

[54] **PUSHBUTTON SWITCH WITH LIQUID DRAINAGE FACILITATING CAGE BODY, AND DIAPHRAGM SEALING AND ACTUATING MEANS**

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[58] Field of Search.....200/159 R, 159 A, 159 B, 168 G, 200/172 A, 153 V, 83 N, 83 B

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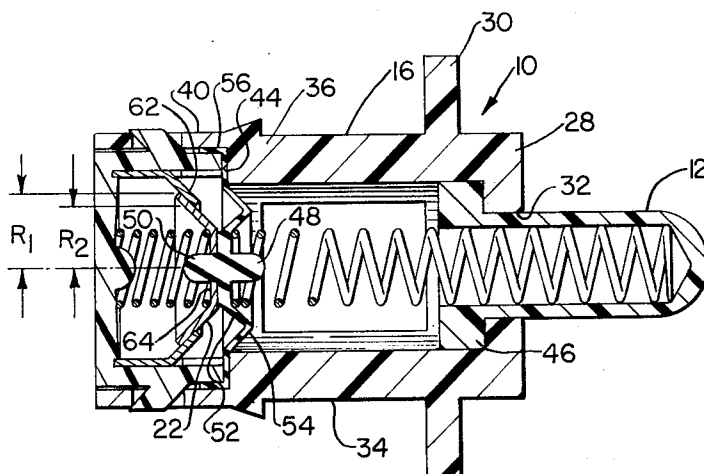
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[57]

ABSTRACT

This is a switch which includes a flexible diaphragm adapted to flex when actuated by a plunger spring thereby providing both a water-proof seal and part of the actuating system of the switch. The switch body is formed of an upper circular member having an axial hole formed therethrough and a lower circular member having an axial hole formed therethrough, the two members connected by a pair of legs which are in spaced opposed relation to each other providing an open cage like configuration which will allow water to drain outwardly and assist in waterproofing the switch.

4 Claims, 5 Drawing Figures



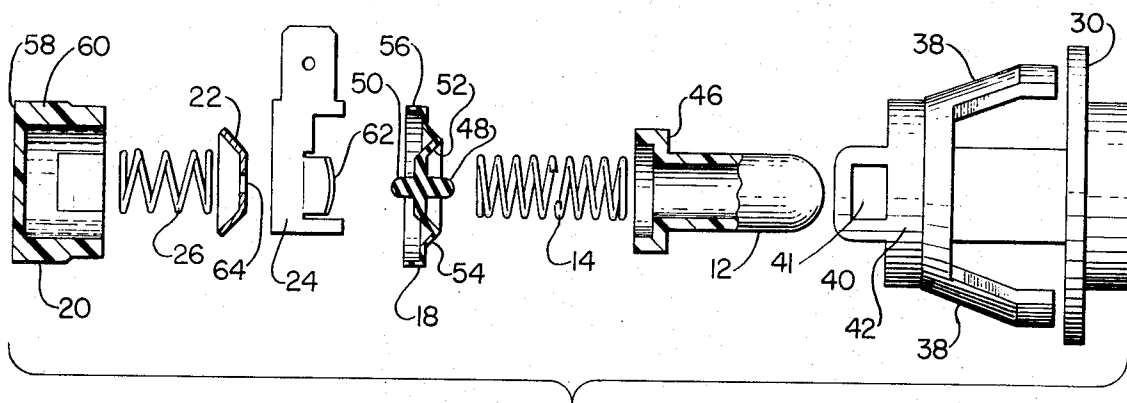


FIG. 1

FIG. 2

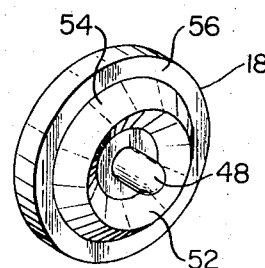
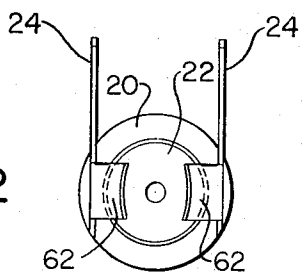


FIG. 3

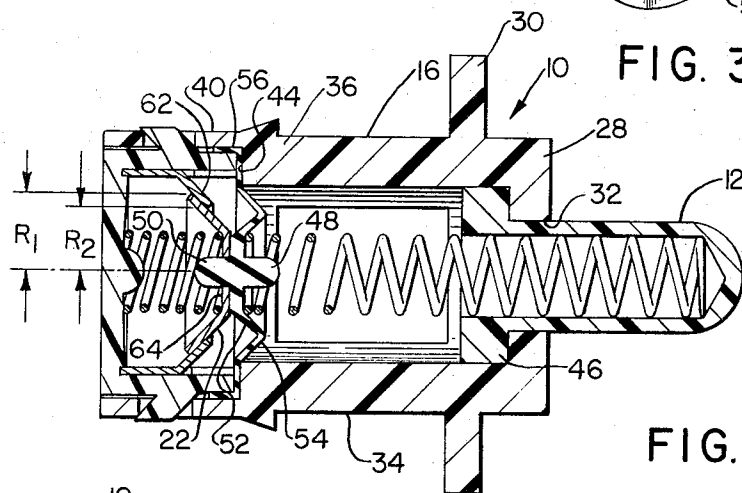


FIG. 4

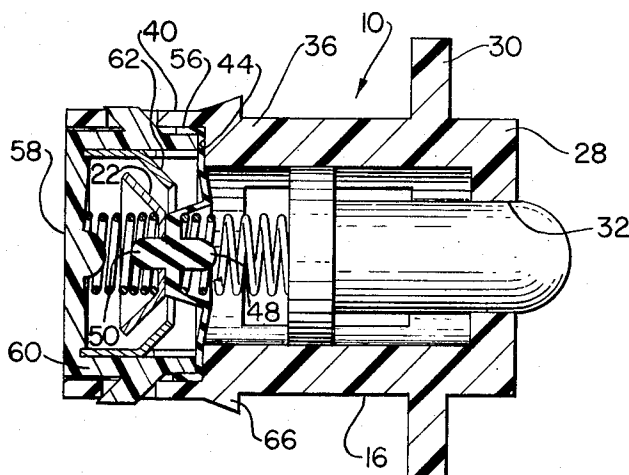


FIG. 5

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PUSHBUTTON SWITCH WITH LIQUID DRAINAGE FACILITATING CAGE BODY, AND DIAPHRAGM SEALING AND ACTUATING MEANS

BACKGROUND OF THE INVENTION

This invention is directed at door switches for refrigerators or at switches which operate in a humid or somewhat damp environment. Frequently, when a housewife cleans a refrigerator, she will take a damp cloth and pass it over the switch which is set in the door and which actuates the light in the refrigerator cabinet. This use of water would cause ordinary switches to short circuit thereby giving the person who is holding the cloth or sponge a shock.

DESCRIPTION OF PRIOR ART

The problem of short circuiting due to moisture has in the past been solved in two ways. Either by the use of gaskets or O-rings or by the use of an external boot or cover diaphragm.

The use of a gasket to water-proof a switch is shown in the patent to Long, U. S. Pat. No. 3,249,726. One of the difficulties in the use of gaskets is that they require extra spring force which may not be acceptable to refrigerator manufacturers because the extra force may push the door open or may cause the switch plunger to penetrate through thin door panels. Also in many switches using the gasket approach, the plunger spring carries current and may therefore be dangerous to a person using same.

Examples of the use of an external boot are shown in the patents to Cooper, U. S. Pat. No. 3,146,329, West, U. S. Pat. No. 3,204,069, and Miachon, U. S. Pat. No. 3,238,344. The use of the boot reduces the plunger stroke to one of less than a half inch. Also the boot takes up space and requires the use of more plunger force.

SUMMARY OF THE INVENTION

The applicant's water-proof switch utilizes an open cage construction which guides the flow of moisture along the arms causing the water to drip off away from the electrical mechanisms due to the pull of gravity. As to moisture which flows along the spring, this moisture is blocked by the diaphragm. The pull of gravity is utilized by having the axis of the switch at right angles to the pull.

An object of the present invention is to provide a switch which is capable of preventing short circuiting by moisture.

A further object of the present invention is to provide a water-proof switch which gains its ability to avoid short circuiting through the use of a diaphragm and an open cage construction.

A still further object of this invention is to provide a switch in which the plunger spring is insulated from the current carrying member.

Another object of the invention is to provide a switch having its contacts set in a compartment separate from the plunger compartment.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded view of the switch.

FIG. 2 is a plan view of the contact assembly of the switch shown in FIG. 1.

FIG. 3 is a perspective of the diaphragm.

FIG. 4 is a section of the switch.

FIG. 5 is a section of the switch with the plunger depressed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The switch 10 comprises a plunger 12, a plunger spring 14, a body 16, a rubber diaphragm 18, a movable contact 22, a pair of fixed contacts 24, a contact spring 26, and a case 20.

The body 16 includes a cylindrical plunger holder or upper portion 28 having a top surface and an annular flange 30 extending radially from an end and forming a right angle with the plunger holder 28. An aperture 32 is formed axially and centrally through the plunger holder 28. A cavity is formed within

the plunger holder 28 of greater diameter than the aperture 32 and into which the aperture 32 opens. An integral leg 34 extends from each side of the plunger holder 28. The legs 34 are in opposed relation to each other, in spaced, parallel relation to the axis of the switch, and are spaced from each other for the major portion of their length. Each of the legs 34 has transversely arced inner and outer surfaces. An integral ring portion 36 joins the legs 34 and provides a plane which is spaced in parallel relation to the annular flange 30. Two arms 38 extend from the ring portion 36 toward the flange 30. The arms 38 are in spaced opposed relation to each other, with a leg 34 between them on each side, and each has a free terminal end as well as a knuckle. Each of the legs 34 is continued beyond the ring portion 36 by a thinned extension 40 having a rectangular opening 41 and the ring portion 36 is continued for the rest of its circumference by a thinned skirt portion 42. The extension 40 and the skirt portion 42 form an internal shoulder 44 with the ring portion 36.

The plunger 12 comprises a tubular portion closed at one end and having an annular flange 46 extending radially adjacent to the other end which is open. The annular flange 46 has a skirt portion extending therefrom, and the tubular portion has a diameter less than the diameter of the aperture 32.

The diaphragm 18 includes a disc portion having a centrally located rod portion 48 extending axially from one side and a cylindrical post portion 50 extending axially from the other side. An inner wall 52 extends upwardly and outwardly from the circumference of the disc portion in spaced circumscribing relation to the rod portion 48. An outer wall 54 extends from the far edge of the inner wall 52 in angular relation therewith. The inner wall 52 and the outer wall 54 provide a V-shaped aspect in cross-section. A tab portion 56 extends from the free end of the outer wall 54 on the same plane as the disc portion in right angle relation to the axis of the diaphragm 18.

The contact assembly includes the case 20, the fixed and movable contacts and the contact spring 26. The case 20 comprises a base portion 58 having a circular wall 60 extending therefrom forming a well or cavity. The wall 60 has a slot formed on each side to accept a fixed contact 24. A projection 66 extends from the external surface of opposed sides of the wall 60. The fixed contact 24 comprises a terminal portion and a contact portion which is a continuation of the terminal portion having a contact 62 formed therefrom and bent in an angular relation therewith. The movable contact 22 is dome-shaped and has an opening 64 formed through its apex. The contact assembly is put together by placing one terminal end of the contact spring 26 against the base portion 58 of the case 20. A protuberance or projection extending from the base portion 58 will prevent the contact spring 26 from slipping sideways and will help center it when it is first placed within the case 20. The movable contact 22 is placed over the contact spring 26 with its apex directed away from the base portion 58. The fixed contact will engage in the slot formed in the wall 60 with each of the contacts 62 abutting in superimposed relationship a portion of the movable contact 22.

The switch 10 is assembled by passing the tubular portion of the plunger 12 through the aperture 32 in the body 16 until the annular flange 46 butts against the portion of the plunger holder 28 adjacent the aperture 32. The plunger spring 14 is placed within the tubular portion of the plunger 16 and extends axially therefrom. The diaphragm 18 is placed over the case 20 with the post portion 50 extending through the hole 64 in the movable contact 22. The rod portion 48 is engaged to a terminal end of the plunger spring 14 by placing the terminal end of the plunger spring 14 into the well formed by the disc portion and the inner wall 52 and into circumscribing relation with the rod portion 48.

The body assembly is engaged to the contact assembly by placing the extensions 42 against the outer surface of the case 20 with the skirt portion 44 circumscribing a portion of the case 20. An external shoulder can be formed on the case 20 to act as a stop for the free edge of the skirt portion 44. The pro-

jections 61 will engage against the walls of the rectangular openings 41.

If an axial force is applied to the plunger 12, the plunger 12 and the plunger spring 14 will move as a unit flexing the outer wall 54 of the diaphragm 18 downwardly toward the base 58. This movement will force the movable contact 22 against the contact spring 26 which compresses breaking the engagement between the fixed contacts 24 and the movable contact 22. The plunger spring 14 requires more force to compress than the contact spring 26. Once the contact spring 26 has built up sufficient resistance, the plunger spring 14 will compress providing overtravel.

With reference to the foregoing description it is to be understood that what has been disclosed herein represents an embodiment of the invention and is to be construed as illustrative rather than restrictive in nature and that the invention is best described by the following claims:

I claim:

1. A switch comprising an open cage body, having a series of unrestricted openings around its periphery, the body having an upper plunger holder, an integral leg extending from each side of the plunger holder, the legs being spaced from each other providing the unrestricted openings and in spaced parallel opposed relation to each other and to the axis of the switch and having an end and each of said legs having a transversely

arced inner surface and said ends being joined by an integral ring portion, a plunger movably associated with the body, between said legs, and having a plunger spring associated therewith, a contact assembly including a case, a contact spring engaged with the case and with a movable contact, at least one fixed contact, a flexible diaphragm directly engaged with the plunger spring and the movable contact and interposed therebetween, the case engaged to the body.

2. A switch as set forth in claim 1 wherein the diaphragm includes a disc portion having an inner wall extending upwardly therefrom and an outer wall extending from the inner wall forming an angle therewith, and a tab portion extending from the outer wall on substantially the same plane as the disc portion.

3. A switch as set forth in claim 2 wherein the disc portion has a rod portion extending from one side and post portion extending from the opposite side of the disc portion, the rod portion circumscribed by the plunger spring and the post portion circumscribed by the contact spring.

4. A switch as set forth in claim 3 wherein the plunger spring abuts the disc portion of the diaphragm and the movable contact has an aperture formed therethrough and the post portion extends into the aperture in the movable contact.

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