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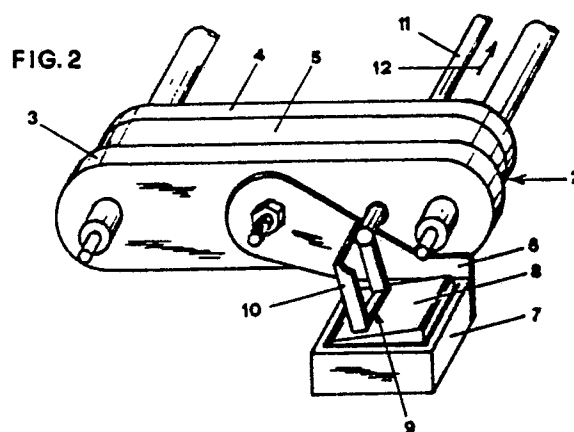
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⑥④ **Temperature limiting device particularly for armoured resistance elements.**

⑥⑦ A temperature limiting device, particularly for armoured resistance element (1), of the type comprising a switch (7) mounted on the fixing flange (3) of the armoured resistance element (1) and connected into the power circuit of this latter, and controlled by a rod (11) secured to a point on the armoured resistance element (1) distant from said flange (3), characterised in that the switch (7) is of monostable type with its contacts open when at rest, and has its operating lever (8) which under normal operating conditions interferes with the end of said rod (11) to maintain said switch (7) in its working state.



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This invention relates to a temperature limiting device particularly for armoured resistance elements.

Temperature limiting devices for application to armoured resistance elements are known, their function being to interrupt power feed on the occurrence of an abnormal operating condition, manifested by excessive increase in the temperature of the resistance element itself.

One of these known devices, described in Italian utility model application No. 21433 B/83 of 5 April 1983 utilises the thermal deformation (elongation) to which the armoured resistance element is subjected under such abnormal operating conditions. It consists of a microswitch applied to the flange by which the armoured resistance element is fixed to the washing machine or other intended electrical appliance, and a metal rod fixed at one end to a point of the armoured resistance element distant from the flange and acting with its other end directly on the microswitch which is connected in series with the resistive winding of the armoured resistance element. This known temperature limiting device operates in the following manner: if the armoured resistance element operates abnormally, for example if an element intended to operate in water operates in air, the temperature increase which it undergoes causes the armour to deform (elongate) and this axially displaces the rod, which itself is influenced much less by this temperature increase. The stressed rod acts on the microswitch and interrupts the power feed to the resistive winding.

This known device has proved valid both for its operational simplicity and consequent reliability, and for its low manufacturing cost. It has however demonstrated certain limits which the present invention overcomes.

One of these limits is that the microswitch normally used is of the single-pole type, contrary to practical considerations which would suggest and sometimes dictate that both phases be interrupted when an abnormal event arises. The use of two single-pole microswitches has not proved to be an effective solution to the problem because they involve a substantial cost increase and a likewise substantial increase in overall size, which is very often unacceptable because of the small dimensions of the flange to which they have to be fitted. Eliminating this problem by using a specially constructed microswitch would also be an unacceptable solution because of the further increase in overall cost.

In addition to these problems of cost, such known temperature limiting devices suffer from a technical problem represented by the lack of complete certainty that both switches will in fact op-

erate, in that the first one which operates may well result in the abnormality no longer presenting itself, so that the other switch does not then operate.

All these drawbacks are obviated according to the invention by a temperature limiting device, particularly for armoured resistance elements, of the type comprising a switch mounted on the connection flange of the armoured resistance element and connected into the power circuit of this latter, and controlled by a rod secured to a point on the armoured resistance element distant from said flange, characterised in that the switch is of monostable type with its contacts open when at rest, and has its operating lever which under normal operating conditions interferes with the end of said rod to maintain said switch in its working position.

A preferred embodiment of the present invention is described hereinafter with reference to the accompanying drawing in which:

Figure 1 is a plan view of an armoured resistance element provided with the temperature limiting device according to the invention;

Figure 2 is an enlarged detailed perspective view showing the engagement between the control rod and the switch under normal operating conditions; and

Figure 3 shows the same detailed view as Figure 2 immediately after an intervention.

As can be seen from the figures, the temperature limiting device according to the invention is applied, in the illustrated example, to an armoured resistance element 1 provided with a conventional member 2 for its fixing to a washing machine. Specifically, the armoured resistance element 1 is substantially of M-shape in order to give it the required length while maintaining a small overall size, and has its two parallel arms traversing the fixing member 2. This is in the form of a flange 3, a backing flange 4 and a rubber block 5 interposed between these latter to expand laterally when they are tightened together so as to form a seal against the edge of the corresponding aperture provided in the washing machine.

To the flange 3 there is welded a plate 6 to which there is fitted a switch 7 of "monostable" type, ie having only one stable position of the operating lever 8, in which the electrical contacts are open.

To the lever 8 of the switch 7 there is applied an intermediate element or bracket 9 in the form essentially of a rectangular frame, with one side preferably cemented to the operating surface of the lever 8 and with an adjacent side 10 extending in proximity to the outer surface of the flange 3. The frame 10 is constructed preferably of nylon or a similar material, and although being substantially rigid in a direction parallel to the surface of the

flange 3, it yields elastically in the direction away from this flange, in order to both maintain the switch in the working state and to enable it to be "reset" after an intervention, as will be apparent hereinafter.

To the armoured resistance elements 1 there is applied a control rod 11 substantially of the same type as that described in said Italian utility model application No. 21433 B/83 and of which that end not secured to the armour of the resistance element 1 passes through the fixing member 2 and projects beyond the flange 3 by an amount just sufficient to interfere with the side 10 of the frame 9.

The switch 1 which as stated is preferably of double-pole type has its two sets of contacts connected in series with the power feed to the two terminals of the resistive winding of the armoured resistance element 1.

Under normal operating conditions, the switch 1 is retained in its unstable working position (see Figure 1) by the interference between the end of the rod 11 projecting beyond the flange 3 and the side 10 of the frame 9, this side having at its end a recess substantially complementary to the shape of the rod. Under these conditions the contacts of the switch 7 are closed and the armoured resistance element 1 is correctly powered in accordance with the requirements of the user.

If the temperature of the armoured resistance element 1 should rise beyond its normal value, because for example the element accidentally operates in air instead of in water, or because a short circuit arises between the heater winding of the element 1 and the armour, the thermal deformation to which the armoured resistance element 1 is subjected due to the abnormal temperature increase results in an axial displacement of the rod in the direction of the arrow 12 in Figure 2. In this case the end of the rod 11 no longer interferes with the frame 9 and allows the switch 7 to snap into its stable position (see Figure 3) to cause both its sets of contacts to open leading to total interruption of the power feed.

This interruption causes the temperature increase to disappear and results in the return of the armoured resistance element and rod 11 to their original positions, ie with the end of this latter projecting beyond the flange 3.

If having eliminated the reason for the abnormality the assembly is to be "reset", ie returned to the state in which it can again operate (see Figure 2) in line with user requirements, the lever 8 of the switch 7 is returned manually into its unstable position, this being facilitated by the elastic deformability of the frame 9, which by means of the side 10 can be moved away from the flange 3 to overcome its interference with the end of the rod

11.

It is apparent from the foregoing description that the temperature limiting device according to the invention offers numerous advantages, and in particular:

- it uses conventional switches of low cost and easy availability;
- it is applicable to armoured resistance elements of any type;
- it enables single-pole or double-pole switches to be used at choice without substantial cost or overall size increase;
- in the case of double-pole switches it ensures that the device interrupts both phases; and
- it allows very simple "resetting"

Claims

1. A temperature limiting device, particularly for armoured resistance element, of the type comprising a switch mounted on the fixing flange of the armoured resistance element and connected into the power circuit of this latter, and controlled by a rod secured to a point on the armoured resistance element distant from said flange, characterised in that the switch (7) is of monostable type with its contacts open when at rest, and has its operating lever (8) which under normal operating conditions interferes with the end of said rod (11) to maintain said switch (7) in its working state.

2. A device as claimed in claim 1, characterised in that the operating lever (8) is provided with a member (9) which interferes with the end of said rod (11).

3. A device as claimed in claim 2, characterised in that the member (9) with which the lever (8) is provided comprises a portion (10) substantially orthogonal to the operating surface of said lever (8) and to the axis of said rod (11), and is elastically yieldable in the direction which disengages it from this latter to enable the assembly to be reset.

4. A device as claimed in claim 1, characterised in that the member (9) with which the lever (8) is provided consists of a frame, of which one side is fixed to said lever (8) and an adjacent side (10) forms the portion which interferes with said rod (11).

5. A device as claimed in claim 3, characterised in that the member (9) is constructed of nylon.

6. A device as claimed in claim 4, characterised in that the end of the side (10) comprises a recess substantially complementary to the shape of the rod (11).

7. A device as claimed in claim 1, characterised in that the switch (7) is of double-pole type.

8. A device as claimed in claim 1, characterised in that the switch (7) is mounted on a plate (6) applied to the fixing flange (3) of the armoured resistance element (1).

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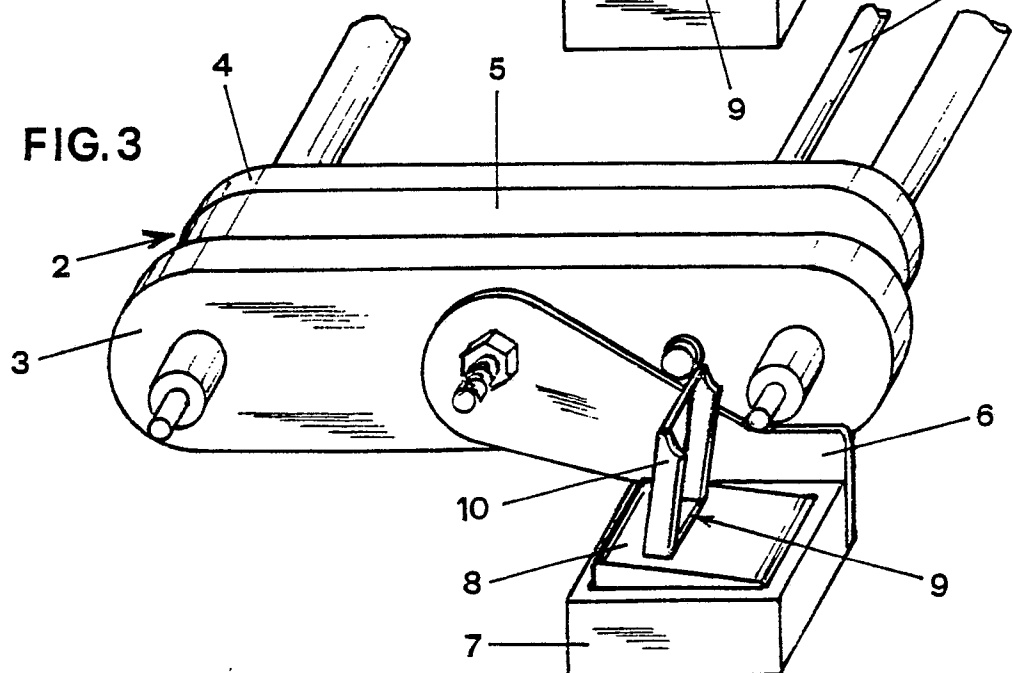
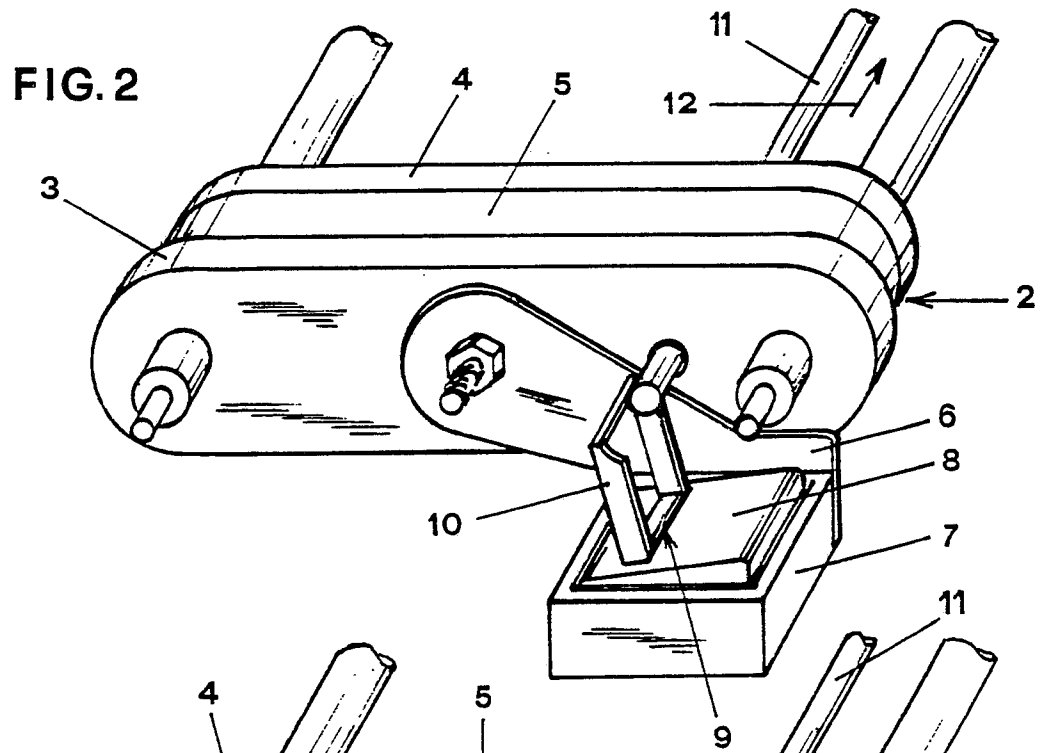
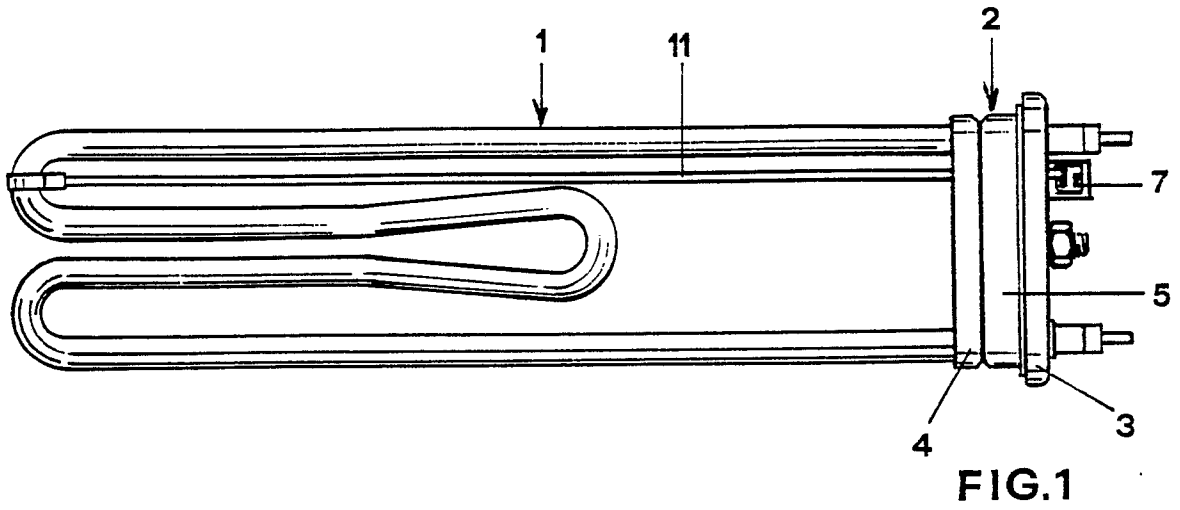
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DOCUMENTS CONSIDERED TO BE RELEVANT			EP 88114923.1
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	GB - A - 2 138 258 (IRCASpA) * Abstract; fig. 1 * --	1	H 05 B 1/02 H 05 B 3/82
A	GB - A - 2 052 230 (IMI) * Abstract; fig. 1 * ----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			H 05 B 1/00 H 05 B 3/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 31-10-1988	Examiner TSILIDIS
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			