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(54) Tap-water heating device and method for controlling it

(57) A method for controlling a tap-water heating device having a tap-water line (2) in a hot-water reservoir (1) comprises a temperature measurement at the inlet side of the tap-water line. The results of the temperature measurement are used to control the tap-water heating device. To this end, the latter device comprises a temperature sensor (3) which is arranged in a body (4) which exhibits good thermal conductivity and is in direct thermal contact with the inlet side of the tap-water line (2) and with the hot-water reservoir (1).

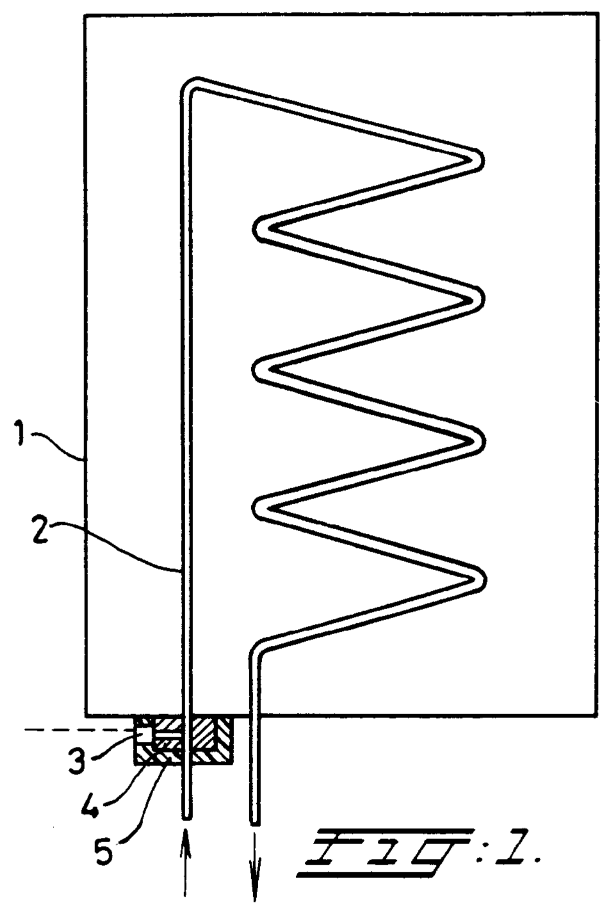

FIG. 1.

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Description

The invention relates to a tap-water heating device, having a tap-water line in a hot-water reservoir. The invention further relates to a method for controlling such a tap-water heating device.

Tap-water heating devices in which the tap-water is heated directly by the heating device are known. On the other hand, heating may take place indirectly via heated water. For indirect heating, boilers and flow-through heating devices are known. In the case of flow-through heating devices, a tap-water line is arranged in a hot-water reservoir. To heat the tap-water effectively, the water in the hot-water reservoir has to be reheated using a corresponding heating element when tap-water is being drawn off.

NL-A-297 384 discloses a hot-water reservoir through which a tap-water line runs. The water in the hot-water reservoir is heated by a heating element constituted by a boiler, and flows from the boiler through a feed connection through the hot-water reservoir and through a return connection back to the boiler. The temperature at the inlet side of the tap-water line is sensed with a heat-sensitive element at a distance from the hot-water reservoir for controlling the tap-water heating device. On the one hand, this arrangement provides for a rapid control of the heating element when tap-water is being drawn off, since cold tap-water reaches the heat-sensitive element very rapidly after the start of the tap-water supply. On the other hand, the heat-sensitive element does not detect the cooling off of the water in the hot-water reservoir in the absence of a tap-water supply, as a result of which tap-water being drawn off afterwards may have too low a temperature during a longer time period, until the heating element has reheated the water in the hot-water reservoir again to the operating temperature.

Further it is known to provide a temperature sensor in the hot-water reservoir, which sensor acts on the control device of the heating element as a function of the water temperature in the hot-water reservoir. This arrangement also is satisfactory only to a limited extent: namely, after the start of a tap-water supply it will take some time until the temperature of the water in the hot-water reservoir drops sufficiently to activate the control system of the tap-water heating device by means of the temperature sensor. In this time period the tap-water temperature can drop to an unacceptable extent.

Firstly, the invention aims to provide a method, which leads to a vary rapid control of the heating element, having sufficient warm tap-water available at all times.

To this end, the method according to the invention, in which the temperature at the inlet side of the tap-water line is measured and the tap-water heating device comprising a temperature sensor controlling the heating device, is controlled on the basis of the results of this measurement, is characterized in that the temperature sensor is arranged in a metal body which exhibits good thermal conductivity and is in direct thermal contact with the inlet side of the tap-water line and with the hot-water reservoir. The temperature sensor is situated outside the hot-water reservoir.

According to the invention, the temperature sensor is not situated only in or at a distance from the hot-water reservoir, in order to respond to the temperature thereof. By contrast, according to the invention, the temperature measurement is performed at the inlet side of the tap-water line and at the hot-water reservoir. Even a small temperature drop is transmitted to the metal body and to the temperature sensor, so that the latter ensures that the heating element is controlled virtually without delay. Additionally, with the same temperature sensor also a slow temperature drop of the water in the hot-water reservoir is detected when during a longer time period no tap-water is being drawn off, so that also in this case the control system of the heating element can be activated in time. Thus, further heat is supplied to the hot-water reservoir, both at a temperature drop at the inlet side of the tap-water line and at a temperature drop in the hot-water reservoir.

In order to avoid thermal radiation from the metal body, which preferably - like the tap-water line - consists of copper, which radiation could impair immediate detection of the falling temperature by the temperature sensor, it is advantageous to provide the metal body with a thermal insulation.

The drawing diagrammatically illustrates two exemplary embodiments of the invention, in which:

Fig. 1 shows a vertical cross-section through a hot-water reservoir having an integrated tap-water line;
Fig. 2 shows a detail of Fig. 1, on an enlarged scale, in order to illustrate the way in which the temperature sensor is arranged; and
Fig. 3 shows a second way of arranging the temperature sensor.

In the various figures, identical reference numerals relate to identical components. Arrows indicate the direction of flow of tap-water.

According to Figs. 1 and 2, a tap-water line 2 is situated in the hot-water reservoir 1 having a heating element (not shown). A bolt-shaped temperature sensor 3 with connection wires 3a is arranged outside the hot-water reservoir 1 on the side where the tap-water enters the hot-water reservoir 1. In the embodiment shown, one end of the temperature sensor 3 projects into the tap-water. The rest of the temperature sensor 3 is embedded in, in particular screwed into, a metal body 4 which is preferably made of copper and is connected to the tap-water line 2 and the hot-water reservoir 1. Naturally, it is also possible to embed the temperature sensor 3 entirely in the metal body 4. A temperature drop such as the one occurring when fresh cold water flows through the tap-water line 2 into the hot-water reservoir

1 is detected almost immediately and used to control the tap-water heating device by switching on the heating element. A temperature drop of the water in the hot-water reservoir 1 is also transmitted to the temperature sensor 3 by the metal body 4. The metal body 4 is surrounded by a thermal insulation 5.

Fig. 3 shows a rod-shaped temperature sensor 3b in the form of a tube which exhibits good thermal conductivity and in which a temperature-sensitive element 3c is situated. The temperature sensor 3b is arranged in two holes in the tap-water line 2 which lie opposite one another and is soldered fast in these holes in a liquid-tight manner. The thermal contact between the temperature sensor 3b and the inlet side of the tap-water line 2 is ensured by the fact that part of the temperature sensor 3b is situated in the water in the tap-water line, and the thermal contact between the temperature sensor 3b and the hot-water reservoir 1 is ensured by the fact that another part of the temperature sensor 3b is situated in the body 4 which is connected to the tap-water line 2.

Claims

1. Method for controlling a device tap-water heating having a tap-water line in a hot-water reservoir, in which the temperature at the inlet side of the tap-water line (2) is measured and in which the tap-water heating device is controlled on the basis of the results of this measurement, characterized in that the temperature is measured with the aid of a temperature sensor (3) which is arranged in a metal body (4) which exhibits good thermal conductivity and is in direct thermal contact with the inlet side of the tap-water line (2) and with the hot-water reservoir (1).

2. Tap-water heating device, having a tap-water line in a hot-water reservoir and a temperature sensor controlling the heating device, characterized in that the temperature sensor (3) is arranged in a metal body (4) which exhibits good thermal conductivity and is in direct thermal contact with the inlet side of the tap-water line (2) and with the hot-water reservoir (1).

3. Tap-water heating device according to claim 2, characterized in that at least part of the temperature sensor (3) is in direct contact with the water in the tap-water line (2).

4. Tap-water heating device according to claim 2 or 3, characterized in that the temperature sensor (3) is substantially bolt-shaped.

5. Tap-water heating device according to claim 2 or 3, characterized in that the temperature sensor (3b) is substantially rod-shaped.

6. Tap-water heating device according to any of claims 2-5, characterized in that the metal body (4) consists of copper.

7. Tap-water heating device according to any of claims 2-6, characterized in that the metal body (4) is provided on the outside with a thermal insulation (5).

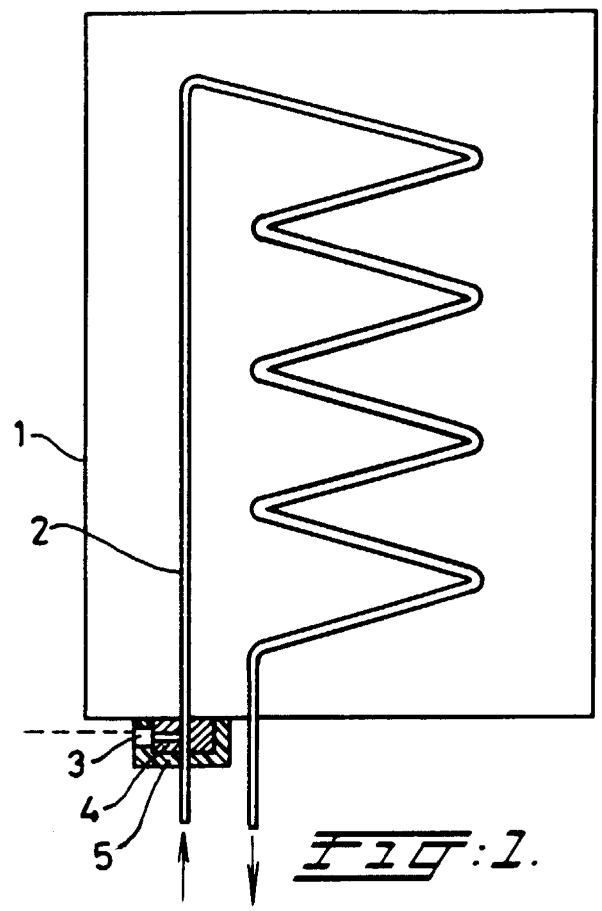

Fig:1.

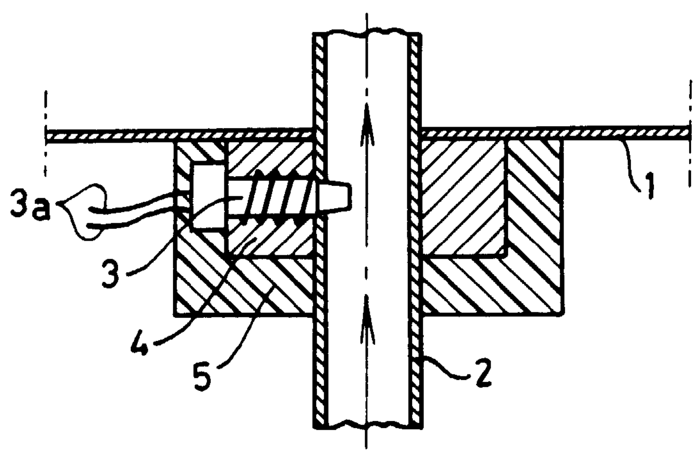

Fig:2.

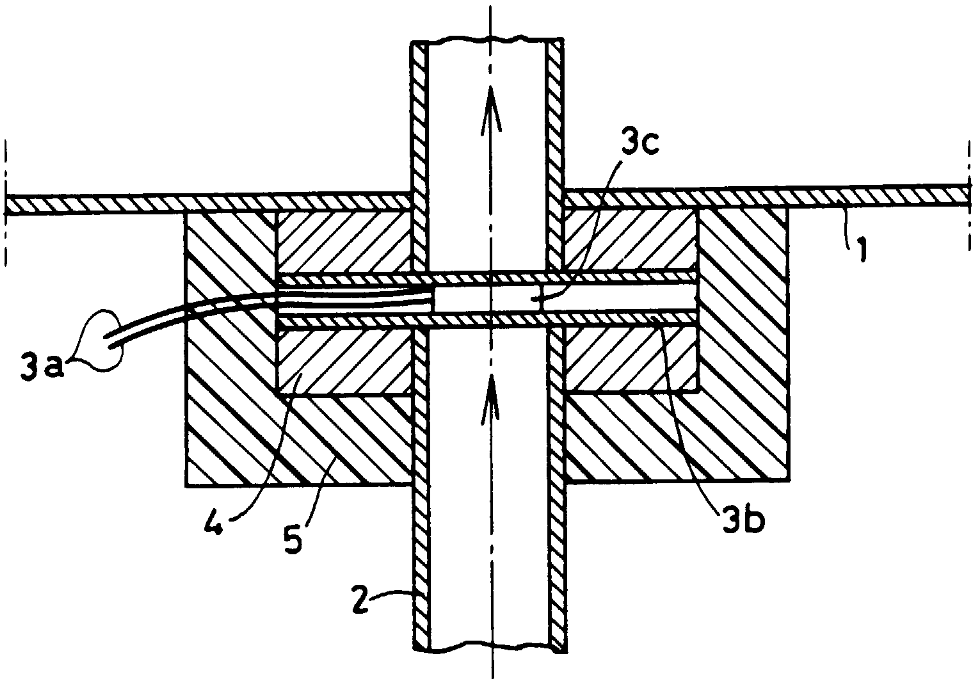

Fig: 3.