

Title: "Temperature responsive devices"**Description of Invention**

This invention is concerned with improvements relating to temperature-responsive devices, particularly of the kind (hereinafter referred to as being of the kind specified) utilising the movement of a bimetal element to effect switching of an electric circuit.

Devices of the kind specified conventionally use a bimetal element in the form of a strip of two metals having differing coefficients of thermal expansion, the element being secured at one (fixed) end portion and arranged so that the other (free) end portion moves on variation in temperature, which may be the ambient temperature to which the bimetal element is subjected, or the temperature of the element due to passage of electric current therethrough, or the temperature of the bimetal element when heated by a resistive heating element or a combination thereof.

The free end portion of the bimetal element is provided with an engagement member so arranged that when the element moves into a specific position, the engagement member moves into engagement with an operating member, such as a trip latch, which operates to open the electric circuit.

Where the device is designed to operate on electrical overload conditions, a circuit branch is connected to the bimetal element, usually at a position separated from the engagement member, such as by a fixed tapping taken from the fixed end portion of the element, and a flexible tapping secured to a central region of the bimetal element.

In setting up the device so as to ensure that the circuit is tripped at a desired temperature, it is necessary to adjust the engagement member, conventionally by engaging the member with a tool, such as a screwdriver, and manipulating it so as to vary the position of the engagement member in

relation to the bimetal element. Since the bimetal element is flexible this is difficult and time consuming to accomplish, particularly since it is in practice not possible to carry out such adjustment without temporary deformation of the bimetal element.

According to this invention there is provided a temperature responsive device of the kind specified, wherein the bimetal element is supported within a housing on a knife-edge pivot engaging an intermediate region of the element, one end portion of the element being connected to an adjustment device for moving the bimetal element about the pivot and comprising an abutment face, against which said one end portion is urged by a spring, and screw-threaded means to positionally adjust said abutment face, the opposite end portion of the bimetal element being located adjacent to tripping mechanism of the device.

In this manner, since adjustment of the device may be accomplished without deformation of the bimetal element, the device may be set up simply and quickly, in particular by positional adjustment of the screw-thread means under the desired operating conditions until the bimetal element opens or closes.

Advantageously the pivotal mounting for the bimetal element is afforded by a mounting member secured to the housing of the device.

There will now be given a detailed description, to be read with reference to the accompanying drawings, of a temperature responsive device which is a preferred embodiment of this invention, having been selected for the purposes of illustrating the invention by way of example.

In the accompanying drawings:

FIGURE 1 is a schematic sectional view of a conventional temperature responsive device;

FIGURE 2 is a view corresponding to Figure 1 of part of the temperature responsive device which is the preferred embodiment of this invention; and

FIGURE 3 is an enlarged view of part of the preferred embodiment.

The temperature responsive device shown in Figure 1 is of the kind specified, being a miniature circuit breaker (MCB) provided with thermal and magnetic overload protection, the device comprising a housing 6, a terminal 8 comprising a fixed terminal portion 10 within the housing, to which one end portion 12a of a bimetal element 12 is secured, the opposite end portion 12b of the bimetal element carrying a screw-thread adjustment device 16.

Welded to the bimetal element between the end portions is a flexible conductive element 13, which extends to a circuit branch of the circuit breaker, which is conventional, and not shown.

The position adopted by the bimetal element 12 within the housing will be dependent upon the temperature at the element, dependent upon the ambient temperature thereof in conjunction with the current flowing therethrough, namely from the connector 13 to the terminal 8, and under conditions of either thermal or current overload the bimetal will flex in a generally anti-clockwise direction about the fixed end portion 12 so that the adjustment device 16 engages an operating member such as an element 14 of a trip latch, to cause the circuit to open.

Disadvantages encountered in such a conventional circuit breaker are as follows:

- (a) tapping of the bimetal element is difficult due to the small size of the adjustment screw 16;
- (b) setting up of the device involves adjustment of the screw 16, conveniently through an aperture 18, by the use of a screwdriver, and this necessitates the application of deforming pressure on the bimetal element 12, which makes setting up to a specific condition difficult;
- (c) the terminal portion 10 tends to remove heat from the bimetal element 12, producing variations in the conditions under which the device will trip.

The device which is the preferred embodiment of this invention is similarly a miniature circuit breaker, and similar numerals are used to indicate like parts. In the preferred embodiment the bimetal element 12 is pivotally mounted at an intermediate region thereof on a mounting member 20, provided in the form of a metal pressing (shown in an enlarged view in Figure 2b) positioned in channels 19 provided in the housing 6, the mounting element providing flexible knife edges 22 between which the bimetal element 12 may be positioned.

At its lower end portion 12a, the bimetal element 12 is engaged by an adjustment means 24, comprising a spindle 26 extending freely through a boss 28 captive within the housing and through a screw-threaded bore 30 spaced axially from the boss 28. An aperture 18 is provided to enable the spindle 26 to be rotated by a tool such as a screwdriver, and hence moved axially by virtue of its engagement with the threaded bore 30.

The spindle 26 is provided with a flange 32 operative to engage one side of the bimetal element 12, the other side of the bimetal being engaged by a spring 34 pressing against the boss 28. In this manner rotation of the shaft 26 in one direction will cause the flange 32 to move the bimetal element pivotally in a clockwise direction about the mounting element 20, against the action of the spring 34, whilst rotation of the shaft 26 in the opposite direction will cause the bimetal element to be rotated in the opposite direction.

Alternatively the boss 28 may be substituted by a threaded nut with which the spindle may be threadedly engaged, the bore 26 being unthreaded.

Two flexible straps 13a and 13b are welded to outer regions of the bimetal element, the strap 13a being connected to the terminal 8.

Thus in the use of the circuit breaker which is the preferred embodiment of this invention, under normal operating conditions the bimetal element will adopt a position similar to that shown in Figure 2, i.e. with its end portion 12b spaced from the trip latch 14. However on overload conditions the bimetal element will flex, with the engagement portion 12b moving into engagement with and tripping the latch 14.

By the use of the arrangement above described, no tapping of the bimetal element, as was previously required to accommodate the screw 16, is necessary, and loss of heat by means of connection to a fixed terminal portion 10 is avoided. Adjustment of the spindle 26 does not involve direct

contact with the bimetal element itself, and thus does not tend to deflect the bimetal element. Thus, the position of the lower end portion 12a of the bimetal may be accurately adjusted to the point at which the latch 14 is tripped, and the bimetal can then be backed off (with spring assistance) to a desired setting gap.

CLAIMS:

1. A temperature responsive device of the kind specified, wherein the bimetal element is supported within a housing on a knife-edge pivot engaging an intermediate region of the element, one end portion of the element being connected to an adjustment device for moving the bimetal element about the pivot and comprising an abutment face, against which said one end portion is urged by a spring, and screw-threaded means to positionally adjust said abutment face, the opposite end portion of the bimetal element being located adjacent to tripping mechanism of the device.
2. A device according to Claim 1 wherein the pivotal mounting for the bimetal element is afforded by a mounting member secured to the housing of the device.
3. A device according to one of Claims 1 and 2, wherein the bimetal element is adapted to respond both to temperature overload conditions and to current overload conditions.
4. A temperature responsive device constructed and arranged substantially as hereinbefore described with reference to Figures 2 and 3 of the accompanying drawings.

