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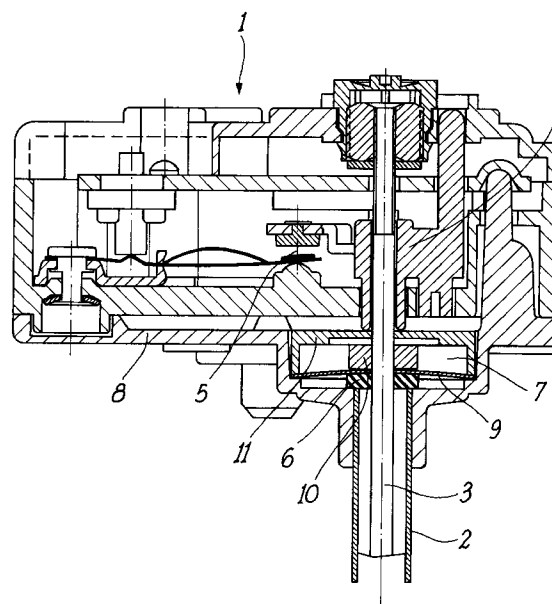
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(54) **Safety device, particularly for a thermostat with an immersion rod sensor.**

(57) A safety device is described, particularly for a thermostat (1) with an immersion rod system comprising a rod (2) realized with thermoexpansible material, a low thermal dilatation rod (3), provided within said thermoexpansible rod (2), a casing (8), within which said rods (2;3) are introduced, in correspondence of a cavity or cup (7) realized in thermoconductive material, and an interruption mechanism (4) to interrupt a phase of the electric circuit, connected to said rods (2;3), said device comprising a spring element (6), a thermally inert thin disk (9), a calibration element (10) for the safety device and an element (11) for transmitting the strains of the inert disk element (9) to an interruption mechanism for both the phases of the electric circuit, said elements being introduced, in the above mentioned sequence, from the bottom to the above along said low thermal dilatation rod (3), with the calibration element (10) that is regulated in such a way to make the safety device intervening at a temperature higher than the intervention temperature of said interruption mechanism of a phase of the circuit, and said inert disk (9) element being realized with a concavity toward the bottom and having features to trip upside, reversing its concavity, following the dilatation of the thermoexpansible rod (2).



The present invention relates to an improved safety system, particularly for a thermostat with an immersion rod sensor.

More particularly, the invention concerns a safety system realized in such a way to be more sensible with respect to the solutions presently available on the market.

As it is well known, the thermostats with immersion rod sensor for water heaters and like provide a brass rod placed within a sheath that is immersed within the liquid.

Within the brass rod a low thermal dilatation rod is provided.

When the liquid has reached the preestablished temperature, the brass rod expands, dragging during its dilatation also the inner rod, and acts then on a mechanical circuit that interrupts a phase of the electric circuit, thus excluding the resistance.

This kind of thermostats is also provided with a further safety device, that intervenes in case of failure of the above mentioned device, so that in case still higher temperatures are reached, it provides to interrupt both the phases of the electric circuit.

At present, this safety system is realized by a bimetallic disk that, in case the temperature increases up to reach a preestablished temperature, gets deformed. Said bimetallic disk is very thin and is shaped in such a way to get deformed, when the transition temperature is reached, tripping from a concave position to a convex position or vice versa.

The bimetallic disk is now placed within a cavity of the thermostat, realized with conductive material, that contacts the liquid, therefore the warping effect is obtained on the basis of a heat transmission between said cavity, heated by the liquid, and the bimetallic disk.

This means that the sensitivity of the safety system is entrusted to said heat transmission, and further to the reading of the temperature in correspondence of the cavity.

Furthermore, and this feature is not admitted by the safety rules of some countries, the bimetallic disk with the decreasing of the temperature, rearms, by the reversed process that brought it to trip following an increasing of the temperature.

In view of all the above considerations, the Applicant has studied a solution concerning the safety system that allows to have greatly improved sensibility features while sensing the temperature with respect to the prior art solutions.

Further, the solution according to the present invention does not allow that the safety system automatically rearms.

These and other results are obtained according to the invention by the realization of a safety system that begins to work on the basis of the dilatation of the brass rod, and therefore acts on the basis of the temperature read within the liquid mass.

It is therefore a specific object of the present invention an improved safety system, particularly for a thermostat with an immersion rod system comprising a rod realized with thermoexpandible material, a low thermal dilatation rod, provided within said thermoexpandible rod, a casing, within which said rods are introduced, in correspondence of a cavity or cup realized in thermoconductive material, and an interruption mechanism to interrupt a phase of the electric circuit, connected to said rods, said system comprising a spring element, a thermally inert thin disk, a calibration element for the safety system and an element for transmitting the strains of the inert disk element to an interruption mechanism for both the phases of the electric circuit, said elements being introduced, in the above mentioned sequence, from the bottom to the above along said low thermal dilatation rod, with the calibration element that is regulated in such a way to make the safety system intervening at a temperature higher than the intervention temperature of said interruption mechanism of a phase of the circuit, and said inert disk element being realized with a concavity toward the bottom and having features to trip upside, reversing its concavity, following the dilatation of the thermoexpandible rod.

Particularly, according to the invention, said spring element is made up of a synthetic rubber or metal disk, or of a disk made up of another elastic material.

Preferably, according to the invention, said inert thin disk is made up of inert metal.

Still according to the invention, said calibration element is comprised by a metal ring screwed on a thread provided at the end of said low thermal dilatation rod, within said casing of the thermostat.

Further, according to the invention, said strain transmission element of the disk element is made up of a hollow overturned cylindrical element, the outer circumference of which rests on the outer circumference of the disk element.

In a preferred embodiment of the safety system according to the invention, between said elastic element and said inert disk element a thin bimetallic disk element can be provided.

The present invention will be now described for illustrative but not limitative purposes according to a preferred embodiment, with particular reference to the figures of the enclosed drawing showing a section view of a thermostat providing the safety system according to the invention.

In the figure an immersion thermostat 1 is partially shown in section, said thermostat 1 including the safety system according to the present invention.

The thermostat 1 comprises a brass rod 2, soaked within the liquid, not shown, and within which a low thermal dilatation rod is provided.

When the liquid has reached a determined temperature, the brass rod 2 expands, dragging also the

inner rod 3 acting, on the basis of its displacement, on a mechanism 4 that interrupt the electric connection 5.

When the liquid temperature descends under the preestablished value, for example 70° C, the brass rod 2 withdraws, restoring the start situation.

The safety system according to the invention, in the embodiment shown in figure, is made up of a spring element 6, realized with synthetic rubber, metal or other elastic material, provided about the rod 3, within a cavity or cup 7 realized in the sheath 8 of the thermostat 1.

Above said spring element 6 an inert disk 9 is provided, i.e. that does not get deformed with the variation of the temperature, and so shaped to assume, when the safety system is inoperative, the position shown in figure, but that is able to vary its bent, tripping if mechanically stressed.

Above the disk 9, screwed on the rod 3, a metal ring 10 is provided for the calibration of the safety system. The calibration is realized tightening the metal ring 10 on the disk 9 until the latter trips due to a certain dilatation of the brass rod 2.

In fact, as it can be deduced from the drawing, an elastic mechanical linkage has been realized between the rod 2 and the disk 9, so that acting on the metal ring 10 the disk trips in consequence of a dilatation of the rod 2 deriving from a different and higher temperature with respect to the temperature that determined the operating of the previously described mechanism, since the safety system must intervene only in case said mechanism did not properly worked for any reason.

Still above the disk 9 and the metal ring 10 a round element 11 is provided, inserted along the rod 3, said round element 11 having a C-shaped cross section, the outer circumference of which rests on the outer circumference of the disk 9.

In this way, the trip of the disk 9, and the consequent bent variation, in consequence of the rod 2 dilatation, thrusts the element 11 upward. The latter acts on the pin 4 that determines the opening of two phases of the electric circuit.

Obviously, being the disk 9 inert, it does not rearm when the temperature descend again under a certain value.

One skilled in the art will understand that, in case it is desired to add a further safety to the thermostat, a bimetallic disk and the inert disk 9 can be coupled, the bimetallic disk being positioned under the inert disk, i.e. contacting the spring element 6.

In fact, in case for any reason the system described should not properly intervene, the effect of the bimetallic element still operates.

However, being provided the inert disk 9, it is not provided the possibility that the bimetallic disk automatically rearms.

The present invention has been described for il-

lustrative, but not limitative purposes, according to its preferred embodiments, but it is to be understood that variations and/or changes can be introduced by those skilled in the art without departing from the relevant scope as defined by the enclosed claims.

Claims

1. Improved safety system, particularly for a thermostat with an immersion rod system comprising a rod realized with thermoexpansible material, a low thermal dilatation rod, provided within said thermoexpansible rod, a casing, within which said rods are introduced, in correspondence of a cavity or cup realized in thermoconductive material, and an interruption mechanism to interrupt a phase of the electric circuit, connected to said rods, said safety system being characterized in that it comprises a spring element, a thermally inert thin disk, a calibration element for the safety system and an element for transmitting the strains of the inert disk element to an interruption mechanism for both the phases of the electric circuit, said elements being introduced, in the above mentioned sequence, from the bottom to the above along said low thermal dilatation rod, with the calibration element that is regulated in such a way to make the safety system intervening at a temperature higher than the intervention temperature of said interruption mechanism of a phase of the circuit, and said inert disk element being realized with a concavity toward the bottom and having features to trip upside, reversing its concavity, following the dilatation of the thermoexpansible rod.
2. Safety system according to claim 1, characterized in that said spring element is made up of a synthetic rubber disk.
3. Safety system according to claim 1, characterized in that said spring element is made up of a metal disk.
4. Safety system according to claim 1, characterized in that said spring element is made up of elastic material disk.
5. Safety system according to one of the preceding claims, characterized in that said inert thin disk is made up of inert metal.
6. Safety system according to one of the preceding claims, characterized in that said calibration element is made up by a metal ring screwed on a thread provided at the end of said low thermal dilatation rod, within said casing of the thermostat.

7. Safety system according to one of the preceding claims, characterized in that said strain transmission element of the disk element is made up of a hollow overturned cylindrical element, the outer circumference of which rests on the outer circumference of the disk element. 5
8. Safety system according to one of the preceding claims, characterized in that between said elastic element and said inert disk element a thin bimetallic disk element can be provided. 10
9. Improved safety system, particularly for a thermostat with an immersion rod according to each one of the preceding claims, substantially as illustrated and described. 15

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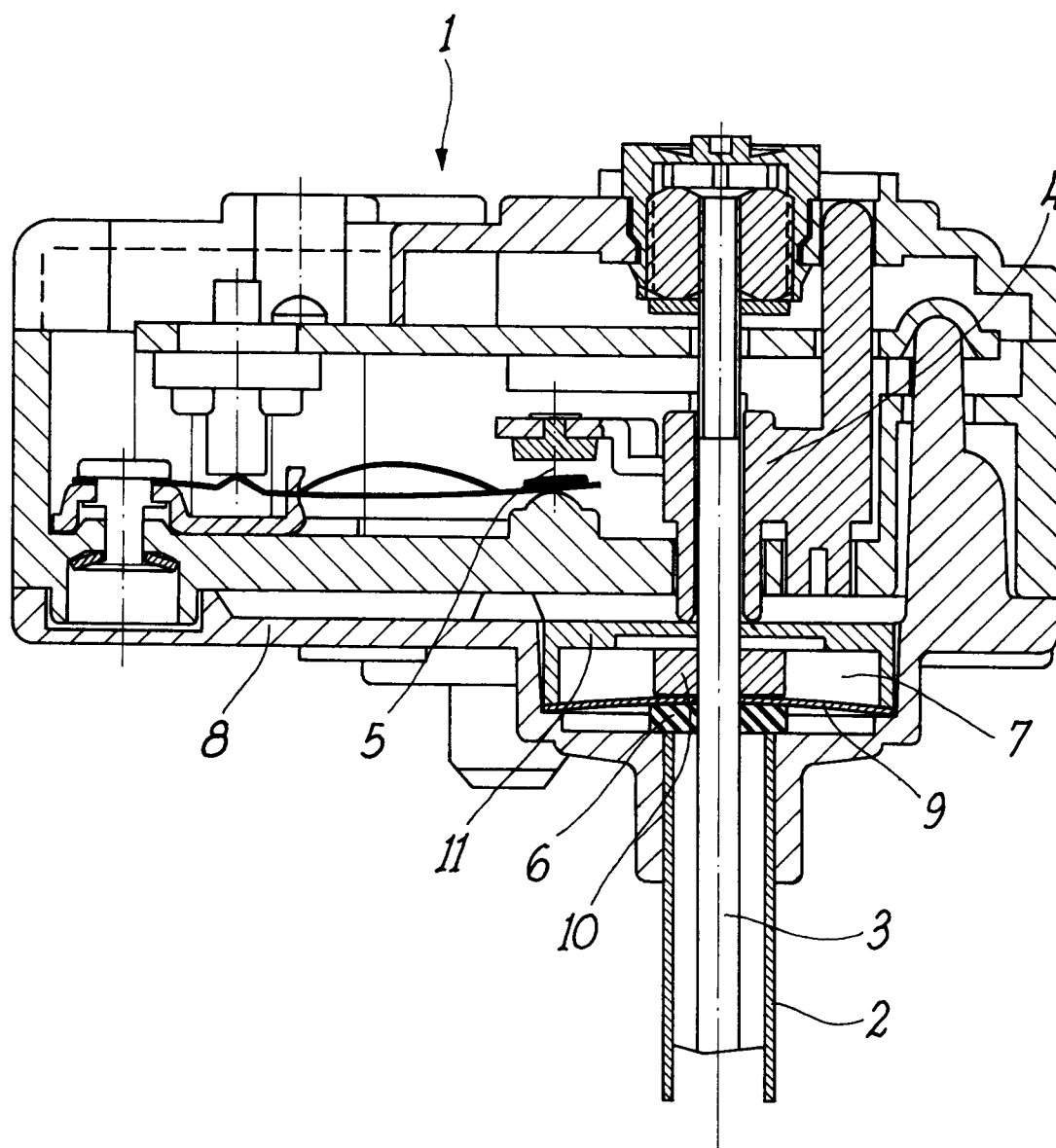
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European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 94 83 0343

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	GB-A-2 172 749 (S. A. COTHERM) * page 1, line 5 - line 37 * * page 1, line 116 - page 2, line 12; figure 1 * ---	1,3	H01H37/48
A	FR-A-2 369 674 (J. SNIPELISKI) * page 2, line 7 - page 4, line 36; figures 1,3 * ---	1,6	
A	FR-A-1 543 230 (J. SNIPELISKI) * the whole document * ---	1	
A	CH-A-335 739 (FR. SAUTER AG) * the whole document * ---	1	
A	FR-A-2 149 242 (B.D.M. ITALIA S.P.A.) * claims 1,2; figures 4-7 * -----		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01H
Place of search BERLIN		Date of completion of the search 30 January 1995	Examiner Ruppert, W
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