May 24, 1949. H. P. CHAPMAN 2,471,260

ELECTRICAL FLUID HEATER

Filed Jan. 30, 1947 2 Sheets-Sheet 1

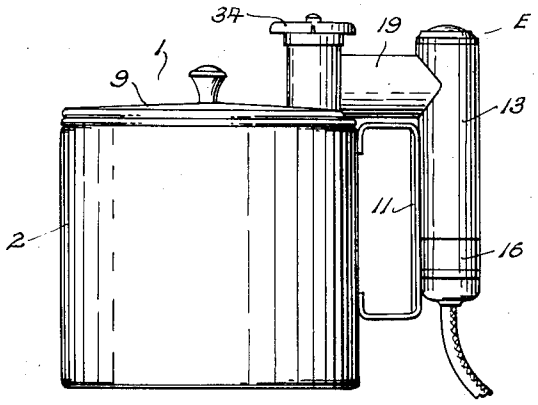
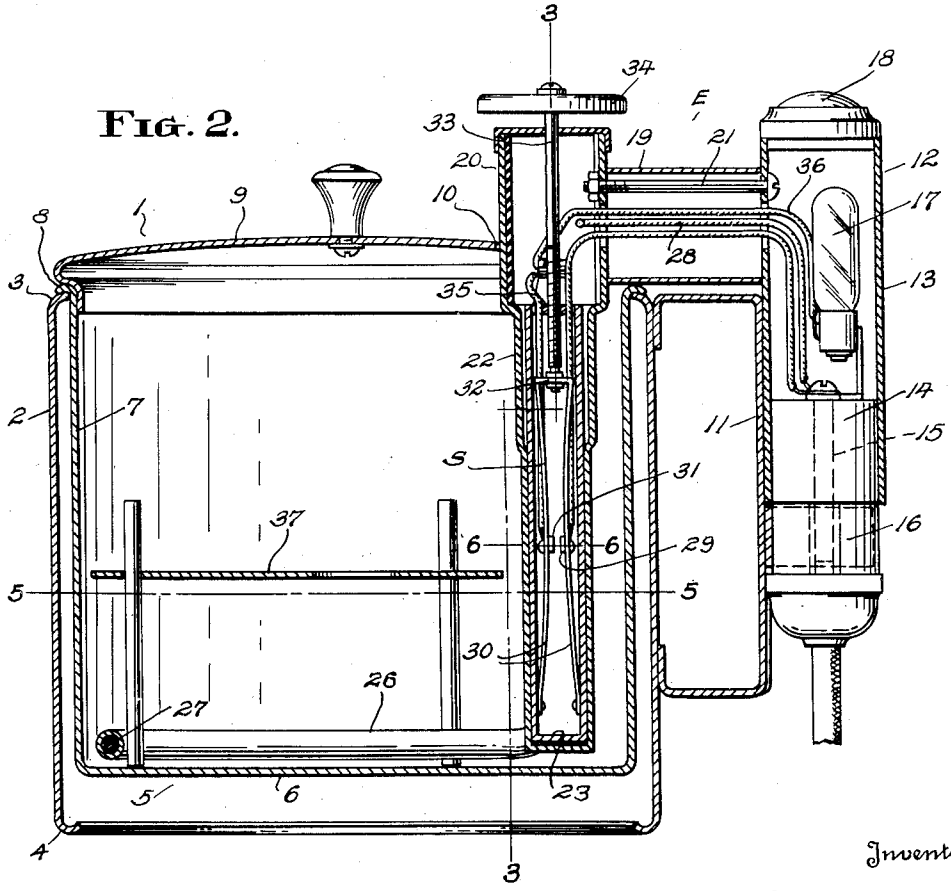


FIG. 1.

FIG. 2.



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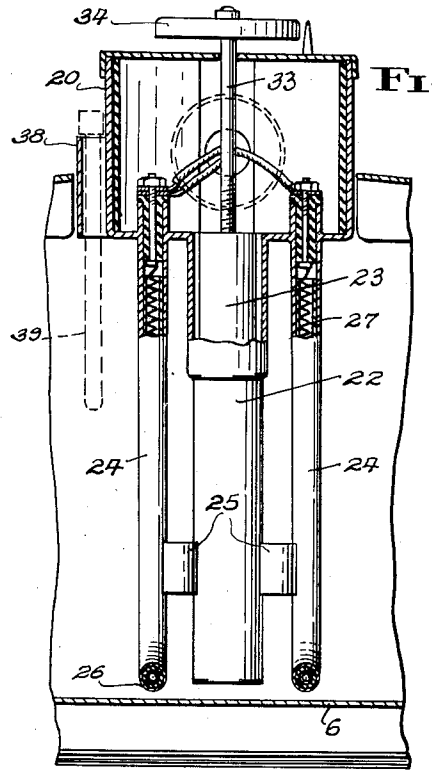


FIG. 3.

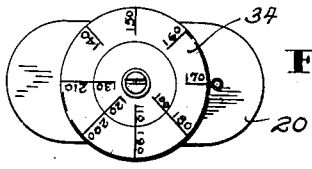


FIG. 4.

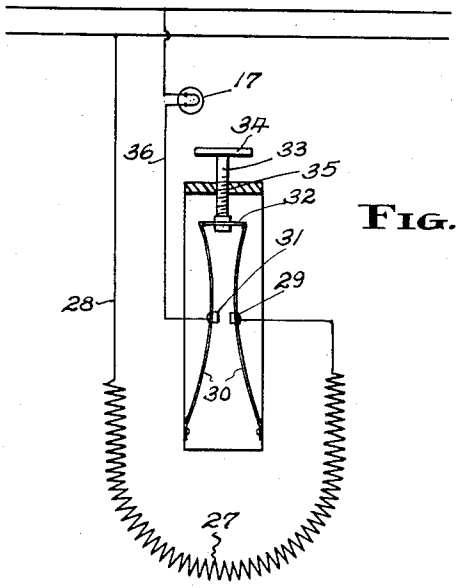


FIG. 7.

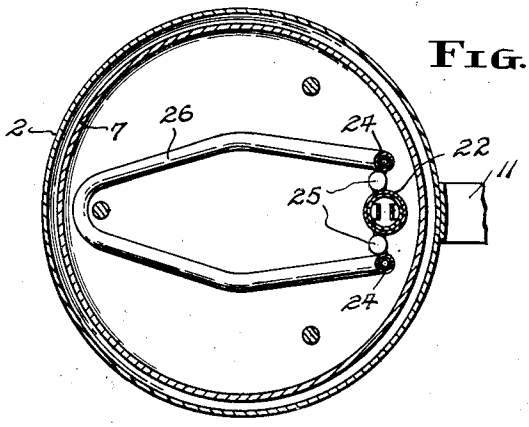
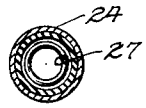


FIG. 5.



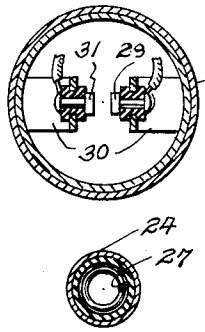


FIG. 6.

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ELECTRICAL FLUID HEATER

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Application January 30, 1947, Serial No. 725,316

7 Claims. (Cl. 219—44)

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This invention relates to an improved electrically heated receptacle, and has particular reference to a receptacle for heating water, and other fluids, to predetermined temperatures and for maintaining the fluids within a narrow predetermined temperature range.

In laboratory apparatus, such as that used by dentists and dental technicians, it is often desirable to heat impression-forming wax which is to be placed in the mouth of a patient to selected temperatures adapted to render the wax plastic but not so highly heated as to cause undue discomfort to the patient.

Accordingly, the present invention provides apparatus embodying a liquid-holding receptacle having an open top and wherein a removable electrically controlled heating unit is adapted to be positioned in the receptacle and immersed in the fluid contained therein to heat the fluid to required temperatures.

It is another object of the invention to provide an electrically actuated heating unit for liquid-holding receptacles and wherein the heating unit is freely removable from the receptacle so that the latter may be readily kept in a cleanly and sanitary condition, the heating unit being so formed as to constitute, when applied to the receptacle, a component part of the handle structure of the receptacle, so that the latter may be readily carried from place to place with the heating unit in its operative position.

It is a further object of the invention to provide an electrically actuated heating unit for liquid-holding receptacles in which the heating unit includes a depending heat-sensitive tube arranged vertically within and adjacent to one side of the receptacle, there being arranged in parallel relationship with and adjacent to the opposite sides of the tube the vertical legs of a resistor element, so that in operation the heat radiated from and conducted by the resistor containing legs will be directly transmitted to the heat sensitive tube and a thermostatic switch arranged in said tube may function effectively, automatically and within a closely controlled temperature range to open or close the circuit employed in transmitting electrical current to the heat-generating resistor of said legs.

A further object resides in a heating element of the character specified wherein manually actuated adjustable means are provided for causing the actuation of the thermostatic switch to open or close the resistor circuit at any desired temperature within a predetermined range.

A still further object is to provide a heater of

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this nature employing a signal lamp in the resistor circuit, which lamp is automatically energized when the resistor circuit is closed by the thermostatic switch control, so that the user of the appliance will be provided with a visual signal for determining when the resistors are being energized.

Still a further object is to provide an electrically actuated heating element of the character set forth wherein the vertical resistor-containing tubes are directly united with the interposed casing of the thermostatic switch by a plurality of heat-conducting lugs, so that the heat of the resistor tubes will be conducted directly to the walls of the switch casing, as well as being radiated thereto, whereby to render the operation of the thermostatic switch extremely sensitive in response to temperature variations of the resistors.

The present application constitutes a continuation-in-part of my prior application, Serial No. 539,044 filed June 7, 1944.

For a further understanding of the invention, reference is to be had to the following description and the accompanying drawings, wherein:

Fig. 1 is a side elevational view of a liquid receptacle provided with the electrical heating unit constituting the present invention;

Fig. 2 is an enlarged vertical sectional view taken through the receptacle and its associated heating unit;

Fig. 3 is a vertical transverse sectional view on the plane indicated by the line 3—3 of Fig. 2;

Fig. 4 is a top plan view of the manually adjustable control for the heating unit;

Fig. 5 is a horizontal sectional view on the line 5—5 of Fig. 2;

Fig. 6 is a similar view on the line 6—6 of Fig. 2, illustrating the heating unit on a larger scale;

Fig. 7 is a diagrammatic view disclosing the electrical circuit of the heating unit and its associated parts.

Referring more particularly to the drawings, the numeral 1 designates a receptacle which has been especially designed to receive the electrical heating unit indicated generally at E. The receptacle preferably comprises a cylindrical outer casing 2 having rolled flanges 3 and 4 at its upper and lower edges, respectively, the casing being open at the top and bottom thereof, as shown in Fig. 2. Positioned within the casing is a removable liquid-holding receptacle 5, the latter having a bottom 6, and a cylindrical side wall 7 which is spaced from the wall of the casing 2, the upper edge of the side wall 7 terminating in an outwardly rolled flange 8 which rests on the

flange 3 of the casing, so that the receptacle 5 is removably suspended within the outer casing. The bottom 6 of the receptacle is located in a horizontal plane above the flange 4 of the casing, so that when the receptacle becomes heated, it will not injure the underlying base. The open top of the receptacle 5 is adapted to be covered by means of a removable lid 9, which is recessed as at 10 to receive the heating unit E. Exteriorly, the casing 2 is provided with a fixed handle, shown at 11.

The heating unit E comprises a casing 12 which is disposed, in the main, exteriorly of the receptacle parts when the heating unit is actively positioned. The casing involves a vertical tube 13 which is adapted to be positioned immediately adjacent to the handle 11, so that when the handle is grasped by a user, the tube 13 will be simultaneously grasped by one hand of the user, so that the receptacle may be lifted and transported without disturbing the operating position of the heating unit. Positioned in the lower end of the tube 13 is a terminal block 14 provided with spaced depending prongs 15 adapted for detachable union with a current-supplying socket 16. Also, arranged within the tube 13 is an incandescent lamp 17, which is energized when the heating unit is in active operation. The upper end of the tube 13 is closed by means of a colored glass lens 18, which is illuminated by the lamp 17 to apprise the operator of the apparatus when the heating unit is in operation.

Forming a part of the casing 12 and joined with the upper portion of the tube 13 is a horizontally disposed tubular section 19, which is adapted to extend over the top of the handle 11 and one side of the receptacle 5. Abutting the inner end of the tubular section 19 is a head 20, the latter being united unitarily with the tube 13 and the section 19 by means of one or more tie bolts 21 disposed within the confines of the section 19. Depending vertically from the lower central portion of the head 20 is a tubular switch casing 22 in which is removably positioned a hollow member 23 containing a thermostatic circuit-controlling switch S.

Also carried by the head 20 are depending resistor-holding tubes 24, which are located on opposite sides of the switch casing 22 in adjacent relationship therewith. The tubes 24 are directly united with the walls of the casing 22 by means of the heat-transmitting lugs shown at 25 in Fig. 3. The lower ends of the tubes 24 terminate in an integral U-shaped horizontally disposed tube 26. Positioned in the tube sections 24 and 26 is a heat-generating resistor 27, one end of which being connected by a conductor 28 with one of the block terminals 15, while the other end of the resistor is connected with the contact element 29 of the switch S.

As shown more particularly in Figs. 2 and 7, the switch S comprises a pair of bowed, oppositely facing, metallic strips 30, the latter being formed from a metal possessing a different coefficient of expansion than the metal comprising the wall of the member 23. At their nearest adjacent points, the strips are provided, intermediately of their lengths, with the contact elements shown at 29 and 31 which, when in relative engagement, are adapted to complete the electrical circuit used in energizing the resistor 27, and when relatively separated to interrupt or open said circuit.

Thus, the lower ends of the strips 30 are securely fastened to the inner wall surface of the member 23, while the upper ends of said strips are connected to a transversely extending web 32, the latter having its axial portion swiveled to the lower end of an adjusting screw 33. This screw extends upwardly through the head 20 of the casing 12 and is fixed to a temperature graduated and indicating wheel 34, the threaded shank of the screw being received in an internally threaded bore 35 provided at the top of the member 23. It will be seen that when the wheel or knob 34 is rotated, vertical movement will be imparted to the screw 33 and the web 32. If this movement is downward, the strips 30 are bowed in a direction to bring the contacts 29 and 31 toward each other, and, if in an upward direction, such movement will impart tensioning forces to the strips to effect relative separation of contact elements. In this manner, the operating positions of the strips 30 may be controlled to produce circuit completion and opening at various temperatures. The contact 31 is joined by a conductor 36 with the lamp 17 and one of the terminal prongs 15.

The interior of the receptacle 5 may be provided with a supporting rack 37 to be heated for the reception of various materials or utensils in which such materials are placed within the receptacle. Such utensils may receive an impression-forming wax employed by dentists in reproducing the contours of a patient's mouth and teeth. The receptacle 5 is adapted to receive a suitable supply of water, and heat is transmitted to the water by the energization of the resistor 27 and thence to the material, not shown, positioned on the rack 37 and the contents thereof. The casing 12 may be provided with a well 38 adapted for the removable reception of a mercury column thermometer 39, which may be employed for checking the adjustment and calibration afforded by the wheel or knob 34 of the switch. When the thermometer occupies the well 38, the lower end thereof will be immersed in a body of water contained within the inner pan or receptacle 5.

By reason of the heat conducting relationship which the resistor tubes 24 bear to the switch casing 22, the heating unit is particularly sensitive to temperature fluctuations. In normal operation, the switch fluctuates within a range of one degree Fahr. plus or minus from the temperature at which the switch is set to operate. The importance of this will be appreciated when it is understood that dentists' impression materials which are overheated become sticky, lose body and produce discomfort for the patient. If such materials are under heated, they fail to register major and minor detail. The parts of the apparatus are all separable, so that it is easy to sterilize and maintain the same in a cleanly state.

I claim:

1. A unitary electrical heater adapted to be removably positioned in open-topped liquid-receiving receptacles, comprising a casing adapted to be removably positioned on the top of an associated receptacle and to extend into the latter adjacent to one side thereof, a resistor-containing coil carried by said casing, said coil having vertical portions disposed on opposite sides of the portion of said casing depending into said receptacle and in heat-exchanging relationship with the walls of said casing, the lower portion of said coil being disposed in a substantially horizontal plane and when the heater is actively positioned immediately above the bottom of the associated receptacle, means carried by said cas-

ing for removably supporting the same and said coil from the upper edge portions of the associated receptacle, a thermostatic switch arranged in the depending portions of said casing, which depending portions are adapted to be immersed in liquid contained in the receptacle, conductors uniting said switch with the resistors of said coil, manually operated means accessible exteriorly of said casing from the top thereof for controlling the temperature-responsive action of said switch, an exterior handle disposed parallel to said depending portions and attached to said casing and containing wiring and a socket for electrically connecting the resistor coil with a current supply, and means supporting said receptacle having a member cooperating with the handle to permit the entire device to be portable.

2. An electrical heater attachment for open-topped water receptacles comprising a handle structure adapted to be arranged on the exterior of a receptacle adjacent to a side wall of the latter, a switch casing joined with and arranged in parallel relationship with the handle structure and arranged vertically within the receptacle adjacent to the side wall thereof adjacent to said handle structure, heating tubes connected with said switch casing, electrical resistors in said tubes for the generation of heat, a thermostatic switch disposed in said switch casing and responsive to the temperature of liquids heated in said receptacle to open and close an energizing circuit connected with said resistors, and an incandescent lamp mounted in said handle structure and arranged in said circuit to produce a visual signal observable from the exterior of the handle structure for indicating the closure of said circuit, and means associated with said receptacle cooperating with the handle to permit the entire device to be portable.

3. An electrical heater attachment for open-topped water receptacles comprising a handle structure adapted to be arranged on the exterior of a receptacle adjacent to a side wall of the latter, a switch casing joined with and arranged in parallel relationship with the handle structure and arranged vertically within the receptacle adjacent to the side wall thereof adjacent to said handle structure, heating tubes connected with said switch casing, electrical resistors in said tubes for the generation of heat, a thermostatic switch disposed in said switch casing and responsive to the temperature of liquids heated in said receptacle to open and close an energizing circuit connected with said resistors, an incandescent lamp mounted in said handle structure and arranged in said circuit to produce a visual signal observable from the exterior of the handle structure for indicating the closure of said circuit, and horizontally disposed connecting means joining said handle structure with said switch casing, said means being adapted to rest upon the upper edge of the receptacle to support the attachment in its operating position in association with the receptacle.

4. An electrical heater attachment for open-topped water receptacles comprising a handle

structure adapted to be arranged on the exterior of a receptacle adjacent to a side wall of the latter, a switch casing joined with and arranged in parallel relationship with the handle structure and arranged vertically within the receptacle adjacent to the side wall thereof adjacent to said handle structure, heating tubes connected with said switch casing, electrical resistors in said tubes for the generation of heat, a thermostatic switch disposed in said switch casing and responsive to the temperature of liquids heated in said receptacle to open and close an energizing circuit connected with said resistors, an incandescent lamp mounted in said handle structure and arranged in said circuit to produce a visual signal observable from the exterior of the handle structure for indicating the closure of said circuit, and manually adjustable means accessible from the exterior of said casing for varying the response of said thermostatic switch to different temperature conditions within the receptacle, and means associated with said receptacle cooperating with the handle to permit the entire device to be portable.

5. A portable electric heating device including a receptacle, a heating element located in the receptacle adapted to be energized by an electric current, a thermostatic switch mechanism in said receptacle and mounted adjacent to and in heat conducting relationship with said heating element, said switch mechanism comprising a tubular metallic casing containing a pair of bowed metallic strips therein having a different coefficient of expansion than the metal of the tubular casing, said casing defining one element of a bimetallic thermostat, said strips being provided with contact means to make and break the electrical circuit providing current for energizing the heating element, and means for placing into and removing from the receptacle the heating element and the switch mechanism as a unit, said means having a hollow handle portion which houses an incandescent lamp and electrical connections and facilitates portability of the device.

6. The structure set forth in claim 3 having manually adjustable means accessible from the exterior of the casing for varying the response of the thermostatic switch to different temperature conditions within the receptacle.

7. The structure set forth in claim 5 having manually adjustable means accessible from the exterior of the receptacle for varying the response of the thermostatic switch to different temperature conditions within the receptacle.

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