering the inner surfaces of the cover and bushing to provide a secondary insulation in addition to the contact actuator block that insulates the cover and bushing and toggle lever from the movable contact.

7. The invention defined in claim **6**, wherein said one piece molded-in-place resilient member is molded of silicone rubber.

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H. O. JONES, Primary Examiner