United States Patent [19]

Kimball et al.

[11] **3,821,685**

[45] **June 28, 1974**

[54] **THERMALLY RESPONSIVE NON-RESETTABLE ELECTRIC SWITCH**

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[22] Filed: **Oct. 29, 1973**

[21] Appl. No.: **410,879**

[52] **U.S. Cl.** **337/409**

[51] **Int. Cl.** **H01h 37/76**

[58] **Field of Search** 337/401, 407, 409, 408, 337/52, 403, 402, 404, 414, 415, 412, 410

[56] **References Cited**

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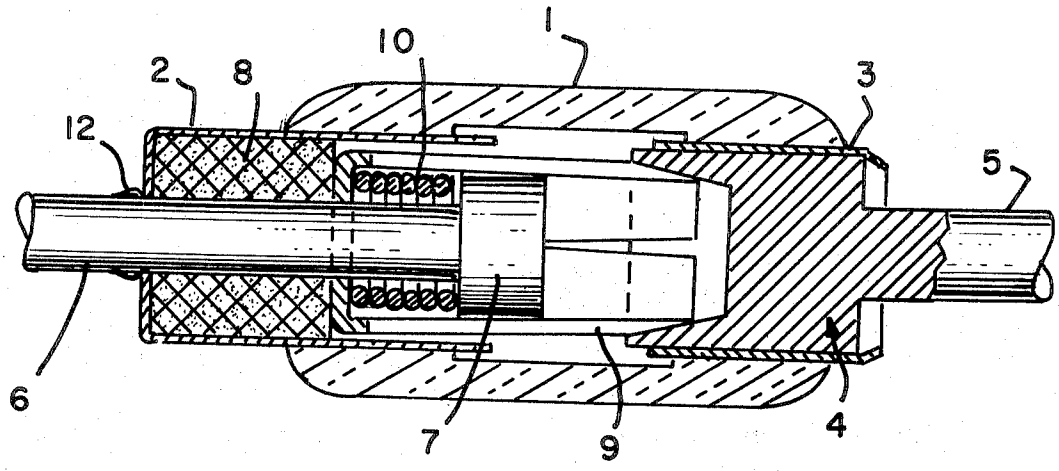
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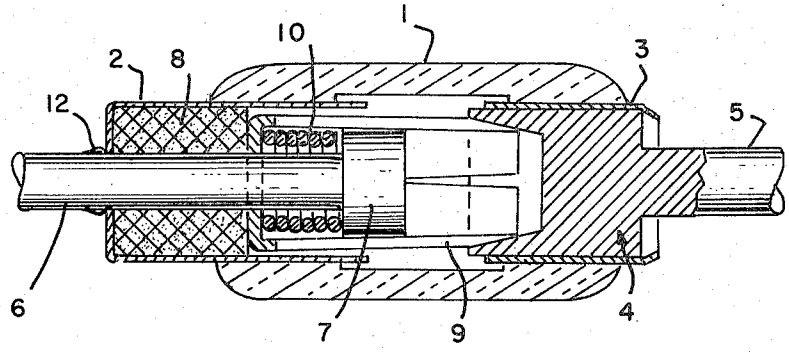
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[57] **ABSTRACT**

An electric switch comprises a glass cylindrical envelope having lead-in wires disposed at each end thereof along the central axis of the cylinder. A conical end closure connected to one of the lead-in wires electrically contacts a slotted can within the envelope. Electrical contact between the slotted can and the second lead-in wire is established, utilizing a coil spring and a pellet of meltable material. When the switch attains a temperature high enough to melt the pellet, the switch opens.

4 Claims, 1 Drawing Figure




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THERMALLY RESPONSIVE NON-RESETTABLE ELECTRIC SWITCH

THE INVENTION

This invention concerns non-resettable protective electric switches of the type that are normally closed but which open when the switch is heated to a predetermined temperature. Such switches are generally used to protect electrical devices and appliances from overheating. When such an overheating condition does occur, the opened switch must be removed from the circuit and replaced by a new switch, preferably after the cause of overheating has been corrected.

Previously, cycling or bimetal type of thermal protectors have been used to prevent overheating in electrical appliances. However, such protectors have contacts which, after many cycles of operation, can arc and weld themselves together, thereby rendering the protector inoperative.

This invention provides a non-resettable protector switch which must be discarded after it has been tripped. Replacement with a new switch will ensure that the electrical appliance is always protected against overheating.

A switch in accordance with this invention has a cylindrical envelope made of glass for electrical insulating purposes. Disposed at each end of the envelope are external lead-in wires along the central axis of the envelope. The lead-in wires are fastened to short metal tubes or closures which, in turn, are fastened to the ends of the glass envelope by glass-to-metal seals. One of the lead-in wires is fastened to a conical plug which is disposed within a metal tube at one end of the envelope. The second lead-in wire extends through a metal cap at the other end of the envelope and has a cylindrical head at its internal end. Encirclingly disposed around the second lead-in wire and within the end cap is a cylindrical pellet of meltable material. The pellet rests between the end cap and the bottom of a cylindrical can, which is disposed within the envelope. The can is longitudinally slotted and has a slight taper at its other end in order to fit into the cone of the conical plug which is fastened to the first lead-in wire. Disposed within the slotted can is a coil spring, which is compressed between the end of the can and the underside of the head of the second lead-in wire. The slotted can is a current-carrying element and, as long as the meltable pellet retains its rigidity, there is electrical continuity within the switch from one lead-in wire to the other. When the pellet melts, the spring pushes the slotted can away from the conical end closure thereby breaking the electrical connection therebetween.

The single FIGURE in the drawing is an expanded sectional view of a thermal switch in accordance with this invention.

In the embodiment shown in the drawing, envelope 1 was a ½ inch length of G12 glass tubing, having outside and inside diameters, respectively, of 150 and 110 mils. Sealed to one end of glass envelope 1 was a tubular metal end cap 2 made of 5 mil thick metal and having an outside diameter of 100 mils and a length of 150 mils. End cap 2 had a 41 mil axial hole therethrough.

Sealed to the other end of envelope 1 was a 5 mil thick metal tube 3 the length and outside diameter of which were 100 mils. Extending into tube 3 and fastened thereto was conical end closure 4 which was connected to external lead-in wire 5. End closure 4 was substantially cylindrical, having an outside diameter of 99 mils and a length of 120 mils. The internal end of end closure 4 had a conically shaped cylindrical hole therein, the hole having a depth of 50 mils and a diameter of 93 mils tapering to 79 mils.

Lead-in wire 6, having a diameter of 40 mils, extended through the hole in end cap 2 and was peripherally cold headed at 12 to secure it. The internal end of lead-in wire 6 had a cylindrical head 7, head 7 having a diameter of 70 mils and a thickness of 40 mils. Disposed around lead-in wire 6, within end cap 2, was a ring-shaped meltable pellet 8. Pellet 8 had a melting point of 238° F, but was substantially rigid at temperatures therebelow. Pellet 8 had an outside diameter of 100 mils, a length of 100 mils and an axial hole therethrough of 41 mils through which lead-in wire 6 extended.

Disposed between pellet 8 and end closure 4 was a slotted can 9, can 9 being longitudinally slotted for about 85 percent of its length starting from the end in contact with end closure 4. Can 9 had a length of 180 mils, an outside diameter of 91 mils and an axial hole through its closed end of 41 mils. Can 9 was made of 10 mil copper, silver plated, and had a slight taper at its open end so that, at assembly of the device, the open end of can 9 was frictionally inserted into conical end closure 4, the slotted copper being readily deformable for this purpose, thereby establishing good electrical contact between end closure 4 and can 9.

Cylindrical head 7 of lead-in wire 6 was disposed within can 9 and frictionally engaged the walls thereof sufficiently to establish good electrical contact therebetween. Compressed between head 7 and the bottom of can 9 was a coil spring 10 made of 9 mil music wire and having an outside diameter of 64 mils.

In operation, electrical contact between lead-in wires 5 and 6 is as follows: from lead-in wire 5 through conical end closure 4 to slotted can 9 to cylindrical head 7 of lead-in wire 6. When pellet 8 is heated to its melting point, it can no longer resist the force of spring 10 tending to push the bottom of can 9 towards the lead-in wire 6 end of the switch. When this axial movement of can 9 does occur, electrical contact between end closure 4 and can 9 is broken.

We claim:

1. A thermally responsive non-resettable electric switch comprising: a cylindrical glass envelope having metal closures sealed to each end thereof; lead-in wires at each end of said envelope disposed along the axis thereof; a conical end closure fastened to the internal end of one of said lead-in wires; a cylindrical head fastened to the internal end of the other lead-in wire; a longitudinally slotted can disposed within said envelope and providing electrical continuity between said conical end closure and said cylindrical head; a pellet of meltable material disposed at one end of said envelope; and a coil spring, in compression, disposed within said slotted can between the bottom thereof and said cylindrical head.

2. The switch of claim 1 wherein the open end of said slotted can is slightly tapered and is in frictional engagement with said conical end closure.

3. The switch of claim 1 wherein said cylindrical head has sufficient engagement with the interior walls of said slotted can to provide good electrical contact therebetween.

4. The switch of claim 1 wherein said pellet has a predetermined melting temperature upon attainment of which said spring forces said slotted can out of electrical contact with said conical end closure.

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