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(11) **EP 0 822 567 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**04.02.1998 Bulletin 1998/06**

(51) Int. Cl.<sup>6</sup>: **H01H 37/36**, H01H 35/26

(21) Application number: **96830586.2**

(22) Date of filing: **18.11.1996**

(84) Designated Contracting States:  
**AT BE CH DE DK ES FI FR GB GR LI LU NL SE**

(30) Priority: **30.07.1996 IT MI960549 U**

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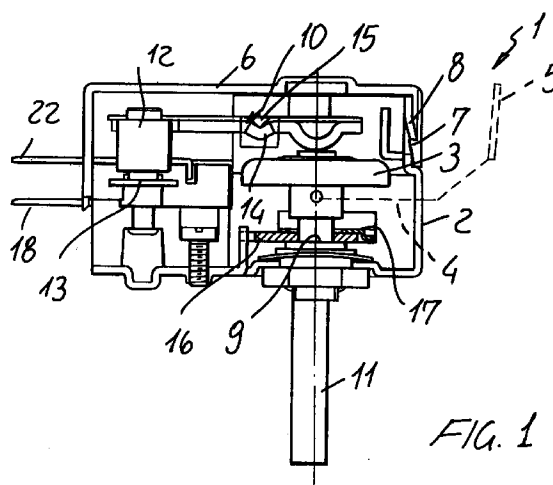
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(54) **Control thermostat for apparatus operating by thermal cycles**

(57) The present invention relates to a control thermostat for apparatus operating by thermal cycles.

The thermostat comprises a box-like casing housing therein an expansible plenum chamber which is coupled, through a capillary element, to an expanding liquid holding probe.

The plenum chamber, in particular, is arranged between an adjusting abutment element and a swinging lever operating on a resilient blade, made of an electrically conductive material, coupled to a first electric terminal and provided with a movable electric contact, which can be displaced by the movement of the resilient blade caused by the swinging lever, in order to close and/or open an electric circuit.



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## Description

### BACKGROUND OF THE INVENTION

The present invention relates to a control thermostat for apparatus operating by/on thermal cycles.

As is known, several apparatus operating by/on thermal cycles are provided with thermostatic elements for controlling the operation of said apparatus, the thermostatic element comprising, as a sensing element therefor, an expansible plenum chamber coupled to a liquid holding probe, the volume of the probe liquid changing as the temperature changes.

These prior thermostatic elements have the drawback of a comparatively complex construction, and a consequent comparatively high making cost.

A further drawback of prior thermostatic elements is that they have a large size, thereby these thermostatic elements can be arranged with difficulties in the apparatus to be controlled thereby.

### SUMMARY OF THE INVENTION

Accordingly, the aim of the present invention is to overcome the above mentioned drawbacks, by providing a control thermostat, for apparatus operating by/on thermal cycles in general, the construction of which is very simple and which, moreover, is very reliable in operation.

Within the scope of the above mentioned aim, a main object of the present invention is to provide a very accurately operating thermostat.

Another object of the present invention is to provide such a thermostat which can be made at a comparatively low and competitive cost.

Yet another object of the present invention is to provide such a thermostat which is very safe and reliable in operation.

According to one aspect of the present invention, the above mentioned aim and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by a control thermostat for apparatus operating by thermal cycles, characterized in that said control thermostat comprises a box-like casing housing therein an expansible plenum chamber coupled, through a capillary element, to an expanding liquid holding probe, said plenum chamber being arranged between an adjustment abutment element and a swinging lever operating a resilient blade, made of an electrically conductive material, coupled to a first electric terminal and provided with a movable electric contact designed to be driven by the movement of said resilient blade as caused by said swinging lever, so as to close and/or open an electric circuit.

### BRIEF DESCRIPTION OF THE DRAWINGS

Further characteristics and advantages of the ther-

mostat according to the present invention will become more apparent hereinafter from the following detailed disclosure of a preferred, though not exclusive, embodiment of said thermostat, which is illustrated, by way of an indicative, but not limitative example, in the accompanying drawings, where:

Figure 1 illustrates the control thermostat according to the present invention as partially cross-sectioned;

Figure 2 illustrates the control thermostat according to the present invention as sectioned through a plane perpendicular to the sectional plane of figure 1;

Figure 3 illustrates a top plan view of the control thermostat according to the present invention, the box-like casing cover being removed; and

Figure 4 is a further top plan view, as partially cross-sectioned, illustrating the control thermostat according to the invention.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the number references of the above mentioned figures, the control thermostat according to the present invention, which has been generally indicated by the reference number 1, comprises a box-like casing 2 housing therein an expansible plenum chamber 3, which is coupled, through a capillary element or tube 4, to a probe 5, holding therein, in a vacuum condition, a liquid material, which can change its volume as the temperature changes.

More specifically, the box-like casing 2 is closed at the top thereof by a closing cover 6, made of a synthetic material, which is snap-coupled to the body of the box-like casing.

As shown, the cover 6 is provided, at the bottom thereof, with fins or tabs 7 provided with a small tooth element, engaging, owing to the resilient flexibility of said fins 7, with abutment elements 8 provided near the top edge of the body of the box-like casing 2.

Inside said casing, the expansible plenum chamber 3 is arranged between an adjustment abutment element 9 and a swinging lever 10.

In particular, the adjustment abutment element 9 can be driven, in a per se known manner, in parallel to the expanding direction of the expansible plenum chamber 3, by turning a shaft 11 thereon is supported an adjusting or control knob, which has not been shown for simplicity.

The lever 10 is pivoted, at a middle portion thereof, to said casing 2, and one end thereof faces the expansible plenum chamber 3, whereas the other end thereof is provided with an electrically insulating material head

12, preferably made of steatite, affecting a resilient blade 13.

More specifically, the lever 10 is provided, at a middle region thereof, with a bend 14 the concave face of which bears on a tip 15 rigid with the casing 2, and defining the pivot pin for the lever 10.

As shown in figure 1, the expansible plenum chamber 3 can be simply directed towards one end of the lever 10 or, as is shown in figure 2, it can be restrained or fixedly coupled to said lever 10, as the plenum chamber 3 must be operated under a pulling force, instead of a pushing force, as provided in the embodiment shown in figure 1.

Near the adjusting abutment element 9 a plate 16 is provided, said plate being held in its set position by a resilient blade 17 coupled to the casing 2.

The resilient blade 13 is preferably made of a beryllium-copper alloy and is coupled, in a per se known manner, to an electric power supply terminal 18.

The resilient blade 13, in particular, is connected, at one end thereof, to said electric terminal 18 and is provided, at the other opposite end thereof, with a fixed electric contact 20 coupled to an electric terminal 21, as well as another fixed electric contact coupled to a further electric terminal 22.

In a normal operation, the movable electric contact 19 abuts against the fixed electric contact 20, thereby normally closing a related electric circuit, and being disengaged from the electric contact coupled to the electric terminal 22, thereby holding a corresponding electric circuit in an open condition.

The control thermostat according to the present invention operates as follows.

Under a normal operation condition, as already stated, the movable electric contact 19 bears on the fixed contact 20 thereby providing an electric connection between the terminal 18 and the terminal 21.

As the expansible plenum chamber 3 is expanded because of a temperature increase at the probe 5, said plenum chamber 3 will cause the swinging lever 10 to swing, thereby turning about the fulcrum point defined by the tip 15 and affecting by the head 12 the resilient blade 13.

Thus, the resilient blade 13, as it is deflected, will cause the movable electric contact 19 to move away from the electric contact 20 and, simultaneously will bring the movable electric contact 19 to abut against the electric contact coupled to the terminal 22 thereby the latter will be electrically coupled to the electric terminal 18, alternately to the electric terminal 21.

The control thermostat according to the present invention is moreover characterized in that all the electric portion thereof can be preliminarily assembled on a steatite supporting socket having a very reduced size.

This socket, in turn, will be affixed inside the box-like casing in a very simple manner, by means of a single affixing screw.

From the above disclosure and from an examina-

tion of the figures of the accompanying drawings, it should be apparent that the control thermostat according to the present invention fully achieves the intended aim and objects.

In particular, the fact is to be pointed out that a control thermostat has been provided which is construction-wise very simple and, accordingly, can be produced at low cost while having a very reliable and safe operation.

In practicing the invention, the used materials, even if the better results have been obtained by the disclosed materials, as well as the contingent size and shapes, can be any, depending on requirements.

## Claims

1. A control thermostat for apparatus operating by thermal cycles, characterized in that said control thermostat comprises a box-like casing housing therein an expansible plenum chamber coupled, through a capillary element, to an expanding liquid holding probe, said plenum chamber being arranged between an adjustment abutment element and a swinging lever operating a resilient blade, made of an electrically conductive material, coupled to a first electric terminal and provided with a movable electric contact designed to be driven by the movement of said resilient blade as caused by said swinging lever, so as to close and/or open an electric circuit.
2. A thermostat, according to Claim 1, characterized in that said lever is pivoted, at a middle portion thereof, to said box-like casing and having an end thereof facing said plenum chamber and an opposite end thereof provided with an electrically insulating material head contacting said resilient blade.
3. A thermostat, according to Claim 2, characterized in that said head is made of steatite.
4. A thermostat, according to one or more of the preceding claims, characterized in that said box-like casing houses therein said plenum chamber, swinging lever and resilient blade, said supporting body being closed by a closing cover snap coupled to said supporting body.
5. A thermostat, according to one or more of the preceding claims, characterized in that said movable electric contact is arranged between a first fixed electric contact and a second fixed electric contact, said movable electric contact being designed for contacting, as a resilient blade is deformed, said first electric contact and said second fixed electric contact.
6. A thermostat, according to Claim 5, characterized in that said resilient blade is made of a copper-beril-

lithium alloy.

7. A thermostat, according to one or more of the preceding claims, characterized in that said thermostat further comprises means for adjusting a position of said adjusting abutment element in parallel to the expanding direction of said plenum chamber. 5
8. A thermostat, according to one or more of the preceding claims, characterized in that said swinging lever is provided, at the pivot pin thereof, with a bent portion which is coupled, on a concave side thereof, with a tip element rigid with said box-like casing and defining said pivot pin for said swinging lever. 10 15
9. A thermostat, according to one or more of the preceding claims, characterized in that all of the electric parts thereof can be preliminarily assembled on a very small size steatite socket, to be fixedly connected inside said box-like casing by a single affixing screw. 20

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