Dec. 6, 1955 M. F. KOENIG 2,726,105

SEALING MEANS FOR ELECTRICAL SWITCHES

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Fig. 1

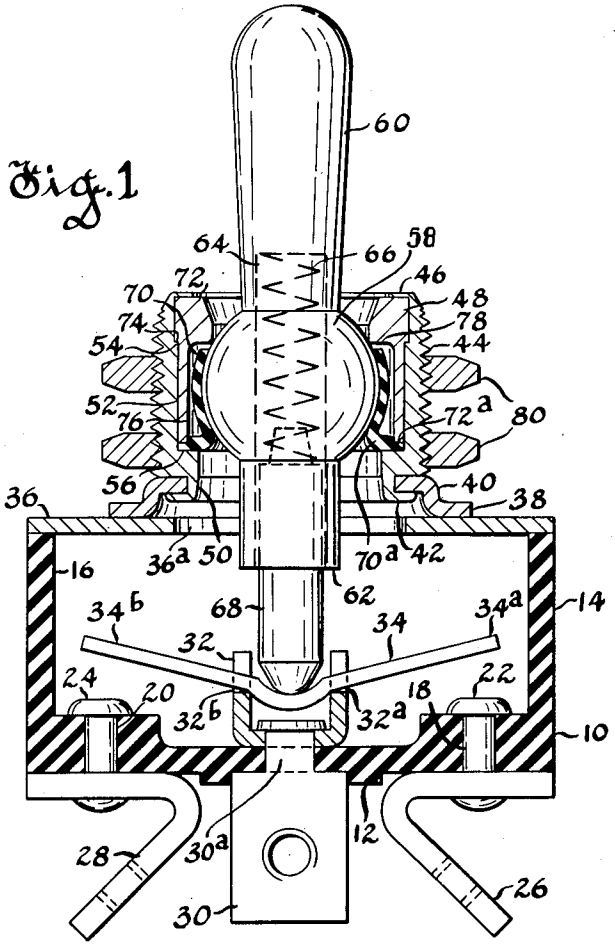


Fig. 2

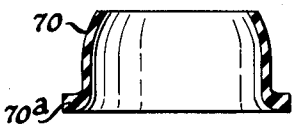


Fig. 3

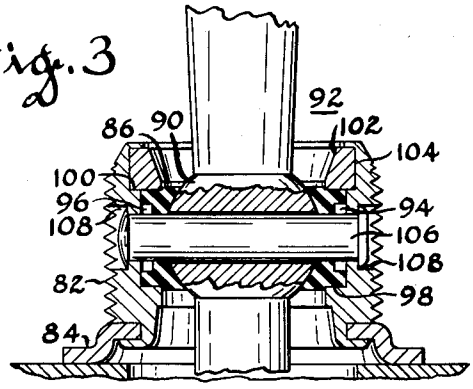
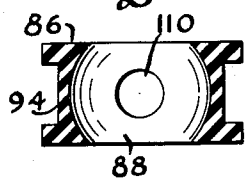


Fig. 4



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SEALING MEANS FOR ELECTRICAL SWITCHES

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1 Claim. (Cl. 286—15)

This invention relates to electric switches, and more particularly to means for sealing casings thereof against entry of foreign matter.

A primary object of the present invention is to provide an improved type of seal for actuator openings in switch casings.

Another object is to provide a seal of the aforementioned character which prevents entry of foreign matter into the actuator of the switch casing while permitting full operation of the actuator, and

A further object is to provide a seal of the aforementioned character which is economical to manufacture and readily installed.

Various other objects and advantages of the invention will hereinafter appear.

The accompanying drawings illustrate certain embodiments of the invention which will now be described, it being understood that various modifications may be made in respect of the embodiments illustrated without departing from the spirit and scope of the appended claim.

In the drawings:

Figure 1 is a sectional view in side elevation of a switch embodying the invention;

Fig. 2 is a vertical sectional view of a sealing gasket in unassembled, relaxed condition;

Fig. 3 is a fragmentary sectional view in side elevation of a portion of an electrical switch illustrating a modified form of the invention; and

Fig. 4 is a vertical sectional view of a preferred form of sealing gasket used in the embodiment of Fig. 3.

Referring to Fig. 1 of the drawing, the numeral 10 designates a base molded from a suitable insulating material to form a box-like structure having a bottom wall 12, an open top, and end walls 14 and 16. In the bottom wall 12 and respectively adjacent to end walls 14 and 16 are formed openings 18 and 20. A pair of rivets 22 and 24 penetrating openings 18 and 20, respectively, secure terminals 26 and 28 to the underside of bottom wall 12. A third terminal 30 and a U-shaped member 32 are secured to the underside and upperside, respectively, of the central portion of the bottom wall 12 by a portion 30^a of terminal 30 penetrating alined openings in wall 12 and the connecting base portion of member 32 and riveted over the latter.

The legs of the U-shaped member 32 are notched at their upper ends to form a pair of pivot fulcrums 32^a and 32^b. A bridging contactor 34, shown in Fig. 1 at rest upon both of the fulcrums, has arms 34^a and 34^b extending to the right and left beyond fulcrums 32^a and 32^b, respectively.

Each of the bridging contactors 34, the U-shaped member 32, the rivets 22, 24 and 30^a and the terminals 26, 28 and 30, are formed of electrical conducting material. Thus upon clockwise rotation of bridging contactor 34 about fulcrum 32^a, arm 34^a makes contact with the head of rivet 22 and a circuit is completed between terminals 26 and 30. Similarly, a circuit is completed between terminals 28 and 30 when arm 34^b contacts rivet 24 upon counterclockwise rotation of bridging contactor 34 about fulcrum 32^b.

Secured in any appropriate manner to base 10 is a cover plate having, in position to overlie the open top of base 10, a flat portion 36 which has an oblong perforation 36^a centrally located with respect to the open top of base 10. Overlying the cover plate 36, and secured to it or to base 10 by any appropriate fastening means, is a top plate 38 having an upwardly bulged center portion 40 of elongated cross section in which is formed an opening. The opening is arranged in alinement with perforation 38 and is adapted to accommodate the lower end 42 of a bushing or nipple 44 which is upset over top plate 38 to rigidly secure the top plate and bushing together. Bushing 44, as shown, is externally threaded except at its upper end 46 and lower end 42 which are of reduced outside diameter. An axial opening through bushing 44 is of varying diameter such that the upper inner wall 48 of bushing 44 is of greater inside diameter, and the lower inner wall 50 is of smaller inside diameter than the inside diameter of the central inner wall 52, thus forming shoulders 54 and 56 each of which extends about an inner periphery of the inner wall.

Pivotally located in assembled position within bushing 44 as hereinafter more fully described, is the ball portion 58 of an operating lever which comprises, in addition, a handle 60 and a shank portion 62. The shank portion 62 extends through perforation 38 of cover plate 36 which, being of oblong shape, restricts the shank portion and thus the operating lever to movement in a perpendicular plane which is in longitudinal alinement with bridging contactor 34.

A recess 64 extending partially through the operating lever and opening at the lower end of shank portion 62, accommodates a coiled compression spring 66 which bears at one end against the bottom wall of the recess and at its other end against an insulating finger 68, thus tending to urge the finger 68 downward to bear upon the bridging contactor 34. Oscillation of handle 60 in the plane permitted by perforation 38 causes the finger 68 to move along bridging contactor 34 and over fulcrums 32^a and 32^b and through cam action rotates the bridging contactor to establish the switch circuits as aforedescribed.

The ball portion 58 is held in assembled position within the bushing 44 by an elastic gasket 70 and a spacer insert or bushing 72. The gasket 70 which is shown unassembled in Fig. 2, has inside dimensions somewhat less than the outside dimensions of the ball portion 58. Thus the elastic gasket 70, when assembled about ball portion 58, elastically grips a peripheral area of the surface of the latter and a seal against the passage of foreign matter between the gasket and ball portion is effected.

Forming a portion of the gasket 70 is a flange 70^a which, in assembled position, overlies the peripheral shoulder 56 formed on the inner bushing surface preferably such that the outermost edge of flange 70^a fits snugly against a perimeter of the central inner wall 52. The elastic flange is held under compression by the circular lower edge 72^a of spacer 72. The outside diameter of the upper and lower portions of this spacer 72 differ and are such that it fits snugly within the upper wall 48 and the central inner wall 52 of bushing 44 such that a shoulder 74 is formed which abuts shoulder 54 when the lower edge 72^a of the spacer 72 compresses the elastic flange 70^a a predetermined amount. The upper end 46 of bushing 44 is upset over the top of the spacer to hold the latter in position against the renitence of the flange 70^a. The inner wall of spacer 72 is tapered inwardly from its upper end to provide clearance for oscillation of handle 60 while the lower inside wall 76 of spacer 72 is of in-

creased inside diameter to provide a lip **78** and clearance for the upper edge and side walls of gasket **70**. The lip **78** forms a bearing to retain the ball **58** which tends to move upwardly thereagainst because of the bias of spring **66**.

Thus assembled the switch is sealed against entry thereinto of foreign matter, including water and dust, between the bushing **44** and the operating lever. The renitence of the gasket **70** prevents passage of such foreign matter between the gasket and the ball portion **58** while the renitence of the flange **70a**, where compressed against inner bushing wall **52** and shoulder **56**, prevents passage of foreign matter into the switch which might otherwise enter from between the gasket **70** and the spacer **72** or between this spacer and bushing **44**. Moreover, the switch when provided with an externally threaded bushing as shown in the drawing, may be mounted with its bushing within a single opening of a panel by cap nuts **80** which are adapted to be taken up against opposite sides of the panel. A gasket may be interposed between these cap nuts and the respective panel surfaces in any suitable manner to seal the aforementioned panel opening. There being no other paths for the passage of foreign matter, the switch is completely sealed.

In Fig. 3 is shown an alternative form of bushing and operating lever assembly. The bushing **82** is similar in shape to the bushing **44** of Fig. 1 and is secured in like manner to a similar top plate **84**. An elastic gasket **86**, shown unassembled and relaxed in Fig. 4, is provided with an axial opening **88** of smaller diameter but of shape complementary to the shape of the surface of a ball portion **90** of operating lever **92** while the central portion **94** of the outer surface of the gasket **86** is of reduced diameter. Prior to assembly of the lever within the bushing **82**, the gasket **86** is positioned about the ball portion **90** which it elastically embraces to effect a seal against passage of foreign matter between the same.

The dimensions of the ball, gasket and bushing are so relatively proportioned that in assembled relation prior to assembly of the spacer insert **102**, the gasket **86** is snugly interposed between the ball **90** and the central inner wall **96** of the bushing and such that the upper end of the gasket **86** normally extends above the upper bushing shoulder **100** when the lower end of the gasket is at rest upon shoulder **98**.

Upon insertion of spacer **102** within the upper inner wall **104** of the bushing with the lower edge of spacer **102** resting upon shoulder **100**, gasket **86** will be compressed downwardly. Thus compressed, the gasket will press tightly against the lower side of the spacer, the central inner wall **96** of the bushing, shoulder **98** and ball portion **90**, and a seal will be effected.

The ball portion **90** is restrained against all but pivotal movement with respect to the bushing **82** by a pivot pin **106** which extends with a free fit through an opening in ball portion **90** and through diametric openings **108** in bushing **82** to which latter the pin is riveted.

The gasket **86** may be provided with diametric openings **110**, as shown in Fig. 4, to allow insertion of the pivot pin through the gasket during assembly but the preforming of such holes is not essential since the pivot pin may be used to puncture holes in the gasket as it is inserted during assembly. Nor is it required that the basket have the form shown in Fig. 4. Gaskets having other shapes may be used. For example, a cylindrical gasket having uniform inside diameter with either a uniform outside diameter, or with outside diameters like that shown in Fig. 4 may be used.

The bushings when provided with external threads as shown in Fig. 1 and Fig. 3 and described above are particularly well suited for one-hole mounting pipes of switches. It will be readily apparent that the external threads need not be added and the bushing may be appropriately modified when the switch is to be mounted in another manner. Moreover, it will be similarly apparent that the operating lever, the bushing and the insert need not be cylindrical, and the lever ball need not be spherical as shown in the drawing. These members and their openings may have other shapes, in which case the gasket would be formed to have correspondingly appropriate shape to insure a sealing effect.

In each of the embodiments shown in Fig. 1 and Fig. 3 there is relative motion between the ball and the gasket as the lever is oscillated. Wear of either or both the gasket and the ball may be reduced by the introduction of a suitable lubricant between them. The effect, if any, of such a lubricant upon the seal, would be to increase the sealing effect.

I claim:

In an electric switch, the combination with a bushing having an axial opening therethrough of varying diameter to form an annular shoulder on the inner surface of said bushing, of an oscillatable operating lever having a substantially spherical portion disposed within said opening, an elastic sealing member comprising a hollow portion having inside dimensions normally less than the outside dimensions of said spherical portion, said hollow portion of said sealing member being complementally disposed about and elastically embracing said spherical portion and being slidable relative to said spherical portion of said lever as said lever is oscillated, said sealing member further comprising a circular flanged base portion having seating relation against said annular shoulder and a hollow member interposed between said sealing member and said inner bushing surface and having a circular lower edge adapted to compressviely hold said flange in circumferential sealing engagement with said shoulder, the inner surface of said hollow member being spaced radially outward from the hollow portion of said sealing member.

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