

[54] **ELECTRICAL SWITCH WITH CONTACT WIPING**

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[58] Field of Search 200/6 BB, 6 C, 16 A, 200/159 R, 159 A, 164 R, 166 J, 170 R

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[57] **ABSTRACT**

An electrical switch having two fixed electrical contacts which are mounted within a housing in spaced-apart, face-to-face relationship. Two movable electrical contacts are mounted in back-to-back relationship on the end of a resilient arm between the two fixed contacts. The resilient arm is engaged in its central portion by an actuating plunger which is spring-loaded to hold one pair of contacts in a normally closed position and the other pair of contacts in a normally open position. Manual movement of the plunger closes the normally open contacts and opens the normally closed contacts. Release of the plunger reverses the action. The resilient arm is bowed in its central portion where it engages the actuating plunger to produce a transverse contact wiping movement of the movable contacts whenever the contacts are opened or closed to automatically clean the contacts every time the switch is used. The fixed contacts are canted to increase contact pressure and to lengthen the contact wiping movement. The housing contains a projecting socket to provide a guide of increased bearing length for the plunger and its spring.

6 Claims, 6 Drawing Figures

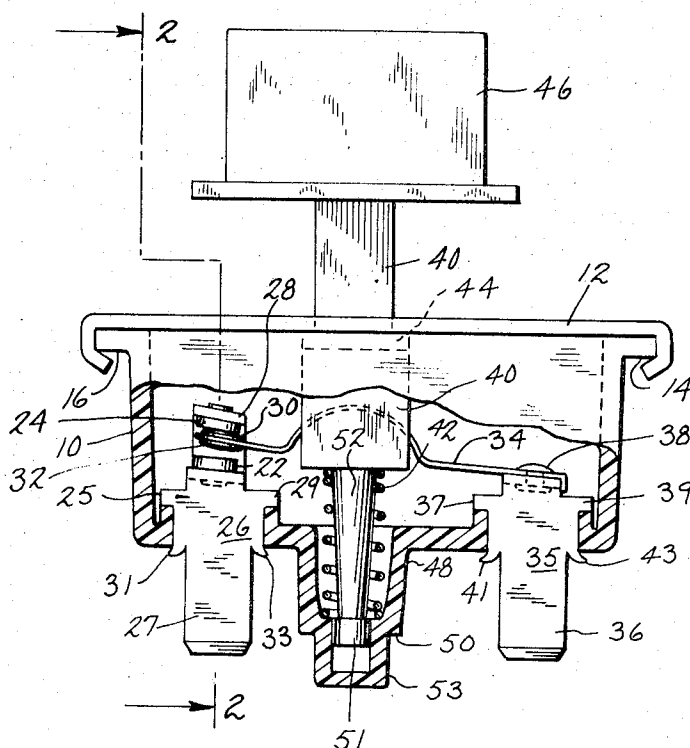


Fig. 1

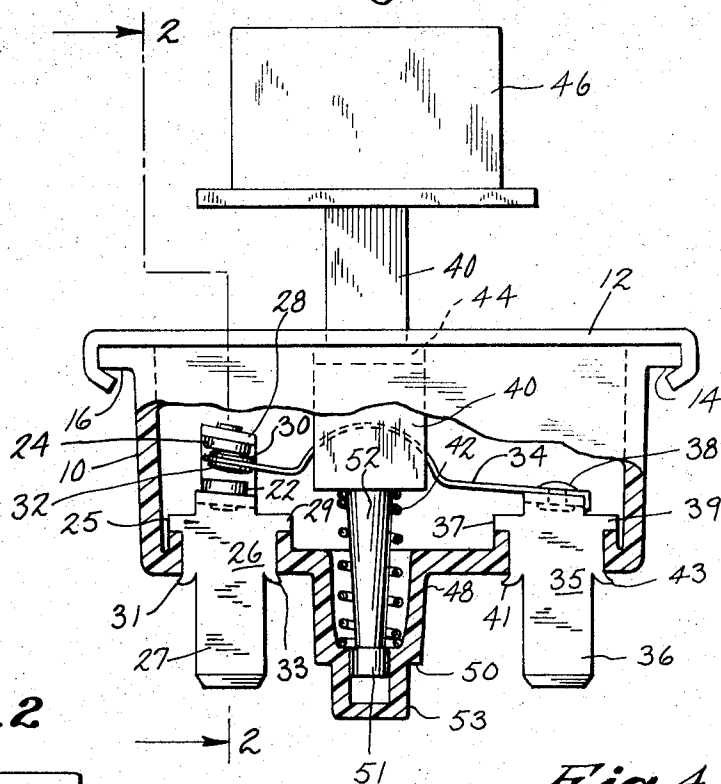


Fig. 2

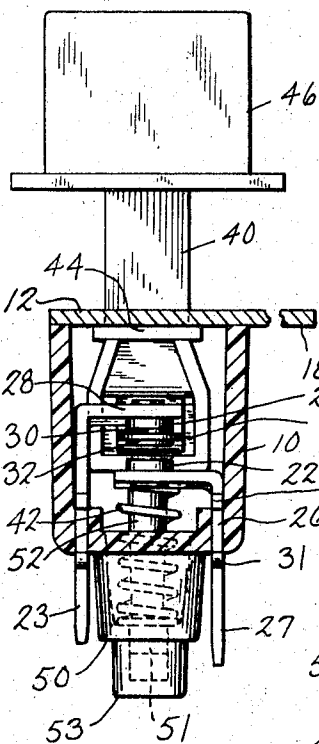


Fig. 3

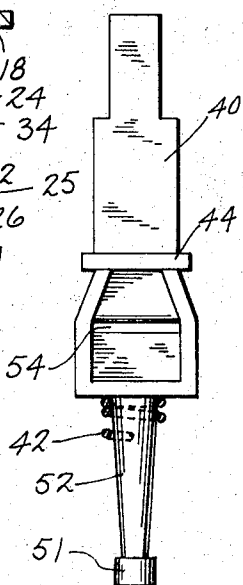


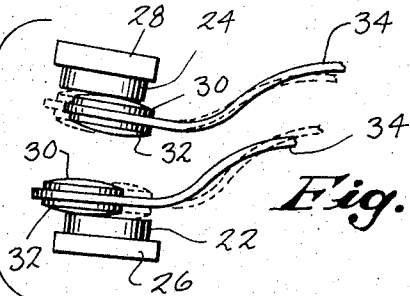
Fig. 4



Fig. 5



Fig. 6



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ELECTRICAL SWITCH WITH CONTACT WIPING

BACKGROUND OF THE INVENTION

This invention relates in general to electrical switches. In the past, difficulty due to corrosion of the contact surfaces has arisen in connection with electrical switches which are used in a moist environment such as encountered in washing machines and clothes dryers.

Accordingly, the principal object of this invention is to provide an electrical switch which contains means for automatically cleaning the contact surfaces to prevent corrosion thereof.

Another object of this invention is to provide an electrical switch of the above-noted character in which the automatic cleaning of the contact surfaces is performed in a simple and reliable manner which does not require the use of added parts to the switch.

A further object of the invention is to provide an electric switch having a novel housing assembly providing a compact arrangement while at the same time providing a guide of increased bearing length for the plunger and its spring.

A further specific object is to provide a switch as above described in which the base of the housing has a projecting socket portion positioned between terminals and forming a guide for the lower end of the plunger and a guide for the lower portion of the plunger spring, the arrangement being such as to eliminate friction between the spring and the housing and between the spring and the plunger and provide maximum distance between bearing points for improved "quality feel."

An additional object of the invention is to provide a switch having the fixed contacts thereof canted to increase contact pressure and to lengthen the contact wiping movement.

A further object of this invention is to provide a switch of the above-noted character which is simpler in structure and less expensive in cost than those heretofore known in the art.

SUMMARY OF THE INVENTION

In accordance with this invention, the above-noted objects are attained by providing an electrical switch having at least one fixed contact and at least one movable contact which is mounted on the end of a resilient arm facing the fixed contact. The resilient arm is engaged in its central portion by an actuating plunger to move the movable contact into and out of contact with the fixed contact. The resilient arm is bowed in the portion thereof which is engaged by the actuating plunger to produce a transverse contact wiping movement of the movable contact whenever the contacts are opened or closed to automatically clean the contacts every time the switch is used. The fixed contact is preferably canted to increase contact pressure and to lengthen the contact wiping movement. The invention also includes a novel housing assembly together with novel means for supporting and guiding the plunger in operating movement and for guiding the plunger spring.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of one illustrative embodiment of the invention partially in vertical section;

FIG. 2 is a cross-sectional view taken on the line 2—2 of FIG. 1;

FIG. 3 is a detail front view of the actuating plunger of the embodiment illustrated in FIGS. 1 and 2;

FIG. 4 is a detail side view of the resilient arm and movable contacts utilized in the embodiment illustrated in FIGS. 1 and 2;

FIG. 5 is a detail top view of the resilient arm and contact structure shown in FIG. 4; and

FIG. 6 is an enlarged side elevational view of the contacts showing how the transverse contact cleaning movement is produced.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIGS. 1 and 2, one illustrative embodiment of this invention is contained within a housing member 10 which is preferably made of a transparent plastic such as polycarbonate material. The housing member 10 acts as a support for the switch and is closed on its bottom side and open on its top side, which is covered by a metallic cover plate 12. The metallic cover plate 12 is attached over the top of housing member 10 by being crimped over flanged upper edges 14 and 16. The metallic cover plate 12 extends from one side of the housing 10 as indicated in FIG. 2 at the numeral 18 and has openings formed therein for receiving screws to mount the switch on a clothes dryer or other device.

Two fixed electrical contacts 22 and 24 are mounted within the housing 10 in spaced-apart, face-to-face relationship on corresponding mounting elements 26 and 28. Mounting elements 26 and 28 are made out of an electrically-conductive material such as brass and are adapted at their lower end portions 27 and 23 to serve as electrical terminals. Two movable electrical contacts 30 and 32 are mounted between the two fixed contacts 22 and 24 on the end of a resilient arm 34 which is attached at one end to a brass mounting element 35 by means of a rivet 38. The resilient arm 34 is made of an electrically-conductive spring material such as phosphor bronze, and the brass mounting element 35 is adapted at its lower portion 36 to act as an electrical terminal. The fixed contacts 22 and 24 are preferably canted at a slight angle with respect to the horizontal (referring to the drawings) to increase the contact pressure and increase the wiping movement of the contacts.

The resilient arm 34 is bowed in its central portion as shown in FIG. 4 and the central portion is engaged by an actuating plunger 40 (see FIG. 1) which is normally spring-loaded in the upward direction by means of a compression spring 42. Actuating plunger 40 is made of an insulating material. The upward movement of the plunger 40 is limited by an abutment 44 which bears against the cover plate 12 and limits the upward movement thereof. The upper end of actuating plunger 40 extends through an opening in the top of cover plate 12 and is attached to a button member 46 which is pushed to operate the actuating plunger 40. The compression spring 42 fits into a tubular projecting socket 48 in the bottom of the housing 10 and abuts against an annular shoulder 50 in the tubular socket 48. The lower portion of the plunger 40 is tapered as shown in FIG. 3 at 52 so as to prevent friction between the actuating plunger and the compression spring 42 when the plunger is

pushed down. There is a short cylindrical end 51 which is guided in a cylindrical projection 53 of the tubular socket. The compression spring 42 makes contact at its upper end with the outside diameter of the tapered portion 52 of plunger 40 and makes contact at its lower end with the inside diameter of tubular socket 48 above the shoulder 50. The tubular projecting socket 48 serves the purpose of permitting a relatively long compression spring 42 to be used and also provides a guide of increased bearing length for the plunger. It should be noted that the projecting socket 48 is positioned in the space between the electrical terminals 27, 23, and 36. This positioning provides the advantages noted above without increasing the size of the housing or interfering with the electrical connections in any way.

The resilient arm 34 passes through an opening 54 in actuating plunger 40 (see FIG. 3). When the plunger 40 is pushed downwardly, the resilient arm 34 is pushed downwardly along with it, carrying the two movable contacts 30 and 32 downwardly and making contact between the two contacts 22 and 32 (see FIG. 6). After contact has been initially made between the two contacts 22 and 32, as shown by broken lines in FIG. 6, the continued downward movement of plunger 40 straightens out the bend in the central portion of the resilient arm 34 and causes the movable contact 32 to move transversely and make a wiping movement over the surface of the stationary contact 22 to the full line position of FIG. 6. When the plunger 40 is released, the movable contact 32 makes another wiping movement over contact 22 before it breaks contact and then, as the contact 30 moves upwardly and initially touches the contact 24, as shown by broken lines in FIG. 6, a similar transverse wiping movement is produced by a shortening of the resilient arm 34 due to an increase in the bend in the central portion thereof. The dimensions of the plunger 40 and the spacing of the fixed contacts 22 and 24 and the free end of resilient arm 34 are arranged so that a normally closed position is maintained between the contacts 24 and 30 under the impetus of the spring 42 while a normally open condition is maintained between the contacts 22 and 32.

The mounting elements 26, 28, and 35 are held in place by means of projecting lugs which engage opposing edges of the housing 10. Referring to FIG. 1, mounting element 26 has upper lugs 25 and 29 and the lower lugs 31 and 33. The upper lugs 25 and 29 rest upon a thickened portion of the housing 10 and the lower lugs 31 and 33 are bent outwardly to engage the bottom of housing 10. Mounting element 35 has upper lugs 37 and 39 and lower lugs 41 and 43 for engaging the housing 10 as described above. Mounting element 28 has similar lugs but they are not visible in the drawings.

Although this invention has been described in connection with one specific embodiment thereof, it should be understood that the invention is not limited to the disclosed embodiment, since many modifications can be made in the disclosed structure without departing from the basic principles of operation set forth in this application. For example, although a two-pole switch having two pairs of matching contacts has been disclosed, it will be clear to those skilled in the art that this invention is also applicable to single-pole switches having only a single pair of contacts and to multi-pole

switches having three or more pairs of contacts. This and many other similar modifications of the invention will be apparent to those skilled in the art and this invention includes all such modifications falling within the scope of the following claims.

What I claim is:

1. An electrical switch comprising a support; a first fixed electrical contact mounted on said support; a resilient arm mounted on said support with one end of said arm being movable and positioned opposite said first electrical contact; an inner electrical contact attached to the movable end of said resilient arm on the side facing said first fixed electrical contact; an outer electrical contact on the other side of said arm; a mounting element projecting from said support and having a second fixed electrical contact positioned to be normally engaged by said outer contact of the arm, said resilient arm having a central portion bowed outwardly; an actuating plunger engaging the bowed portion of the resilient arm and mounted for movement transverse to the direction of extent of said resilient arm toward the support for moving said outer electrical contact of the arm away from said normally engaged second fixed electrical contact into engagement with the first fixed electrical contact while flattening out the bowed portion of the resilient arm and while causing a transverse wiping movement of said first electrical contact; spring means normally urging said actuating plunger and said resilient arm to move in a return direction back into engagement with said second fixed electrical contact, said spring means being positioned to act on the bowed portion of the resilient arm during such return movement to permit a shortening of the resilient arm and a wiping of said second fixed contact during such shortening.

2. An electrical switch as claimed in claim 1 in which the actuating plunger has an actuatable portion outwardly of the resilient arm and has a slot through which the bowed portion of the resilient arm slideably extends, and has an inner plunger portion inwardly of the resilient arm, the support having a socket with a portion shaped to receive and guide said inner plunger portion, and in which said spring means is a coil spring surrounding said inner plunger portion, said socket having an enlarged portion forming a pocket for one end of said coil spring.

3. An electrical switch as claimed in claim 2 in which the support is in the form of a cup-shaped casing, and in which the socket is formed in and projects outwardly from the bottom of the cup and has a first enlarged portion forming the spring pocket and a reduced diameter portion guiding said inner plunger portion.

4. An electrical switch as claimed in claim 2 in which the inner plunger portion which is within the spring pocket is surrounded by the coil spring and of downwardly-tapered form to minimize frictional contact with said spring.

5. An electrical switch as claimed in claim 4 in which the spring pocket portion of the socket has sides tapered in a direction to minimize rubbing contact during flexing of the coil spring.

6. An electrical switch as claimed in claim 3 in which there are electrical terminals projecting from the bottom of the cup, one on each side of said socket.

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