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Description

This invention relates to a heating element for household electrical appliances.

In known household electrical appliances which during their operating cycle comprise a wash stage with previously heated water, this heating is done by a resistance element immersed in the water contained in the bottom of the appliance. During operation the water is circulated through an appropriate utilisation circuit and is heated to the correct temperature while lying in the bottom of the appliance.

The method used up to the present time for carrying out this wash stage have brought to light two types of drawback, of an aesthetic nature and technical nature respectively.

From an aesthetic viewpoint the method (employed in dishwashers) involving the use of a conventional armoured resistance element visible on the bottom of the appliance has often been considered unacceptable.

From the functional viewpoint the need for the resistance element to be always immersed in water means that a water quantity has to be used which is certainly greater than that strictly necessary for correctly performing the wash cycle, leading to energy wastage.

To obviate this latter drawback, ie to reduce the water quantity always present in the bottom of the appliance, it has been proposed to construct increasingly flat resistance elements and install them in a position increasingly closer to said bottom.

However, for constructional reasons it is not possible to flatten the resistance element beyond a certain limit, and its installation closer than a certain limit to the bottom of the appliance can result in technical problem, particularly if this is of plastics construction.

A further drawback of known methods is the need in such household electrical appliances to use safety and operational thermostats which have necessarily to be installed in the bottom of the appliance and inevitably require this to be drilled.

Another drawback is that if the minimum water quantity to be heated, and already representing energy wastage, corresponds to that required for operating the household electrical appliance at full load, it is certainly excessive for reduced loads, at which it also represents excessive detergent and electricity consumption.

It has also been proposed to heat the water by passing it through a steel tube externally surrounded by a resistance element brazed to it. This method allows reduction of the water quantity to be heated but results in further drawbacks, namely:

- high production cost because of the labour required for brazing the armoured resistance element to the water passage tube and the cost of the brazing paste
- the need for strict and continuous checking of the resistance element, which is highly loaded and which, if it accidentally separates from the tube even over a short length, can undergo very rapid temperature increase to unacceptable levels, possibly resulting in destruction of the element
- in order to avoid this latter drawback, the need to monitor the resistance element by means of a capillary tube wound together with it and connected to a thermostat, which interrupts power supply to the element as soon as the temperature exceeds the set value.

DE-A1-2.913.988 discloses a porcupine wire coil of an electric resistance which is positioned in a tube having an electrically insulating inside in which the peaks of the coil convolutions are embedded so as to hold the coil convolutions spaced from each other. This device is particularly used to bring air or liquid flows a high rate and temperature.

US-A-786.257 discloses an electric heater consisting of a conductor wound around a core to which a plastics refractory material is applied to form a tubular sheath. This device is employed in electric lamps of the Nernst type.

DE-A1-3.531.424 describes a heater element for heating liquids comprising a canalization in which a coil heater is disposed. This device can be used in the wash circuit of household electrical appliances.

According to the invention a water heating element is used in the wash circuit of a household electrical appliance as described in claim 1.

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

- Figure 1 is a partly cut-away perspective view of a heating element according to the invention;
- Figure 2 is a longitudinal section therethrough; and
- Figure 3 is a diagrammatic representation showing it connected into the spray circuit of a dishwasher.

As can be seen from the figures, the element according to the invention consists essentially of a plastics tube 1 in which an armoured resistance element 2 disposed in a coil arrangement is embedded. The plastics material is preferably formed by nylon, resistant at least at 250 C.

The thickness of the plastics tube 1, the diameter of the armoured resistance 2 and their mutual position are chosen so that the resistance element 2 protrudes from the inner surface of the tube 1 but not from the external one, as it clearly results in figure 2.

Also embedded in the thickness of the tube 1 there is a safety thermostat 3 which is electrically connected into the power supply circuit of the resistance element 2. Further operational thermostats 4 and 5 can also be embedded in the tube 1, as clarified hereinafter.

The described heating element, indicated overall by 6, is connected into the spray circuit of a household electrical appliance such as a dishwasher. In particular, it is connected in series with a pump 7 which has its delivery side connected to the two rotary sprinklers 8 provided in the dishwasher wash compartment, and its suction side connected to the bottom of the wash compartment.

The operation of the element according to the invention is as follows:

during filling, a valve 9 is opened to allow water feed from the outside. After filling, the valve 9 is closed and the pump 7 and resistance element 2 of the device 6 are powered. As the water circulated by the pump 7 passes through the tube 1, it is gradually heated and emerges from the rotary sprinklers 8 at a temperature which increases until the predetermined temperature for the particular chosen wash cycle is reached. Depending on the particular stage in the wash cycle, the water can be circulated either alone or together with detergent fed simultaneously with it or separately. In any case the water always ensures that the resistance element 2 is kept at an enough low temperature value so not to cause the melting of the plastics tube.

Since the balance of the system is ensured by the presence of water, obviously the absence of this would cause a very quick increase of the temperature of the tube and its unavoidable damaging. For this reason the safety thermostat 3 is provided, which is adjusted at a temperature value higher than that most admissible for the water to be heated, but much lower than the temperature value which could cause the damaging of the plastics tube 1. Preferably the tube 1 is kept horizontally, with the safety thermostat 3 placed in the higher side of this. In such a way the heating device always operates in safety condition, since the side of the tube 1 in which the thermostat 3 is embedded is certainly the more stressed in the case of lack of water.

Together with the thermostat 3, which only operates as safety thermostat, there are provided, as already said, one or more operational thermostats 4 and 5 which have the function of interrupt-

ing the feed of the electrical resistance, but have operating values corresponding to the operating temperatures for different wash cycles foreseen for the machine.

From the aforesaid it is apparent that the heating element according to the invention has numerous advantages over conventional heating elements, and in particular, compared with a resistance element immersed in the water lying in the bottom of the appliance:

- it reduces the quantity of water to be heated, the quantity of electrical energy required for its heating, and the quantity of detergent
- it enables the thermostat or thermostats to be mounted directly in the heating element, so substantially simplifying the assembly of the household electrical appliance and avoiding the need to make holes in the base of the appliance, which besides creating installation problems often produce sealing problems;

compared with a heating element in the form of a steel tube with a brazed resistance element and wound capillary:

- it eliminates the presence of the steel tube and the laboriousness operation of brazing the armoured resistance thereof,
- it consequently does not require the use of brazing paste, which is of high cost and requires specialist application,
- it is practically insensitive to brazing defects and generally to defects resulting in partial separation of the resistance element from the tube, and
- it does not require the use of capillary thermostats, which are costly to assemble and delicate to use;

compared with a heating element in the form of a container housing a resistance element and traversed by the water to be heated:

- it is of much simpler and cheaper construction, and
- it does not result in the formation of any incrustation around the resistance element, consequently ensuring long life.

Claims

1. A water heating element (6) to be connected into the spray circuit of a household electrical appliance, particularly of a dishwasher, the water heating element comprising an electric resistance element (2) positioned in a tube (1), characterised in that the tube is constructed of plastics material, that the electric resistance element is an armoured resistance element (2) disposed in a coil arrangement which coil turns are embedded in the plastics material of the tube (1), and partially protrude from the inter-

nal tube surface lapped by the water and that in the same plastics material of the tube (1) is embedded at least one thermostat (3,4,5) acting in the feed circuit of the armoured resistance element (2).

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2. A heating element according to claim 1 characterised in that it comprises at least a safety thermostat (3) and at least an operating thermostat (4,5) embedded in the plastics material of the tube (1).

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3. A heating element according to claim 1 characterised in that it comprises a safety thermostat (3) embedded in the plastics material of the tube (1) and is arranged horizontally in said tube, said thermostat (3) being on the higher side of the duct of the water to be heated.

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4. A heating element according to claim 1 characterised in that the tube (1) is formed by plastics material resisting at a temperature of at least 250 ° C.

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5. A heating element according to claim 4 characterised in that the tube (1) is formed by nylon.

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Revendications

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1. Un élément chauffant d'eau (6) à connecter dans le circuit de pulvérisation d'un appareil électroménager, particulièrement d'un lave-vaisselle, l'élément chauffant d'eau comprenant un élément de résistance électrique (2) disposé dans un tube (1), caractérisé en ce que le tube est construit en matière plastique, que l'élément de résistance électrique est un élément de résistance armé (2) disposé en bobine dont les enroulements sont encastrés dans la matière plastique du tube (1) et font saillie partiellement de la surface interne du tube recouverte par l'eau, et e dans la même matière plastique du tube (1) est encastré au moins un thermostat (3, 4, 5) agissant sur le circuit d'alimentation de l'élément de résistance armé (2).

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2. Un élément chauffant conforme à la revendication 1, caractérisé en ce qu'il comprend au moins un thermostat de sécurité (3) et au moins un thermostat de fonctionnement (4, 5) encastrés dans la matière plastique du tube (1).

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3. Un élément chauffant conforme à la revendication 1, caractérisé en ce qu'il comprend un thermostat de sécurité (3) encastré dans la ma-

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tière plastique du tube (1) et disposé horizontalement dans ledit tube, ledit thermostat (3) étant sur le côté supérieur du conduit de l'eau à chauffer.

4. Un élément chauffant conforme à la revendication 1, caractérisé en ce que le tube (1) est fabriqué en matière plastique résistant à une température d'au moins 250 ° C.

5. Un élément chauffant conforme à la revendication 4, caractérisé en ce que le tube (1) est fabriqué en nylon.

Patentansprüche

1. Wasserheizelement (6) für den Einbau in den Sprühkreislauf eines elektrischen Haushaltsgerätes, insbesondere einer Geschirrspülmaschine, das ein elektrisches Widerstandselement (2) aufweist, welches in einem Rohr (1) angeordnet ist, dadurch gekennzeichnet, daß das Rohr aus Kunststoff gefertigt ist, daß das elektrische Widerstandselement ein gepanzertes Widerstandselement (2) ist, das eine gewickelte Form hat, deren Windungen in dem Kunststoffmaterial des Rohres (1) eingebettet sind und teilweise über die vom Wasser benetzte Innenwand des Rohres hervorsteht, und daß in das Kunststoffmaterial des Rohres (1) wenigstens ein Thermostat (3,4,5) eingebettet ist, der im Erregerkreis des gepanzerten Widerstandselementes (2) wirksam ist.

2. Heizelement nach Anspruch 1, dadurch gekennzeichnet, daß es wenigstens einen Sicherheitsthermostaten (3) und wenigstens einen in das Kunststoffmaterial des Rohres (1) eingebetteten Arbeitsthermostaten (4,5) aufweist.

3. Heizelement nach Anspruch 1, dadurch gekennzeichnet, daß es einen in das Kunststoffmaterial des Rohres (1) eingebetteten Sicherheitsthermostaten (3) aufweist, der horizontal in dem Rohr angeordnet ist und auf der höheren Seite der Leitung für das zu erhitzende Wasser liegt.

4. Heizelement nach Anspruch 1, dadurch gekennzeichnet, daß das Rohr (1) aus einem Kunststoffmaterial besteht, das einer Temperatur von wenigstens 250 ° C standhält.

5. Heizelement nach Anspruch 4, dadurch gekennzeichnet, daß das Rohr (1) aus Nylon besteht.

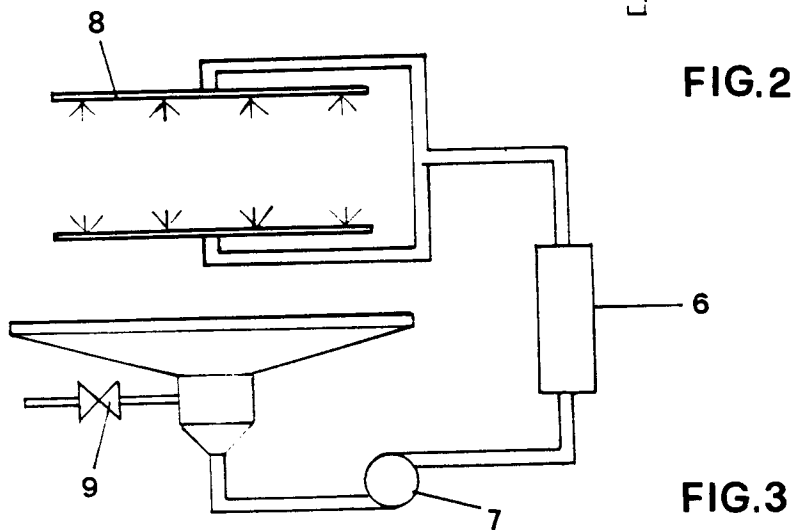
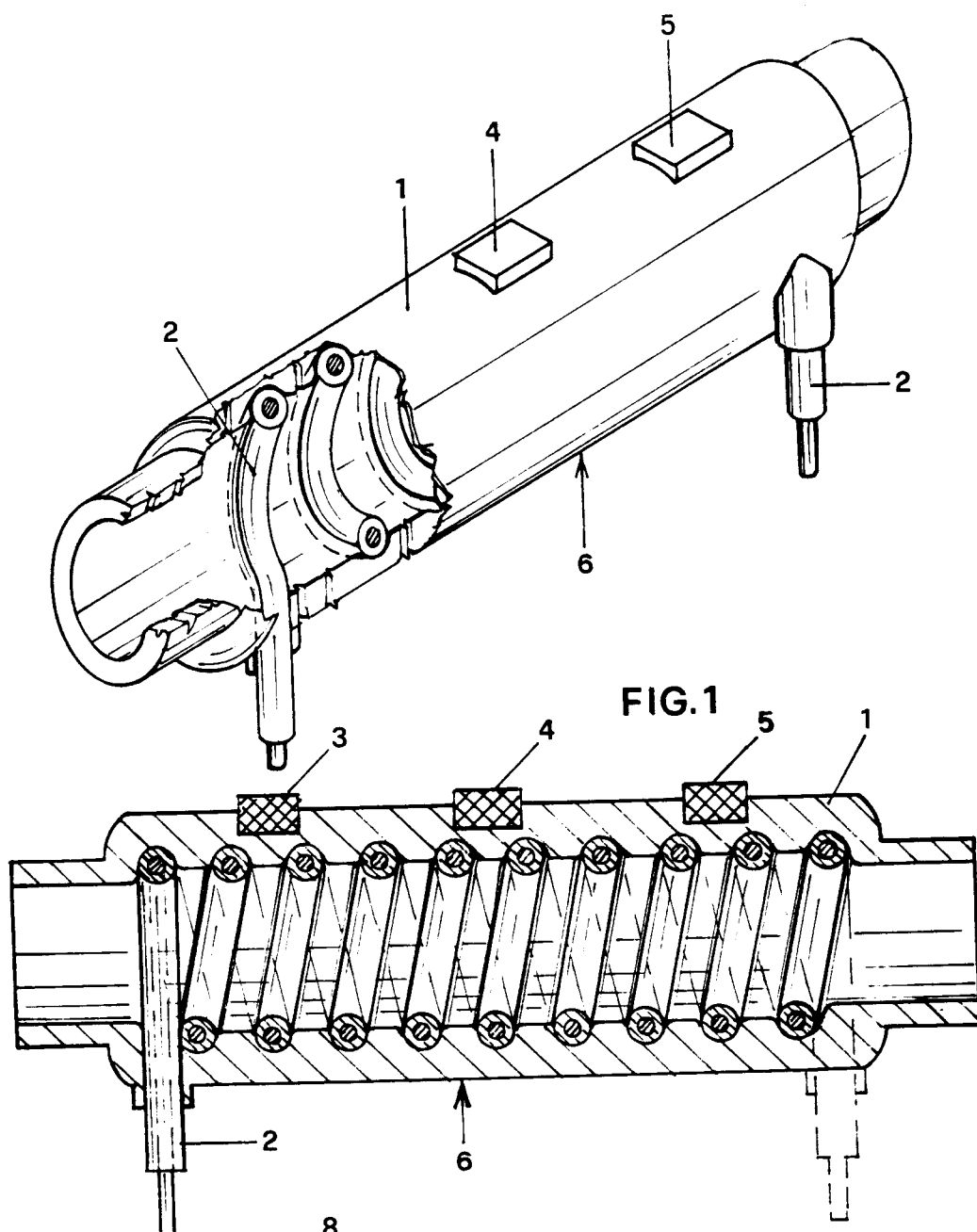


FIG. 3