United States Patent

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[33] Israel
[31] 30399

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[54] ELECTRICAL SWITCH RESPONSIVE TO SUDDEN MOVEMENTS OF AN EXTERNAL ELEMENT

9 Claims, 2 Drawing Figs.

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[51] Int. Cl. H01h 3/02
[50] Field of Search 340/261; 200/61.44, 61.93

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ABSTRACT: An electric switch responsive to sudden movements of an external element, but not to slow movements thereof, comprises a pair of electrical contacts separated by a yieldable connection which causes one to move with the other, and a flowable material, such as silicone putty, tending to resist the movement of the one contact with the other, the flowable material being free-flowing under low stress but not under a sudden high stress, whereby under s sudden movement of the external element and the one contact, the flowable material resists the movement of the other while the yieldable connection yields, thus effecting actuation of the switch; whereas upon a slow movement of the external element and the one contact, the flowable material flows and permits the other contact to move therewith, thus not effecting actuation of the switch.

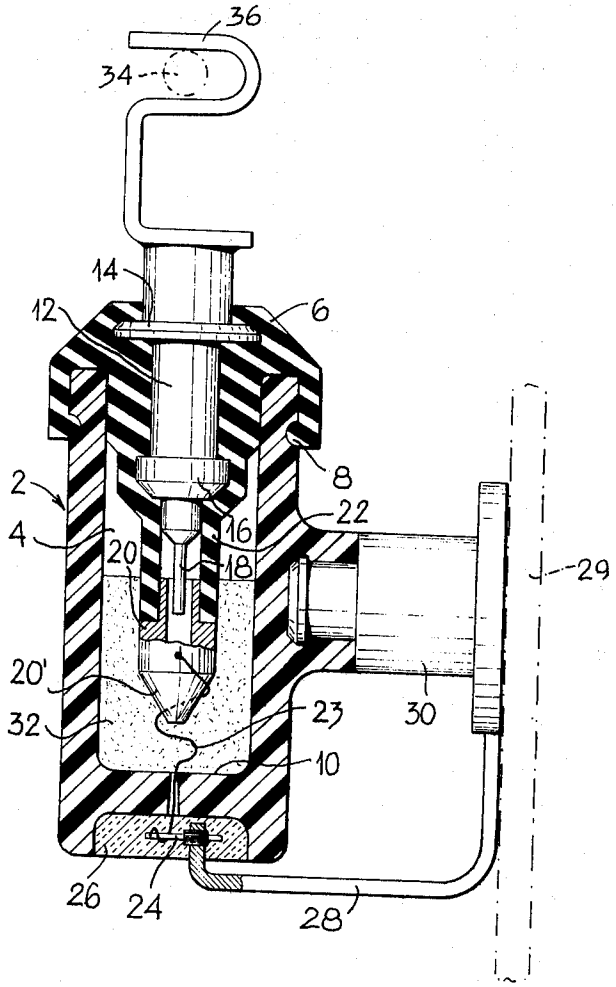


FIG. 1

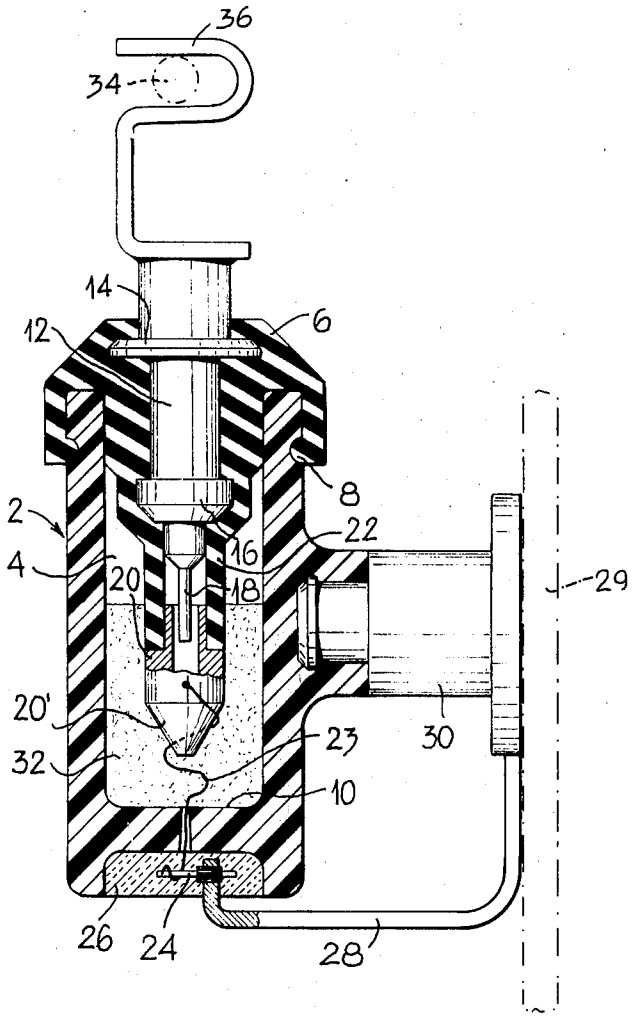
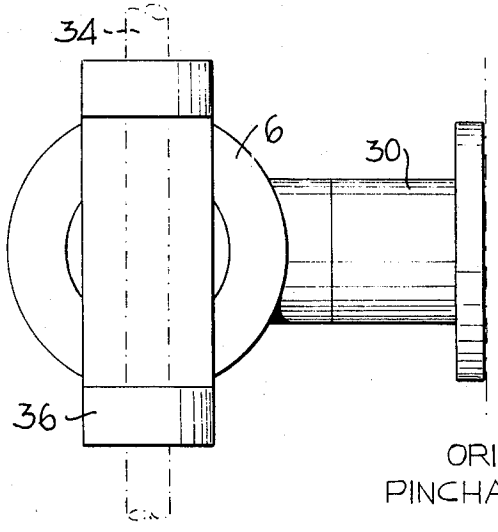


FIG. 2



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ELECTRICAL SWITCH RESPONSIVE TO SUDDEN MOVEMENTS OF AN EXTERNAL ELEMENT

This is a continuation of application Ser. No. 842,114, filed July 16, 1969.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to electrical switches, and particularly to electrical switches responsive to movements or displacements of an external element.

2. Description of the Prior Art

Many types of movement-responsive or displacement-responsive electrical switches are known. All or most of the known ones, however, cannot distinguish between sudden or quick movements on the one hand, and slow movements on the other. There are some applications where it is desired to have the electrical switch responsive only to sudden or quick movements, and to be nonresponsive to slow movements. For example, one such application would be in protective systems for wire-fenced areas, where it may be desired to actuate the protective system (e.g. to provide a signal or sound an alarm) when the wire fence is pulled or cut in order to gain entry, but not to actuate the protective system when slow movements of the wire fence are involved, such as arising from the expansion or contraction of the wire because of temperature changes.

SUMMARY OF THE PRESENT INVENTION

An object of the present invention is to provide a simple electrical switch which is responsive to sudden movements of an external element but is nonresponsive to slow movements of the element.

According to the invention, there is provided an electrical switch responsive to sudden movements of an external element, characterized in that it includes a housing formed with an internal chamber containing a first electrical contact adapted to be physically connected to the external element to be moved thereby, a second electrical contact movable relative to the first contact to effect actuation of the switch, a yieldable connection between the first and second contacts tending to cause the latter to move with the former upon the movement of the former by the external element, and a flowable material tending to resist the movement of the second contact with the first contact. The flowable material is free flowing under a low stress but not under a sudden high stress. The arrangement is such that a sudden movement of the external element causes the flowable material to resist the movement of the second contact with the first contact while the yieldable connection yields, thus effecting actuation of the switch; whereas a slow movement of the external element causes the flowable material to permit the movement of the second contact with the first contact by the yieldable connection, thus not effecting actuation of the switch.

The flowable material could conceivably be a liquid, e.g. a very viscous organic dielectric liquid, or even a paste.

According to a further important feature of the invention, however, the flowable material is preferably silicone putty. This material has the appearance of ordinary putty but possesses a unique combination of physical properties. Under low stress it is plastic and free flowing and even flows under its own weight. However, under sudden stress it acts as a solid; it will bounce when rolled as a ball and will even shatter like glass. This material is known and has been commercially available for a number of years. It is commonly used as a toy or novelty item and as an exerciser for crippled muscles. Particularly good results are attained when it is used as the flowable material in the switch of the present invention. One product that may be used is that known as "general Electric G–E SS–91 Silicone Bouncing Putty."

Further features and advantages of the invention will be apparent from the description below.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein:

FIG. 1 is a longitudinal sectional view of an electrical switch constructed in accordance with the invention; and

FIG. 2 is a top plan view of the switch of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The switch illustrated in the drawings comprises a cylindrical plastic housing **2** formed with an internal cylindrical chamber **4**. The upper end of the chamber is closed by a cap **6** of resilient insulating material formed with an internal annular lip **8** adapted seat in an annular groove in the housing wall. The lower end of chamber **4** is closed by wall **10**.

A metal rod **12** passes through resilient cap **6** and is anchored within the cap by a pair of annular rings **14** and **16** fixed to the rod. A metal pin **18** is fixed to the lower ring **16** and serves as one of the electrical contacts of the switch. The second electrical contact is in the form of a metal sleeve **20** supported by a resilient insulating sleeve **22** which is a continuation of resilient cap **6**, contact **20** being normally supported around, and out of engagement with, contact **18**. The lower end of contact **20** is tapered as shown at **20'**. An electrical conductor **23**, connected to the lower end of contact **20**, passes through wall **10** and is connected to a terminal **24** fixed within a recess **26** at the bottom of the housing.

Terminal **24** is fixed to a metal bracket **28** used in mounting the switch to a support, e.g. post **29**, and also in making an electrical connection to the switch. Recess **26** is filled with a plastic material, such as an epoxy resin, to insulate terminal **24** and also to reinforce the mounting of bracket arm **28** to the housing. The switch mounting also includes a second metal arm **30** embedded in a midportion of housing **2**.

Within the chamber **4** of the housing there is disposed the flowable material **32** namely the silicone putty mentioned earlier. This material fills chamber **4** to the level of the upper end of switch contact **20**.

This upper end of metal rod **12** protruding through resilient cap **6** is adapted to be physically connected to the external element whose sudden movement is to be sensed. For example, this external element may be a wire **34** of a fence, as briefly mentioned earlier, and for this purpose the upper end of rod **12** carries a clamping element or hook **36** adapted to be clamped or hooked to the wire.

The operation of the switch will be apparent from the foregoing description. Assuming that the switch is to be used for sensing the sudden movement of wire **34** of a fence, bracket arms **28** and **30** would be mounted to pole **29** of the fence with clamp **36** engaging the wire. One side of the electrical circuit (e.g., a signalling or alarm circuit) would be connected to the wire **34**; and the other side would be connected to the metal bracket **28** or to the post **29**, if metal.

Under normal conditions, contact **18** is spaced from contact **20**, and therefore this electrical circuit is open. When a stress is applied to wire **34**, clamp **36** is permitted to pivot by resilient cap **6**, this also causing electrical contact **18** to pivot. Contact **20**, being mounted to contact **18** by means of resilient insulating sleeve **22** which acts as a yieldable connection, also tends to move with that contact, but this movement is opposed by the flowable silicone putty **32**.

Now, if the movement of wire **34** is sudden and large, such as would be produced by someone pulling or cutting the wire to gain access into the protected area, a high stress is produced in the flowable silicone putty **32**. Since this material is not free flowing under high stress, it will resist the movement of contact **20** with contact **18**. Contact **18** will thus engage contact **20**, while the resilient sleeve **22** yields, and the switch will be actuated to sound the alarm or to provide the signal.

On the other hand, if the movement of wire **34** is very slow, such as would be produced by the expansion or the contraction of the wire during changing temperature conditions, or by the wind, the flowable silicone putty **32** is subjected to a low stress. This material being relatively free flowing under low stresses, it will not prevent the movement of contact **20** with contact **18** by resilient sleeve **22**, and thus the two contacts will be held apart, and the switch will not be actuated.

Many changes, variations and other applications of the illustrated embodiment of the invention will be apparent.

What is claimed is:

1. An electrical switch responsive to sudden movements of an external element, characterized in that it includes a housing formed with an internal chamber containing a first electrical contact adapted to be physically connected to said external element to be moved thereby, a second electrical contact movable relative to said first contact to effect the actuation of said switch, a yieldable connection between said first and second contacts tending to cause the latter to move with the former upon the movement of the former by said external element, and a flowable material tending to resist the movement of said second contact with said first contact, said flowable material being substantially more free flowing under a low stress than under a sudden high stress, whereby a sudden movement of the external element causes the flowable material to resist the movement of said second contact with said first contact while said yieldable connection yields, thus effecting actuation of said switch, whereas a slow movement of the external element causes the flowable material to permit the movement of said second contact with said first contact by said yieldable connection, thus not effecting actuation of said switch.

2. An electrical switch as defined in claim 1, wherein said flowable material is silicone putty.

3. An electrical switch as defined in claim 1, wherein said second contact is a metal sleeve, and said yieldable connection is a resilient insulating sleeve normally supporting said second contact around and out of engagement with said first contact.

4. An electrical switch as defined in claim 3, wherein said resilient sleeve is carried by a resilient cap closing the upper end of said housing, said resilient cap supporting said first contact in suspension and including a rigid member passing therethrough and adapted to be connected to said external element.

5. An electrical switch as defined in claim 4, wherein said flowable material fills said housing chamber to the level of said second contact, the latter being tapered at its lower end.

6. An electrical switch as defined in claim 1, further including a metal bracket arm attached to the housing at the lower end thereof, there being an electrical connection between said second contact and said bracket arm.

7. An electrical switch as defined in claim 6, further including a second bracket arm attached to a midportion of said housing for mounting same to a support.

8. An electrical switch as defined in claim 2, wherein said second contact is a metal sleeve, and said yieldable connection is a resilient insulating sleeve normally supporting said second contact around and out of engagement with said first contact.

9. An electrical switch as defined in claim 8, wherein said resilient sleeve is carried by a resilient cap closing the upper end of said housing, said resilient cap supporting said first contact in suspension and including a rigid member passing therethrough and adapted to be connected to said external element.

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