

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



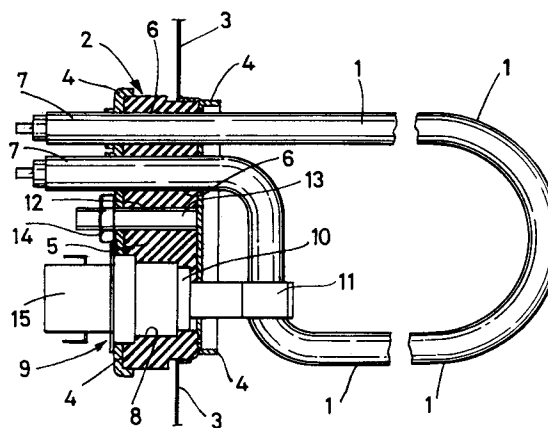
(11) Publication number:

0 624 998 A1

(12)

EUROPEAN PATENT APPLICATION(21) Application number: **94201204.8**(51) Int. Cl.⁵: **H05B 3/82, D06F 39/04, A47L 15/42**(22) Date of filing: **02.05.94**(30) Priority: **11.05.93 IT MI930942**(43) Date of publication of application:
17.11.94 Bulletin 94/46(84) Designated Contracting States:
DE ES FR GB IT(71) Applicant: **CANDY S.p.A.**
Via Missori, 8
I-20052 Monza (Milano) (IT)(72) Inventor: **Fumagalli, Silvano**
Via Grigna, 2
I-20052 Monza (Milano) (IT)(74) Representative: **Mittler, Enrico et al**
c/o Marchi & Mittler s.r.l.
Viale Lombardia, 20
I-20131 Milano (IT)(54) **Safety device for heating elements in temperature-controlled home appliances.**

(57) Safety device for heating elements in home appliances with a fluid subjected to temperature control comprises a thermostat (9) provided with a heat-sensitive element (10, 29, 32) immersed in the fluid, that is thermally and mechanically coupled to said heating elements (1, 18, 31) by thermally-conducting means (11, 23, 33), so as to provide, by means of said thermostat (9), a combined control of the temperature of the fluid and of that of the heating elements (1, 18, 31).

**Fig.1****EP 0 624 998 A1**

The present invention relates to a safety device for heating elements in temperature-controlled home appliances, such as washing machines, washer-driers, dishwashers, deep-friers and such like.

Compliance with safety regulations in force in the matter of home appliances obliges manufacturers to install suitable safety devices on such home appliances that prevent the heating elements from overheating, generally constituted by armoured resistances immersed in a liquid or other suitable fluid.

Such overheating can be caused by the lack of the fluid to be heated, typically water in the case of washing machines, air flow in the case of washer-driers and cooking oil in the case of deep-friers. In the case, say, of a washing machine, the absence of water inside the cylinder causes a fast increase in the temperature of the heating resistance, and the possible burning of its insulator coating; this is clearly dangerous, as it involves the formation of an electrical short-circuit when the water inside the cylinder shall once again come into contact with the resistance.

Safety devices are known that are constituted by power supply switches triggered by devices sensitive to the external temperature of the heating resistance.

devices, however, are dedicated solely to a function of surveillance of the temperature of the heating element, separate devices being always provided to control the temperature of the fluid to be heated; the latter are constituted by thermostats endowed with heat-sensitive elements immersed in the fluid itself. This is naturally reflected on costs of production.

In view of the state of the art, the object of the present invention is to provide a safety device that integrates the function of controlling the temperature of the fluid.

According to the present invention such object is attained thanks to a safety device for heating elements in home appliances with a fluid subjected to temperature control, wherein said temperature control is carried out by a thermostat having a heat-sensitive element immersed in said fluid, characterized in that said heat-sensitive element of the thermostat is also coupled thermally and mechanically, through thermally-conducting means, to said heating elements, to provide, by means of said thermostat, a combined control of the temperature of the fluid and of that of the heating elements.

According to a preferred embodiment of the present invention, said heat-sensitive element is fastened mechanically to a flange wherein said heating elements are fastened to the chassis of the home appliance.

Thanks to the present invention it is possible to provide a safety device integrating the function of controlling the temperature of the fluid, with a consequent saving of components and thus of costs of production.

These and other features of the present invention will be made more evident by the following detailed description of some embodiments thereof, illustrated as non-limiting examples in the enclosed drawings, wherein:

Fig. 1 shows a partially sectioned plan view of a first type of heating element with a flange for mounting to the chassis of the home appliance, on which there is fastened a safety device according to the invention;

Fig. 2 is a side view of said heating element with flange and safety device;

Fig. 3 shows a partially sectioned plan view of a second type of heating element provided with said safety device, wherein the thermostat is fastened to the flange of the heating element by means of a different type of mechanical fastening means;

Fig. 4 is a side view of the unit of Fig. 3;

Fig. 5 is a cross-sectional view taken along the line V-V of Fig. 3;

Fig. 6 shows a detail of the device of Fig. 3, with said mechanical fastening means in a position such as to allow the removal of the safety device;

Fig. 7 shows a partially sectioned plan view of said second type of heating element, wherein the thermostat is fastened to its mounting flange by means of a further type of mechanical fastening means;

Fig. 8 is a side view of Fig. 7;

Fig. 9 shows a partially sectioned plan view of a heating element similar to that of Fig. 1, but with the safety device endowed with a different type of thermostat;

Fig. 10 is a side view of Fig. 9;

Fig. 11 shows a partially sectioned plan view of a third type of heating element provided with a safety device according to the invention.

With reference to Figs. 1 and 2, a first type of heating element is constituted by an armoured resistance 1, provided with a flange 2 for mounting on a chassis 3 of a home appliance; the flange 2 comprises two opposite metal plates 4, between which there is interposed a rubber seal 5. It is also provided with a pair of through holes 6 wherein there are inserted as many terminals 7 of the resistance 1; a third through hole 8 allows the insertion of an immersion thermostat 9, say of the non-adjustable type with trigger temperatures of 30 °C and 90 °C, whose heat-sensitive element 10 is provided with an elastic clip 11 in thermally-conducting material for connecting to the resis-

tance 1. There is also a fourth through hole 12 for the insertion of threaded tie rod 13 thanks to which, by means of a fastening nut 14, the seal 5 is compressed so as to clamp both the resistance 1 and the thermostat 9. The latter is also provided with an electrical switch 15 driven by the heat-sensitive element 10.

In the case wherein the home appliance is a washing machine, the resistance 1 is located in the space between the bottom of the tank 16 and the bottom of the loading cylinder 17 (visible in Fig. 5); when the tank 16 has been filled with water, both the resistance 1 and the heat-sensitive element 10 of the thermostat 9 are immersed. When, during a washing cycle, the heating step is reached, power is applied across the terminals 7 of the resistance 1; the passage of current in the resistance 1 causes it to heat up, and the water is also consequently heated up. The heat-sensitive element 10, as well as controlling, in a manner known in itself, the temperature of the water during the washing cycle, also controls, through the clip 11, the temperature of the resistance 1 and, when this exceeds a given value, it triggers the switch 15 that cuts voltage from across the terminals 7 of the resistance 1.

In Figs. 3-6 there is shown a second type of heating element constituted by an armoured resistance with a longer linear extension with respect to the resistance 1. A corresponding flange 19, similar to the flange 2, is again provided with through holes 20 wherein there are inserted as many terminals 21 of the resistance 18, and, in a central position, with a through hole 22 in which the thermostat 9 is inserted; the heat-sensitive element 10 is provided with a clamp 23 in a thermally-conducting material tightly attached to the resistance 18 by means of a rivet 24. A lever 25 is hinged between two brackets 26 and allows, through two cams 27 (Figs. 5 and 6), the clamping of the two plates 4 of the flange 9 so as to compress the seal 5 and consequently clamp the resistance 18 and the thermostat 9.

In Figs. 7 and 8, as opposed to Figs. 3-6, the clamping of the plates 4 of a respective flange 35 is obtained in a manner similar to that shown in Figs. 1 and 2, by means of a pair of threaded tie rods 28, and of respective fastening nuts 50.

In figs. 9 and 10 there is represented a unit of resistance 1 and flange 2 identical to that shown in Figs. 1 and 2, and described previously. The thermostat 9 has, however, been replaced by a sensor bulb 29 that operates by expansion of a fluid, say, oil, inside a capillary 30 forming part of an adjustable thermostat; in such thermostats, commonly available commercially, the bulb 29 has dimensions that are unified with those of the thermostat 9. The sensor bulb 29 is connected to the resistance 1 by

means of an elastic clip 11.

Lastly, in Fig. 11 there is shown a third type of heating element constituted by an armoured resistance 31, provided with a flange 2 identical to that shown in Figs. 1, 2, 9 and 10. This solution again uses an adjustable thermostat provided with a fluid-expansion sensor bulb 32, that is again provided with a capillary 30 and is in thermal and mechanical contact with the resistance 31 by means of a capillary 33, containing the expandable fluid, connected to the resistance 31 by means of an elastic clip 34.

Claims

1. Safety device for heating elements in home appliances with a fluid subjected to temperature control, wherein said temperature control is carried out by a thermostat (9) having a heat-sensitive element (10, 29, 32) immersed in said fluid, characterized in that said heat-sensitive element (10, 29, 32) of the thermostat (9) is also coupled thermally and mechanically, through thermally-conducting means (11, 23, 33), to said heating elements (1, 18, 31), to provide, by means of said thermostat (9), a combined control of the temperature of the fluid and of that of the heating elements (1, 18, 31).
2. Safety device according to claim 1, characterized in that said heat-sensitive element (10, 29, 32) is mechanically fastened to a flange (2, 19, 35) with which said heating elements (1, 18, 31) are provided for their mounting on the chassis (3) of the home appliance.
3. Safety device according to claim 2, characterized in that said flange (2, 19, 35) comprises two opposite metal plates (4), with the interposition of a seal (5), there being provided mechanical means (13; 25, 26, 27; 28) for compressing said seal (5) to accomplish the clamping of said heating elements (1, 18, 31) and of said heat-sensitive element (10, 29, 32).
4. Safety device according to claim 3, characterized in that said mechanical means (13; 25, 26, 27; 28) are constituted by at least one threaded tie rod (13; 28) and by a respective fastening nut (4).
5. Safety device according to claim 3, characterized in that said mechanical means (13; 25, 26, 27; 28) are constituted by two brackets (26) fastened to one of the plates (4) of the flange (2, 19, 35) and by a lever (25) hinged on said brackets (26) and provided with two cams (27)

operating the other of said plates (4).

6. Safety device according to claim 1, characterized in that said thermally-conducting means (11, 23, 33) are constituted by an elastic clip (11) for connecting to said heating elements (1), applied to the heat-sensitive element (10, 29). 5
7. Safety device according to claim 1, characterized in that said thermally-conducting means (11, 23, 33) are constituted by a clamp (23) applied to the heat-sensitive element (10) and tightly attached to said heating elements (18) by means of a rivet (24). 10 15

20

25

30

35

40

45

50

55

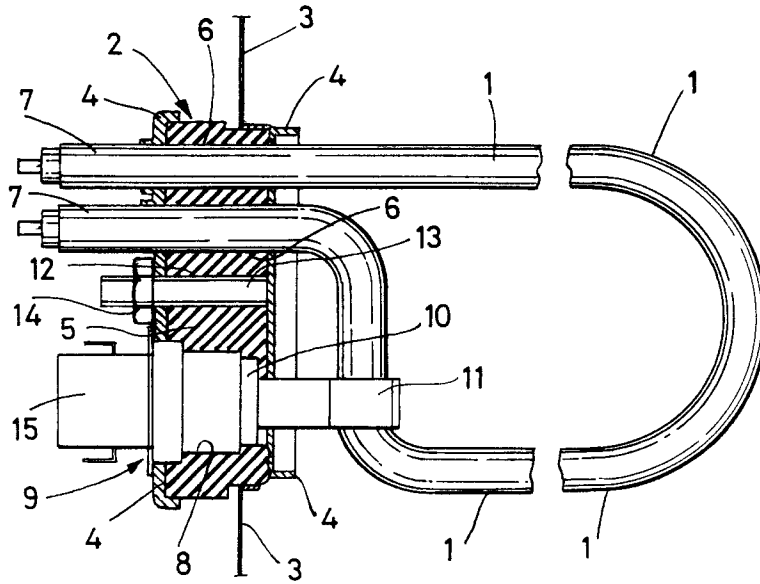


Fig.1

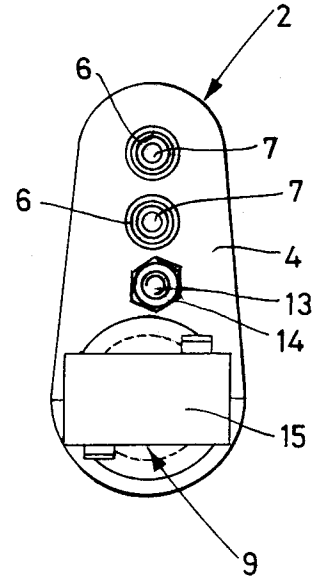


Fig.2

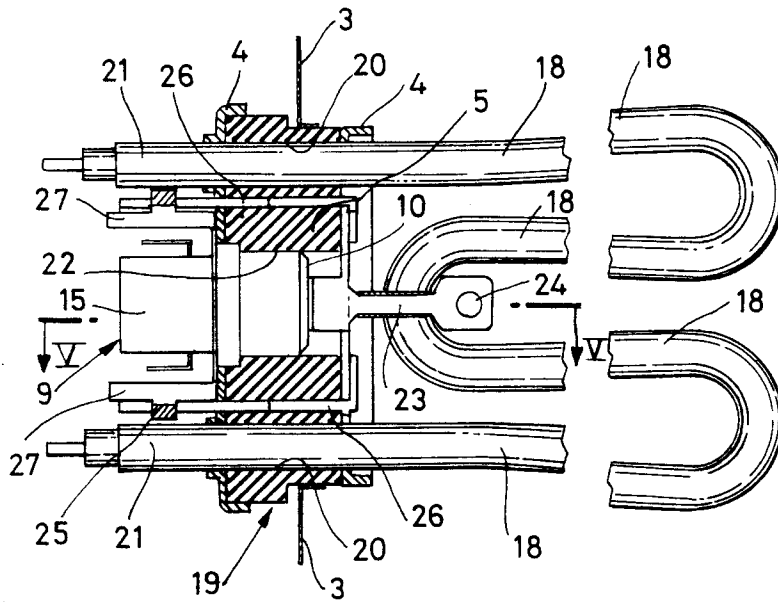


Fig.3

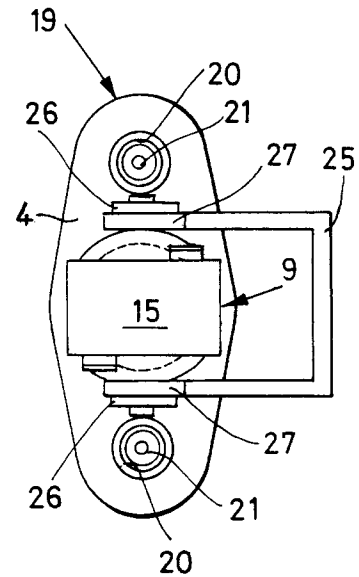


Fig.4

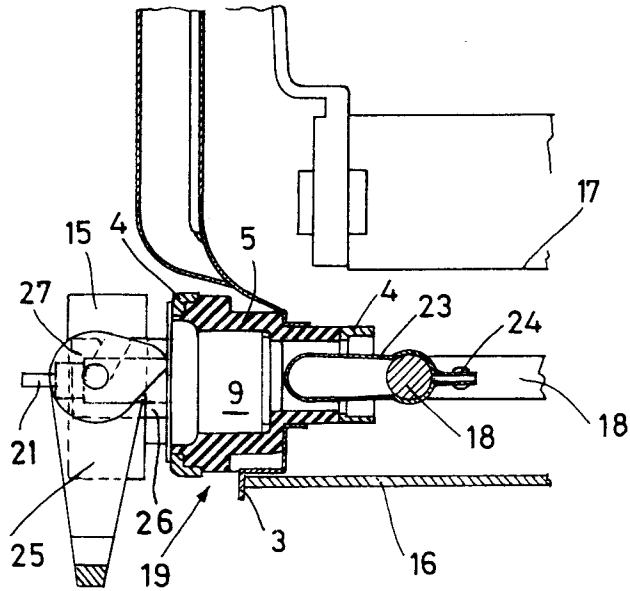


Fig. 5

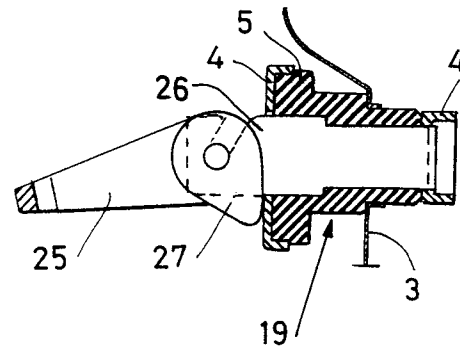


Fig. 6

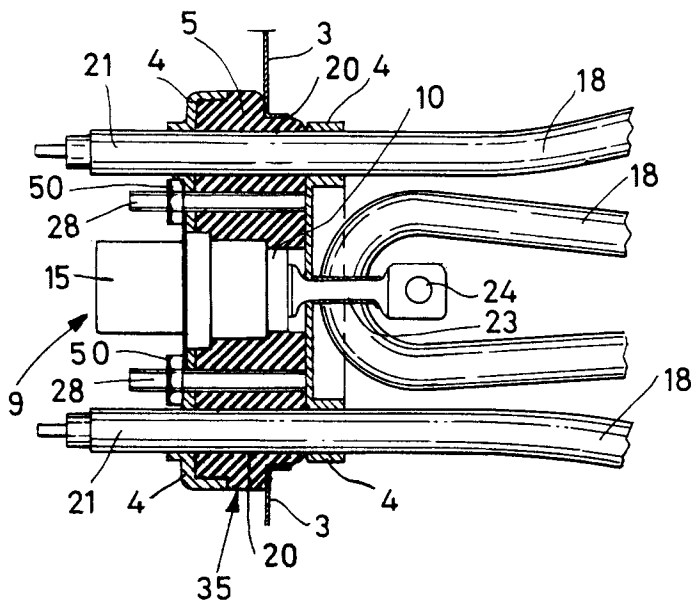


Fig. 7

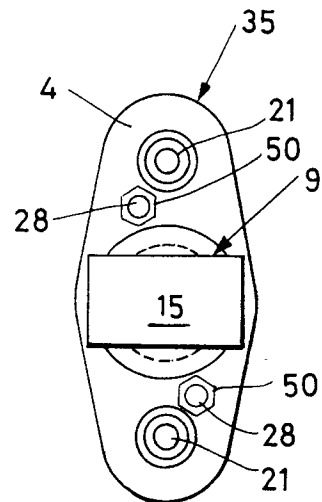


Fig. 8

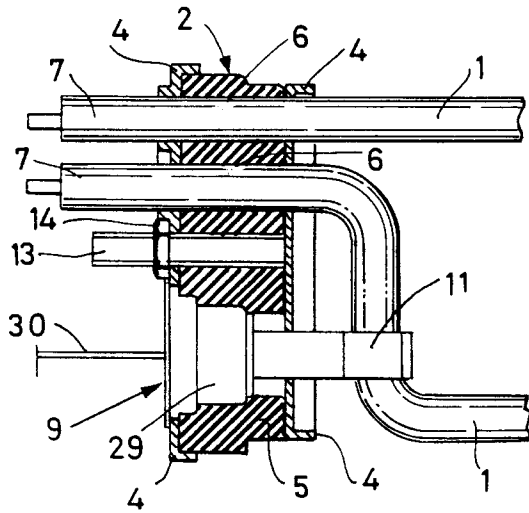


Fig.9

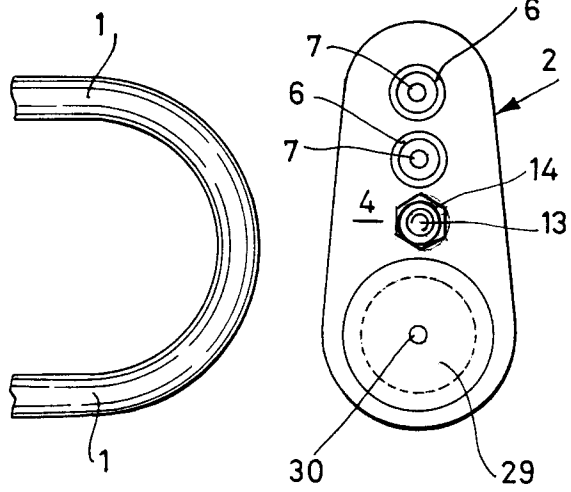


Fig.10

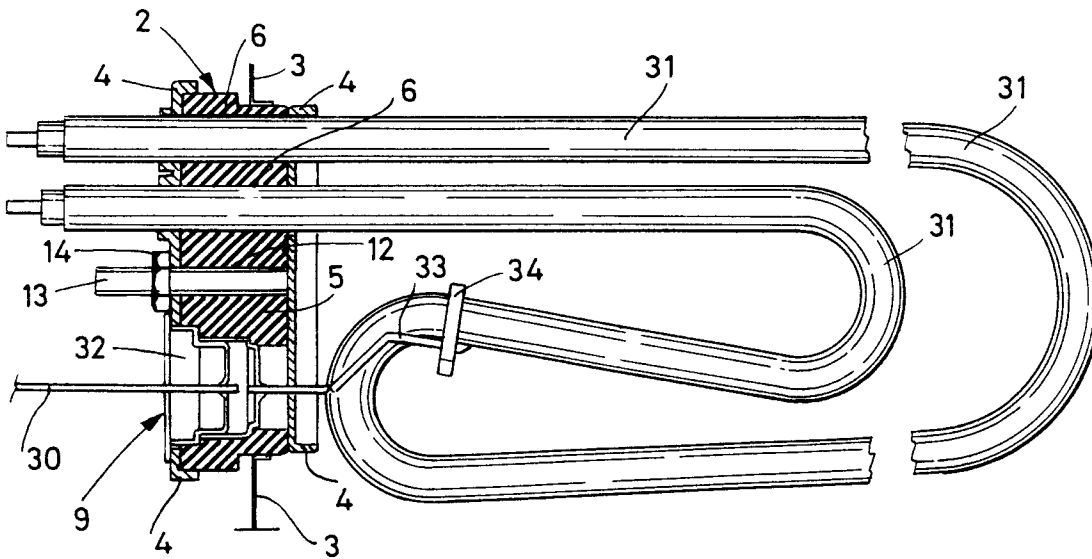


Fig.11



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 20 1204

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.5)
X	EP-A-0 275 635 (REDRING ELECTRIC LIMITED) * the whole document *	1-4	H05B3/82 D06F39/04 A47L15/42
X	WO-A-92 05675 (STRIX LIMITED) * claims; figures *	1-4, 6, 7	
X	DE-B-12 37 240 (LICENTIA PATENT-VERWALTUNGS-GMBH) * the whole document *	1	
X	US-A-3 750 429 (WESTINGHOUSE ELECTRIC CORPORATION) * column 4, line 47 - line 56; figure 3 *	1	
A	DE-A-18 15 429 (ELPAG AG CHUR) * figures *	3-5	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			H05B D06F A47L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22 August 1994	Examiner Courrier, G
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	