



(19)

Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 793 248 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
03.09.1997 Bulletin 1997/36

(51) Int. Cl.⁶: **H01H 37/76**

(21) Application number: **96119859.5**

(22) Date of filing: **11.12.1996**

(84) Designated Contracting States:
AT BE CH DE ES FR GB IT LI LU NL SE
Designated Extension States:
SI

(72) Inventor: **Capraro, Duilio**
31015 Conegliano (IT)

(74) Representative: **Piovesana, Paolo**
Corso del Popolo, 70
30172 Venezia-Mestre (IT)

(30) Priority: **01.03.1996 IT VE960008 U**

(71) Applicant:
I.R.C.A. S.p.A. INDUSTRIA RESISTENZE CORAZ
ZATE E AFFINI
I-31020 San Vendemiano (Treviso) (IT)

(54) Safety fuse, in particular for armoured electrical resistance elements

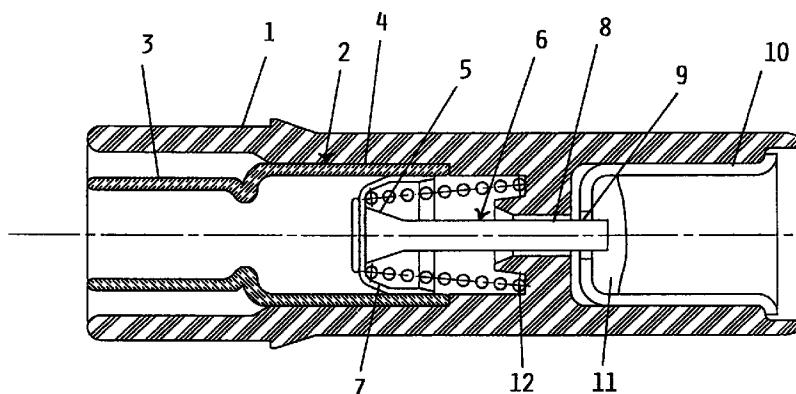
(57) A safety fuse, in particular for armoured resistance elements, characterised by comprising:

- a bush (1) of dielectric material, internally housing two terminals (2,10) separated from each other and engagable by electrical conductors (16,15) of the resistance element (14), one (15) of said terminals being rigid with a metal block (11) retaining a metal slider (6) which is also in contact with the other ter-

minal (16),

- elastic means (12) being provided which, following fusion of the metal block (11) by overheating, cause the slider (6) to move axially, with relative interruption of the electrical circuit.

FIG. 1



EP 0 793 248 A2

Description

This invention relates to a safety fuse, in particular for armoured electrical resistance elements.

Armoured electrical resistance elements are known consisting of an electrical resistance element housed in a metal sheath or armour and maintained electrically insulated from the walls of this latter, which is connected to earth. The resistance element is dimensioned for correct operation under specific operating conditions, which differ according to the use for which it is intended (operation in water or air).

Notwithstanding its correct dimensioning and in spite of careful inspection and tests regarding its insulation and operation, it is possible that for accidental reasons, such as a material defect, a fault or improper use of the appliance, the electrical resistance element is forced to operate under conditions different from and more severe than those intended, this being almost always a reason for its rapid deterioration and possible damage to other parts of the appliance to which the resistance element is fitted.

For example, if a resistance element intended for operation in water instead operates in air, the lack of fluid cooling results in a rapid increase in the temperature of the region concerned, with possible negative consequences for the resistance element itself and for the entire appliance to which it is fitted.

To eliminate these drawbacks it has already been proposed to form a resistance element comprising a tubular sheath surrounding an electrical heating spiral. A safety device is provided at one end of the sheath and comprises an electrical conductor arranged in a cavity in the end of the sheath and having one end electrically connected to the heating spiral. A rod of deformable material extends into the sheath from the closed end to make contact with a normally closed positioned external to the sheath and connected in series with the resistance element and hence with the heating spiral.

If the resistance element overheats, the rod deforms and consequently forces the switch into its open position, so interrupting power to the spiral and consequently interrupting the heating of the resistance element.

This device satisfactorily solves the control problem in that it offers a high degree of reliability and very rapid intervention, but at the same time it suffers from certain limits, and in particular:

- the switch contact is normally closed to allow the entire current powering the resistance element to pass, it therefore having to be adequately dimensioned,
- it has a large space requirement which poses serious limits on the application of the resistance element.

The object of the invention is to provide a thermal switch which is of small bulk while at the same time

being of high reliability.

Such an object and further ones which will result from the following description are attained according to the invention through a safety fuse as described in claim 1.

The present invention is described in detail herein-after with reference to the accompanying drawings, in which:

- Figure 1 is a longitudinal section through a safety fuse according to the invention;
- Figure 2 shows it inserted into an armoured resistance element in the activated state; and
- Figure 3 shows it in the same view of Figure 2, but in the deactivated state.

As can be seen from the figures, the thermal fuse according to the invention comprises substantially a cylindrical bush 1 within which there is housed a metal sleeve 2 formed in two parts 3,4 of different diameter.

The head 5 of a metal slider, indicated overall by 6, is inserted into the larger-diameter part 4.

The head 5 supports a plurality of blades 7 (eight in the illustrated example) which slide along the inner walls of the sleeve 2. That end of the rod 8 not involved with the blades is inserted through a hole 9 provided in the base of a cup element 10 and is maintained stable in this configuration by being embedded in a block 11 of thermofusible material (lead, tin, etc.).

In this configuration a coil spring 12 is elastically compressed by the blades 7.

The fuse of the invention is mounted within the tubular metal sheath 13 of an armoured resistance element 14, such that the end contact 15 of the spiral is inserted into the cup element 10. The other contact 16 is then inserted into the portion 4 of the sleeve 2 after interposing an insulating closure plug 17.

In this configuration, current can pass from the contact 15 to the contact 16 by continuity of the electrical circuit via the cup element 10, the metal block 11, the rod 8 of the slider 6, the blades 7, the cylindrical surface 4 and the cylindrical surface 3.

When an operational abnormality occurs leading to the overheating, the metal block 11 melts and consequently slackens its grip on the end of the rod 8. The elastic reaction of the spring 12 then axially shifts the slider 6, which disengages from the metal block 11 to hence interrupt circuit continuity.

From the foregoing it is apparent that the device of the invention offers numerous advantages, and in particular:

- high reliability by being based on the melting point of the metal mass,
- small bulk.

In a different embodiment, not shown on the drawings, the coil spring is positioned on the other side of the slider head and has its end connected to this latter and

to the end of the portion 4 which borders on the portion 3.

When in the active state the spring is under traction, so that following fusion of the metal block, its compression causes the rod to move, with opening of the electrical circuit. 5

Claims

1. A safety fuse, in particular for armoured resistance elements, characterised by comprising: 10
 - a bush (1) of dielectric material, internally housing two terminals (2,10) separated from each other and engagable by electrical conductors (16,15) of the resistance element (14), one (15) of said terminals being rigid with a metal block (11) retaining a metal slider (6) which is also in contact with the other terminal (16), 15 20
 - elastic means (12) being provided which, following fusion of the metal block (11) by overheating, cause the slider (6) to move axially, with relative interruption of the electrical circuit. 25
2. A fuse as claimed in claim 1, characterised in that the metal slider (6) consists of a shaft (8), of which one end is constrained to the metal block (11) and the other end supports a plurality of blades (7). 30
3. A fuse as claimed in claim 1, characterised in that one terminal (2) consists of a metal sleeve formed in two parts of different diameter, one part (3) being engaged by the conductor (16), the other part (4) being in contact with the slider (6). 35
4. A fuse as claimed in claim 1, characterised in that the other terminal (10) consists of a cup element housing the metal block (11). 40
5. A fuse as claimed in claim 1, characterised in that the elastic means consist of a coil spring (12).
6. A fuse as claimed in claim 5, characterised in that when in the active state the spring is under compression. 45
7. A fuse as claimed in claim 5, characterised in that when in the active state the spring is under tension. 50

55

FIG. 1

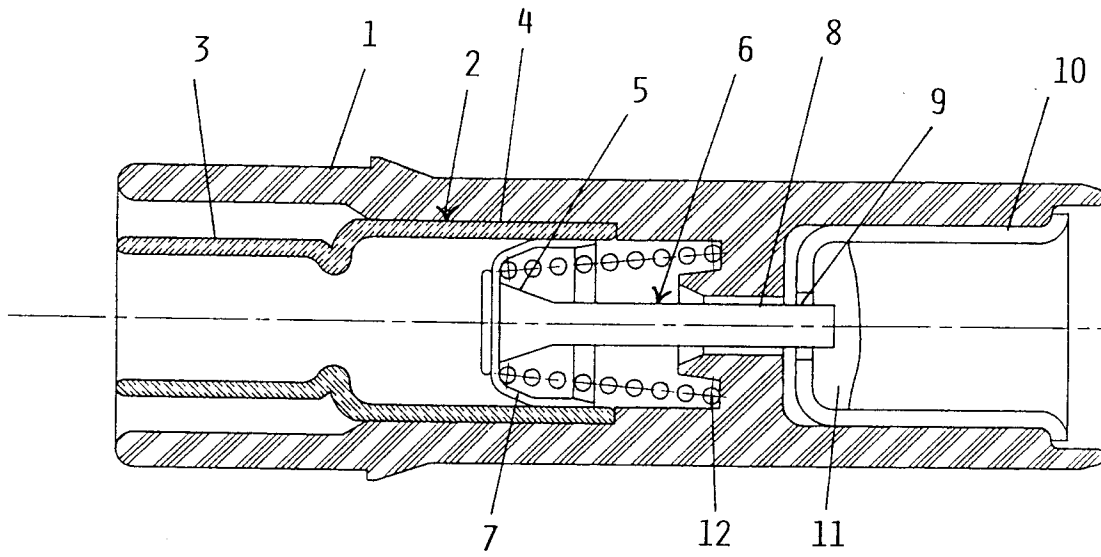


FIG. 2

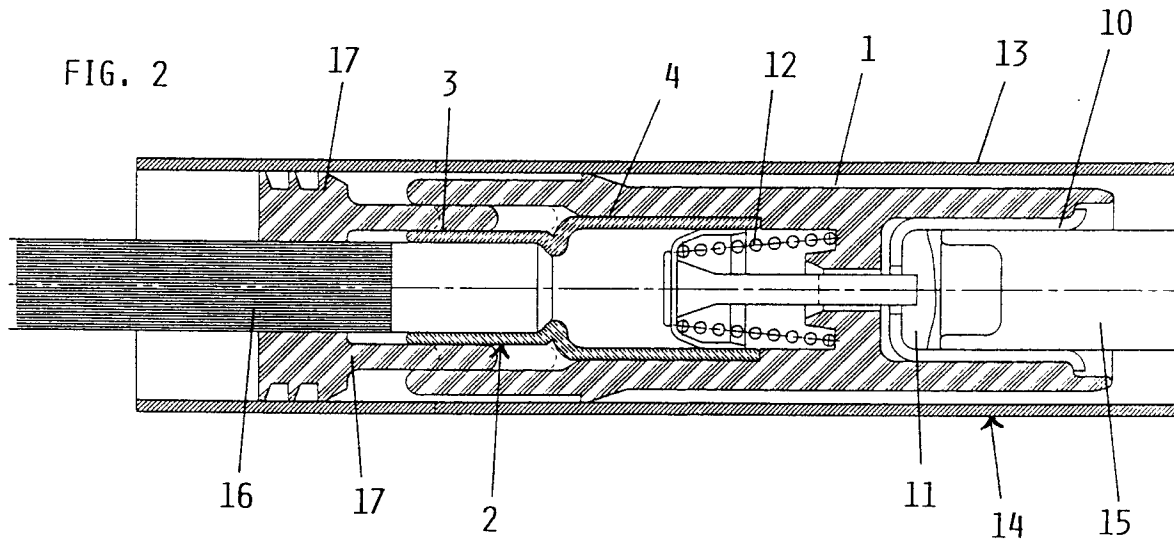


FIG. 3

