July 5, 1949. J. QUINN 2,475,403

ELECTRIC IMMERSION HEATER

Filed Feb. 24, 1947

Fig.1.

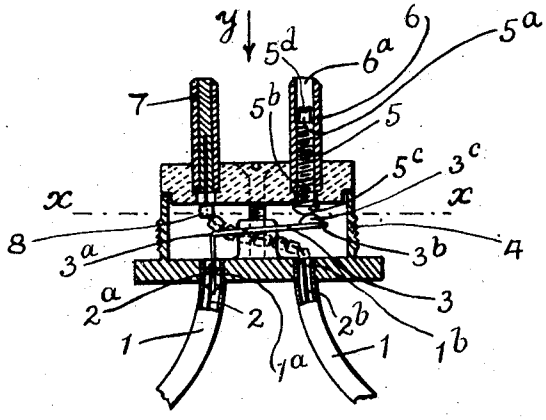
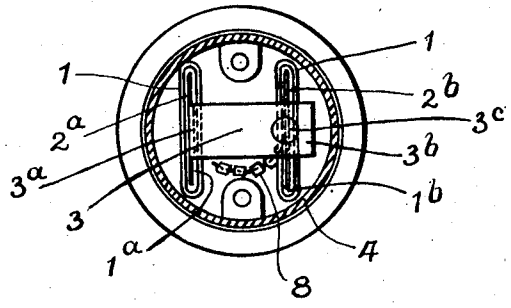



Fig.2.

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# UNITED STATES PATENT OFFICE

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## ELECTRIC IMMERSION HEATER

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1 Claim. (Cl. 219—41)

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This invention relates to electric immersion heaters of the type wherein the heater is mounted on the end of a socket or other support provided with a cut-out device for controlling the supply of current to the heating element so that when the latter reaches a certain temperature the cut-out device will operate to break the current supply circuit and be adapted automatically to re-set itself to again close the circuit when the heating element is cooled to a lower temperature, the heating element being arranged on one end of the socket whilst the other end of the latter has secured thereto an insulating plug provided with outwardly projecting contact members or terminal pins, the resistance winding of the heating element being enclosed within a tubular metal casing having its open ends projecting into the socket.

The object of the invention is to provide improvements in electric immersion heaters of the type above stated.

According to the present invention an electric immersion heater of the type stated is provided in which one end of the resistance winding of the heating element is connected with one end of a heat responsive bi-metallic member adapted to project into the terminal carrying socket through one of the open ends of the tubular metal casing and arranged to extend across the socket and ending in a position opposite or in close proximity to and in front of the other open end of the tubular metal casing, the free end of the said heat responsive bi-metallic member being normally in contact, through a suitable contact thereon, with a contact member connected with one of the projecting contact members or terminal pins in the insulating plug of the socket, the other end of the resistance winding of the heating element being connected with the other contact member or terminal pin of the insulating plug of the socket thus completing the circuit. The arrangement is such that when the heating element reaches a predetermined temperature, the heat from the resistance winding of the heating element will cause a corresponding rise in temperature in the heat responsive member due to the latter being connected with the resistance winding and also due to heat from the other open end of the tubular casing impinging on the free end of the heat responsive member, causing the latter and its contact to move away from the contact member connected with the terminal pin in the insulating plug in the socket and thereby break the circuit. When cooling of the heating element takes place to a lower temperature, the

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heat responsive member will by contraction cause the latter to move so that the contact thereon will move back into contact with the contact member connected with the terminal pin and thereby complete the circuit.

The contact member connected with the terminal pin in the insulating plug and adapted for co-operation with the heat responsive member to control the electric circuit, would preferably be made adjustable in relation to the contact on the heat responsive member to provide for the automatic breaking of the circuit at any predetermined temperature, and in which case the said first mentioned contact member would be located on the inner end of a screw threaded member movable within the terminal pin and provided with a grooved outer end for the reception of a screw driver or equivalent for turning the screw threaded member to effect adjustment of the position of its contact thereon.

The invention will now be described with reference to the accompanying drawing wherein, by way of example, it is shown applied to an electric immersion heater for a kettle.

Figure 1 is a sectional view showing the terminal carrying socket and terminal pins thereon, also showing the open ends of the tubular metal casing of the heating element where they enter the socket and showing the heat responsive member in accordance with the invention connected with the resistance winding in one of said casing ends and also showing the resistance winding from the other end of the casing connected directly to one of the terminal pins.

Figure 2 is a sectional view on the line *x*—*x*, see Figure 1, looking in the direction of the arrow *y*.

Referring to the drawings;

The drawing shows a portion only of the tubular metal casing 1 of the heating element i. e. the portion where the open ends of the casing are secured to the socket. One end 2*a* of the resistance winding 2 in the metal casing 1 of the heating element is connected, through the open end 1*a* of the metal casing 1, with one end 3*a* of a heat responsive bi-metallic member 3. The bi-metallic member 3 is so shaped that it is adapted to project from the end 2*a* of the resistance winding 2 into the hollow socket 4 and to extend across the socket to terminate in a position opposite to, or in close proximity to and in front of the other open end 1*b* of the tubular metal casing 1. The free end 3*b* of the bi-metallic member 3 is normally in contact, through a contact member 3*c* thereon, with a

contact member 5c on the end 5b of a pin 5 adjustably secured in the terminal pin 6 in the insulating plug of the socket 4. The other end 2b of the resistance winding 2 of the heating element is directly connected with the other terminal pin 7 of the insulating plug of the socket 4 and when the contact member 3c is in contact with the contact member 5c and the terminal pins 6 and 7 are, in known manner, placed in and in contact with sockets in an electric power circuit, then the electric circuit through the resistance winding 2 of the heating element will be completed and will so remain until the heating element reaches a predetermined temperature. When the permitted limit of temperature of the heating element is exceeded then the heat from the resistance winding 2 of the heating element will cause a corresponding rise in temperature in the heat responsive member 3 due to the latter being connected with the resistance winding 2 and due also to heat from the other open end 1b of the metal casing 1 impinging on the free end 3b of the heat responsive bi-metallic member 3 with the result that this end of the bi-metallic member 3 and the contact 3c there at will, due to the heat action, move away from the contact member 5c of the pin 5 so that the electric circuit therethrough will thereby be broken. When cooling of the heating element takes place to a lower temperature, the bi-metallic heat responsive member 3 will, by contraction, be caused to move back to its normal position, bringing the contact member 3c thereon again into contact with the contact member 5c of the pin 5 and thereby again restoring or completing the electric circuit through the heating element.

The pin 5 in the terminal pin 6 is, as stated, adjustably supported therein, being, in the example shown, formed with an external screw thread which fits with an adjustable screw movement in a corresponding internally screw threaded hole 6a in the terminal pin 6. The end 5a of the pin 5 is provided with a slot 5d whereby, by use of a screwdriver or equivalent, the pin 5 can be moved as required to adjust the relative positions of the contacts 5c and 3c and thereby provide for the breaking of the electric circuit at different predetermined temperatures.



The heat responsive member 3 would consist of a strip of heat responsive bi-metal secured to one end of the resistance winding 2, preferably by rivetting, and it would be bent or shaped so as to extend therefrom across the hollow socket 4 to the position shown. The connection from the other end 2b of the resistance winding 2 to the other terminal pin 7 would be suitably insulated, for example by means of the insulating beads 8, to prevent any electrical connection being made with the heat responsive member 3.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:

In an electric immersion heater, a socket casing, a tubular immersion member containing a resistance element and having its ends opening into said casing, a bimetallic thermostatic circuit closing element having one end connected directly to the resistance element at one of the open ends of said tubular member and extending transversely of the socket to have its free end over the other open end of the tubular member, a terminal pin on said casing connected to the resistance element at the last mentioned end of the tubular member, and a second terminal pin on said casing and carrying a contact lying in the path of the free end of the thermostatic element, said last mentioned pin being hollow and said contact being screw-threaded therein.

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