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LIQUID MEANS FOR IMPROVING CURRENT CARRYING
CAPACITY OF REED TYPE SWITCH
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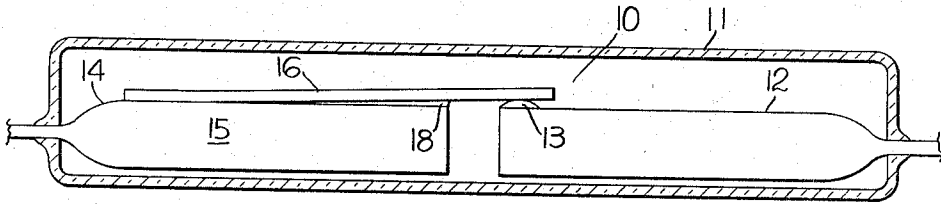


Fig. 1

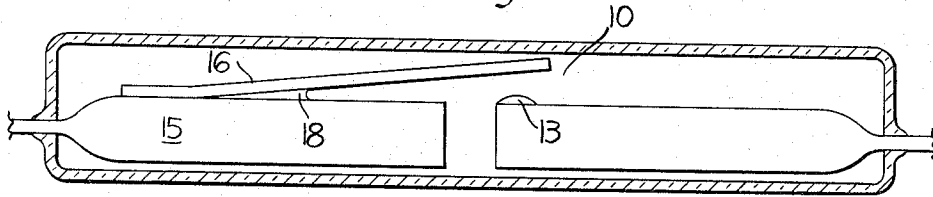


Fig. 2

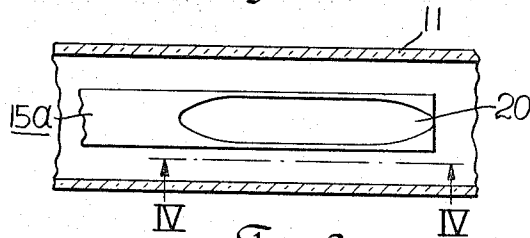


Fig. 3

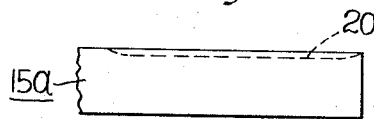


Fig. 4

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LIQUID MEANS FOR IMPROVING CURRENT CARRYING CAPACITY OF REED TYPE SWITCH

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3 Claims. (Cl. 335-154)

This invention relates generally to reed type electrical switches. More particularly, it relates to means for improving the current carrying capacity of such switches.

Some types of reed type switches comprise a pair of spaced apart electrically conductive members which are bridged by a movable contact in the form of thin flexible electrically conductive reed or blade. Very often, the switch is enclosed within a sealed glass tube to protect it from environmental conditions. These switches are very fast acting and reliable but one inherent significant limitation is that only a very small amount of current can be handled due to the small cross-sectional area of the reed. The small cross-sectional area of the reed results in ohmic heating and inhibits heat dissipation.

The present invention contemplates a reed type switch wherein one end of the reed is electrically and mechanically connected to one conductive member and a portion of the reed lies adjacent thereto. The reed is movable so that the other end of the reed can engage or disengage the other conductive member.

In accordance with the present invention, a liquid having good electrical and thermal conductivity and good wetting properties, such as mercury, is disposed between and wets the reed and the conductive member on which it is mounted. Liquids other than mercury could be employed, such as gallium, which is liquid at normal ambient temperatures. The liquid is retained therein by capillary action. When the switch is closed and the reed engages the other conductive member, the liquid is squeezed to the end of the one conductive member. Consequently, the electrical path comprising the one conductive member, the reed, and the liquid has an effective current carrying cross-sectional area which is greater than the cross-sectional area of the reed alone. As a result, ohmic heating is reduced and any heat generated is more readily dissipated. In addition, the liquid helps reduce contact bounce which tends to occur as the reed moves open and closed and other vibration. Ohmic heating of the switch can be further reduced by reducing the gap between the two conductive members.

It is an object of the present invention to provide a new and improved reed type switch having increased current carrying capabilities and improved heat dissipation characteristics.

Another object is to provide a switch of the aforesaid character which uses an electrically conductive liquid, such as mercury, to increase the effective cross-sectional area of the reed.

Another object is to provide a switch of the aforesaid character wherein means are provided to aid in retaining the liquid in position.

Another object is to provide a switch of the aforesaid character wherein the liquid also serves to reduce bounce and vibration of the reed.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawing illustrates two preferred embodiments of the invention but it is to be understood that the embodiments illustrated are susceptible of modifications with respect to details thereof without departing from the scope of the appended claims.

In the drawing:

FIG. 1 is a side elevational view, partly in section, of a reed type switch incorporating the present invention and showing the switch in closed position;

FIG. 2 is a view similar to FIG. 1 but showing the switch in open position;

FIG. 3 is a top plan view of a portion of the switch shown in FIG. 2 but showing a modification thereof; and

FIG. 4 is a side elevational view taken along line IV-IV of FIG. 3.

Referring to the drawing, the numeral 10 designates a reed type switch which is enclosed within a glass tube 11. Switch 10 comprises one conductive member which serves as a stationary contact 12 and another conductive member which serves as a movable contact 14. Stationary contact 12 is provided with a contact portion 13 near its end. Movable contact 14 comprises an electrically conductive base 15 and an electrically conductive armature 16. Armature 16 is a thin flexible electrically conductive reed which has one end electrically and mechanically attached to base 15, as by spot welding. Armature 16 lies adjacent to base 15, bridges the gap between base 15 and stationary contact 12 and lies adjacent to contact portion 13.

In FIG. 1, switch 10 is shown in closed position wherein armature 16 makes electrical contact with contact portion 13. In FIG. 2, switch 10 is shown in open position wherein armature 16 is disengaged from contact portion 13.

In accordance with the present invention a liquid 18 having good electrical and thermal conductivity and good wetting properties, such as mercury, is disposed between base 15 and armature 16 of switch 10. Liquid 18 wets the upper surface of base 15 and the lower surface of armature 16 and is maintained in position as a result of capillary action. When switch 10 is open, as shown in FIG. 2, liquid 18 assumes the position shown in FIG. 2. When switch 10 is closed, as shown in FIG. 1, liquid 18 assumes the position shown in FIG. 1. More specifically, liquid 18 is squeezed between base 15 and armature 16 to fill out the space to the very end of base 15. Consequently, there is only a very short portion of armature 16 between base 15 and contact portion 13 on stationary contact 12 through which the total current through the switch must flow. This short portion of armature 16 has a relatively small cross-sectional area and is therefore subjected to the greatest ohmic heating. However, this distance can be reduced by disposing base 15 and stationary contact 12 more closely together. It is to be understood that without the use of liquid 18, current would have to flow through a greater length of armature 16. Thus, liquid 18 effectively increases the overall current carrying capacity of the switch and also improves the heat dissipation from that portion of armature 16 through which current flows.

FIGS. 3 and 4 show another embodiment of the invention wherein a base 15a which is similar to base 15 in FIGS. 1 and 2 is provided with a shallow depression 20 in which a conductive liquid can be disposed and which aids in retaining the liquid in proper position. Depression 20 is helpful in containing the liquid especially in situations where the switch is not mounted in a horizontal position and the liquid might tend to flow away from its position between the base and the armature.

It is to be further understood that disposition of a liquid between and its adherence to flexible armature 16 and base 15 also tends to exert a damping influence on armature 16 which reduces movement of armature 16 caused by contact bounce or vibratory forces.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

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1. In an electric switch,
 a stationary contact,
 a movable contact comprising an electrically conduc-
 tive base and electrically conductive armature of
 relatively small cross-sectional area with respect to
 said base connected to said base and movable into
 and out of engagement with said stationary contact,
 a portion of said armature lying adjacent a portion of
 said base and defining a space therebetween when
 said armature is out of engagement with said sta-
 tionary contact, and
 an electrically conductive liquid disposed in a portion
 of said space between said base and said armature,
 said liquid being squeezed to occupy another portion
 of said space when said armature moves into engage-
 ment with said stationary contact to thereby effec-

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tively shorten the electrical current path through
 said armature to said base.
 2. The combination according to claim 1 wherein said
 liquid is mercury.
 3. The combination according to claim 1 wherein said
 base is provided with a recess in the portion adjacent said
 armature in which said liquid is disposed.

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