May 21, 1940. W. M. SAGE 2,201,703

THERMOSTATICALLY CONTROLLED IMMERSION ELECTRIC HEATER

Filed Oct. 30, 1937

Fig. 1.

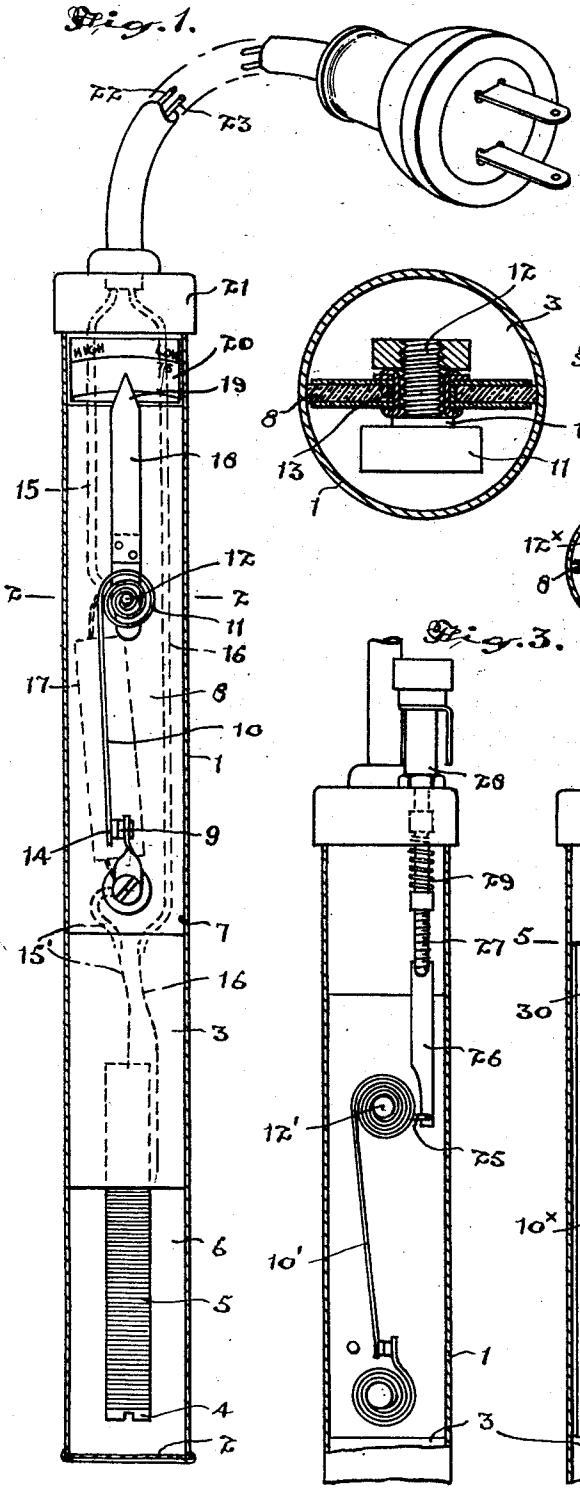


Fig. 2.

Fig. 5.

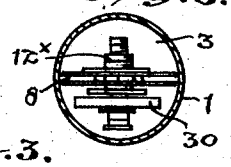


Fig. 3.

Fig. 4.

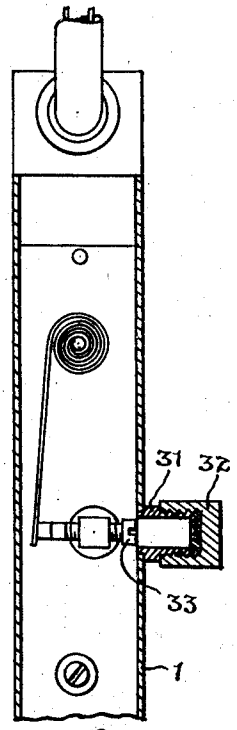


Fig. 7.

Fig. 6.

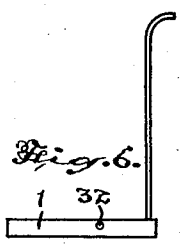
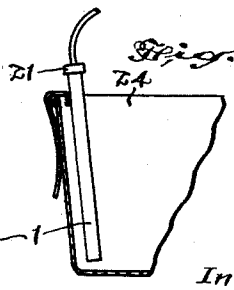


Fig. 8.



Inventor.
Warren M. Sage.
by H. J. S. Dennison
Atty

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UNITED STATES PATENT OFFICE

2,201,703

THERMOSTATICALLY CONTROLLED IMMERSION ELECTRIC HEATER

Warren M. Sage, Toronto, Ontario, Canada

Application October 30, 1937, Serial No. 171,876

8 Claims. (Cl. 219—41)

The principal objects of this invention are to provide an immersion type of electric heating device which may be easily and quickly adjusted to heat the fluid in which it is immersed, and effectively maintain the temperature of such fluid at any desired degree of heat.

A further and important object is to devise a structure which may be manufactured at low cost, so as to render it readily available to the public, and which will be thoroughly dependable and free from danger to the user either from shock or fire hazard.

The principal feature of the invention consists in the novel arrangement of an electric heating element within a chamber at the sealed end of a metal tube and a thermostatic device within an adjacent chamber in said tube separated from the heating chamber by a heat insulating wall, so that the thermostat is affected principally by the temperature of the liquid surrounding the tube.

In the accompanying drawing, Figure 1 is a longitudinal sectional elevation of a heater constructed in accord with this invention.

Figure 2 is an enlarged cross sectional detail through the heater on the line 2—2 of Figure 1.

Figure 3 is a longitudinal sectional elevation of a portion of a heater showing a modified form of thermostat adjustment.

Figure 4 is a detail view similar to Figure 3 showing another form of thermostat adjustment.

Figure 5 is a cross section of the device shown in Figure 4 taken on the line 5—5 of Figure 4.

Figure 6 is a miniature elevation of a modified form of heater.

Figure 7 is a view similar to Figure 3 showing a form of thermostat adjustment as applied to the form of heater shown in Figure 6.

Figure 8 is an elevation showing one manner of using the heater.

Tubular immersion heaters with thermostatic controls have been devised in various forms, but most of these are controlled by the direct influence of the heater.

The present invention consists in providing a tube 1 having the end 2 thereof sealed. A block of heat and electrical insulating material 3, preferably of porcelain fits snugly within the interior of the tube and is spaced intermediate of the length thereof.

A porcelain tube 4 forming part of the block 3 or mounted in a recess in one end thereof supports the electric heating element 5 within the chamber 6 at the sealed end of the metal tube 1, and the terminals extend through suitable holes in the block to the chamber 7.

A plate 8 which may be of metal or an electric insulating material such as "Bakelite" is secured to the block 3 and extends lengthwise centrally of the tube 1, and in the form shown in Figure 1, it supports an insulated terminal 9 adjacent to the block.

A bi-metallic thermostatic arm 10 having a spiral end 11 is mounted on a stud 12 rotatably mounted in an insulated bearing 13 in the plate 8, and its contact end 14 co-operates with the terminal 9.

An electric conductor 15 is electrically connected with the stud 12 supporting the bi-metallic arm 10 and a conductor 16 extends directly through to one end of the heater coil while the other end of the heater coil is connected by conductor 15′ to terminal 9.

A suitable form of condenser 17 is coupled between the terminals 9 and 12 on the opposite side of the plate 8 to the thermostat to eliminate sparking of the contacts.

An arm 18 is secured to the stud 12 and has a pointer 19 of insulating material extending to a scale 20 mounted on the plate and by means of which the thermostat is adusted to open at predetermined temperatures of the fluid to be heated.

A screw cap 21 seals the end of the tube, and through this the electric conduits 22 and 23 extend from a suitable contact plug.

It will be understood that when this tube is inserted into a receptacle 24 containing a fluid to be heated, the tube will be immersed to a point well above the porcelain block, so that the fluid will absorb heat generated in the tube and the temperature within the thermostat chamber 7 will be the mean temperature of the heat conducted upwardly by the tube 1 above the heating chamber 6 and the temperature of the fluid surrounding same.

It will thus be readily appreciated that the temperature affecting the thermostat will be practically the temperature of the surrounding liquid, and the scale for the regulator can be readily calibrated to enable the pointer to be set at a figure representing the heat, which it is desired to be maintained in the fluid.

The simplicity and reliability of the device thus described will be readily appreciated.

Many different forms of thermostatic design and control may be substituted for that shown, and though I have shown several modified forms,

these are merely shown by way of example, the general arrangement of heater and thermostat being the same.

In the form shown in Figure 3 the stud 12' of the thermostat arm 10' has an arm 25 connected to a rod 26 into which a screw 27 mounted in an orifice in the tube cap is threaded. The rod extends through a suitable stuffing box 28, and has an indicator knob on the top and the rod is preferably held under the tension of a spring 29.

In Figures 4 and 5 the thermostat 10x is of the corrugated or bowed type and its spacing from the fixed terminal for temperature adjustment is effected by turning the disc 30 threaded on the stud 12x.

Again in Figures 6 and 7 the tube is preferably square, so that it will be flat on the bottom of a dish containing fluid to be heated. The tube is provided with a ferrule 31 in the side wall closed by a sealing cap 32 through which access is obtained to an adjusting screw 33 by which the thermostat is regulated.

What I claim as my invention is:

1. In an electric heater of the tubular immersion type having an electric heating unit and a thermostatic control unit, a block of insulating material rigidly connected with and mounting said electric heater and control unit in segregated relation respectively on opposite ends thereof, the whole forming a rigid assembly insertable into or removable as a unit from the tubular portion of the heater.

2. In a tubular immersion heater of the type having a resistance heater and a thermostatic switch control, means forming a rigid mounting connection between said heater and switch control including a porcelain block interposed bodily between the switch and heater and having the resistance heater directly mounted thereon and supported thereby in spaced relation to the tubular member.

3. Means as claimed in claim 2 in which said porcelain block is provided with an axial porcelain extension of smaller diameter than the block on which the element of the resistance heater is wound and is supported thereby centrally of the tubular member in rigid association with the block and insertable and removable therewith as a rigid unit.

4. Means as claimed in claim 2 in which said mounting means includes a partition member rigidly secured to one end of said refractory block and extending longitudinally of the tubular member and completely from side to side thereof in diametrical relation dividing the tubular member into two compartments and engaging the tubular wall at opposite sides in bracing and positioning contact.

5. Means as claimed in claim 2 in which said mounting means includes a partition member rigidly secured to one end of said refractory block and extending longitudinally of the tubular member and completely from side to side thereof in diametrical relation dividing the tubular member into two compartments and engaging the tubular wall at opposite sides in bracing and positioning contact, said partition being formed solely of a strip of insulating material and the switch member being mounted thereon to operate in one of said compartments on one side of the insulating partition and a condenser bridging the switch contacts being supported by the partition on the opposite side thereof within the other of said compartments.

6. Means as claimed in claim 2 in which said mounting means includes a partition member rigidly secured to one end of said refractory block and extending longitudinally of the tubular member and completely from side to side thereof in diametrical relation dividing the tubular member into two compartments and engaging the tubular wall at opposite sides in bracing and positioning contact, a pointer enclosed within the tubular member and connected with the thermostatic member for adjustment therewith, and a scale carried by said partition member with which said pointer co-operates.

7. In an electric heater of the tubular immersion type having an electric heating unit and thermostatic control unit enclosed therein, means for adjusting said thermostat including an adjusting screw accessible through an opening in the wall of the tubular enclosing element, and means forming a removable sealed closure about the wall opening to permit the tubular member to be submerged in a body of liquid to a depth such that the liquid surrounds the said wall opening without leakage thereinto.

8. Means as claimed in claim 7 in which said wall opening is provided with a threaded tubular extension through which the adjusting means within the tubular member is accessible, and a cap member threaded on said tubular extension and sealing the entrance thereto.

WARREN M. SAGE.