

June 17, 1958

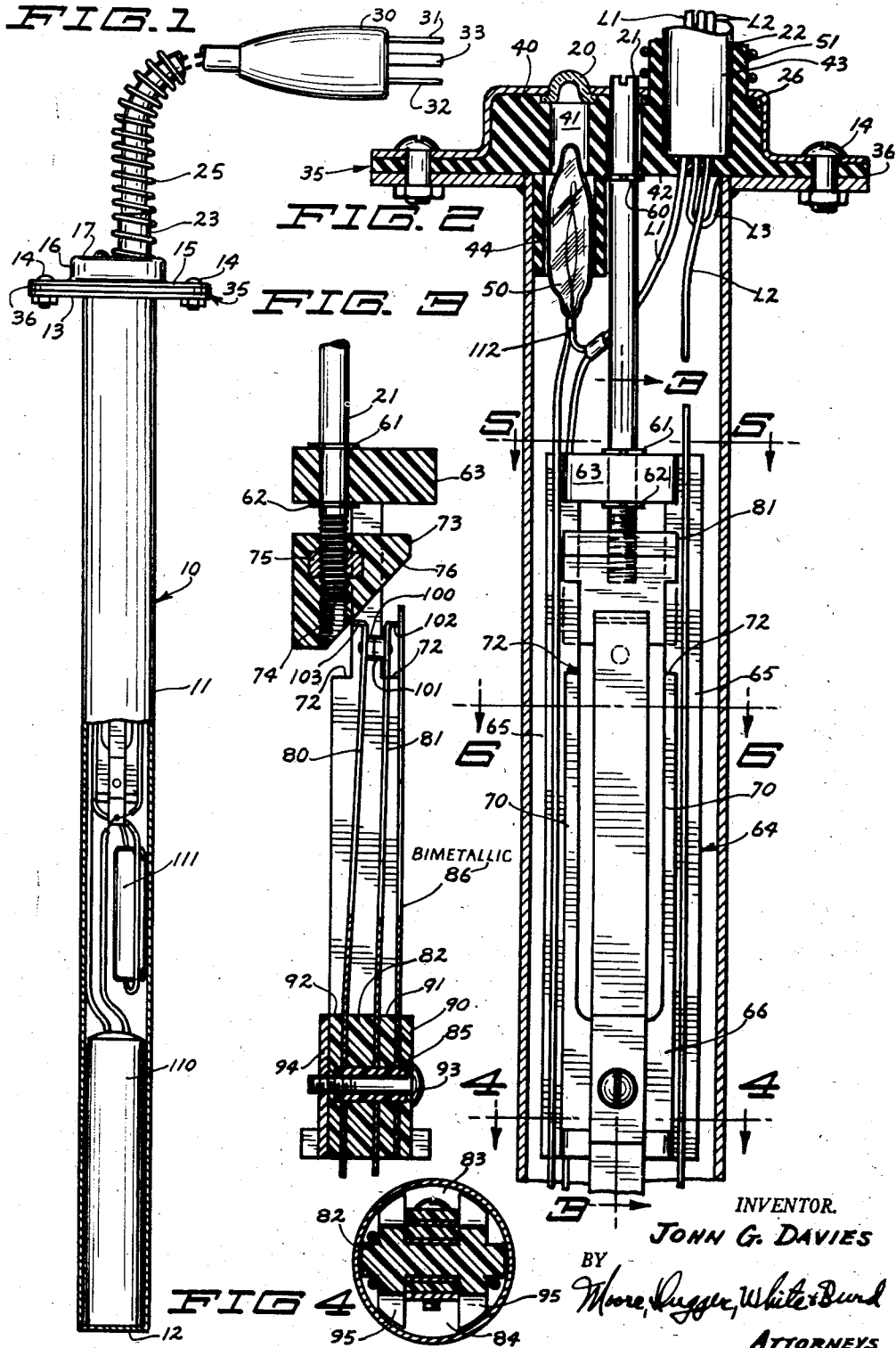
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2,839,660

IMMERSION HEATER

Filed Aug. 13, 1956

2 Sheets-Sheet 1



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FIG. 5

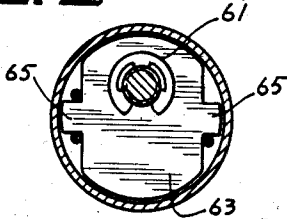


FIG. 6

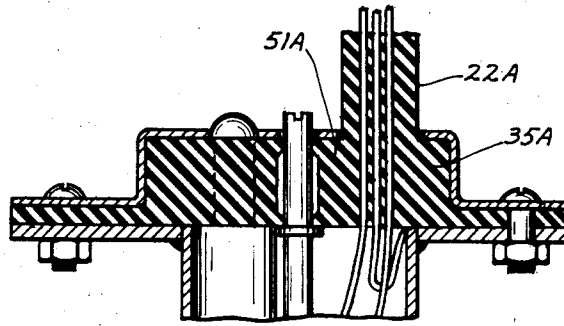
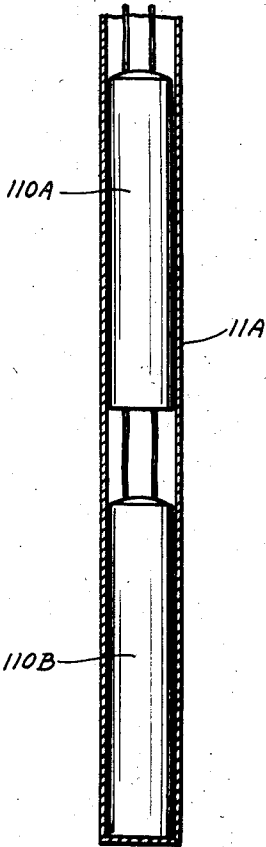
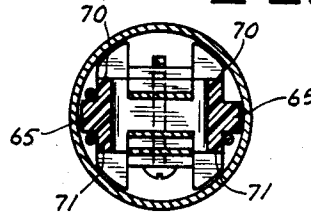


FIG. 8

FIG. 7

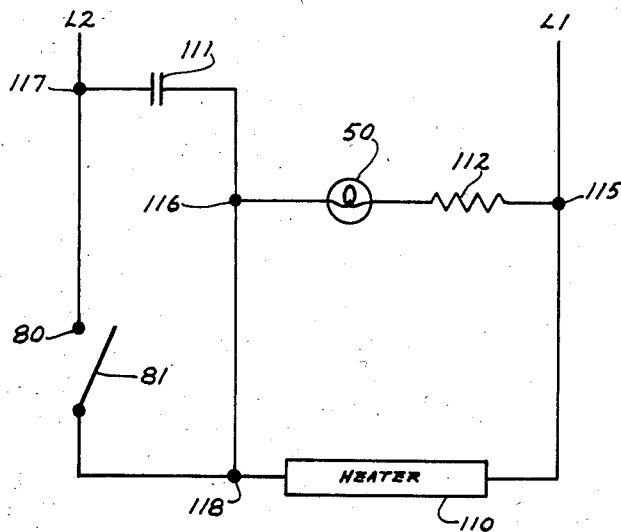


FIG. 9

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IMMERSION HEATER

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9 Claims. (Cl. 219—41)

Briefly, this invention provides a new, rugged immersion heater having maximum efficiency and safety of operation not heretofore provided by prior art heaters. It comprises an elongated member, preferably tubular, having one closed end and a flange at the other end. To this flange is secured a cup having provision for receiving an indicator light and an adjustment screw means for adjusting an internal thermostat. The cup likewise has provision for securing thereto an electric line and resilient armor. At the interior of the cup is a seal member which, in cooperation with the cup and the tube, provides a fluid tight gasket. This seal member is secured to the cup and tube flange and to the electric cord in such manner that the entire immersion heater or any attachments thereto may be lifted by the cord without detaching the same therefrom.

Interior of the tube in axial alignment is provided one or more heating elements, a thermostat including a unique adjustment means, condenser and resistors. The particular form of thermostat including the insulated slideway and a bevelled slider in cooperation with the elongated adjusting means permits rapid yet accurate adjustment of the thermostat from the exterior of the heater.

This invention will be described with reference to the drawings in which corresponding numerals refer to the same parts and in which:

Figure 1 is an elevational view of the immersion heater of this invention partially in vertical section;

Figure 2 is an enlarged fragmentary vertical sectional view of the immersion heater of Figure 1 and showing the interior structure thereof;

Figure 3 is a fragmentary vertical sectional view taken along the line and in the direction of the arrows 3—3 of Figure 2;

Figure 4 is a horizontal sectional view taken along the line and in the direction of the arrows 4—4 of Figure 2;

Figure 5 is a sectional view taken on the line and in the direction of the arrows 5—5 of Figure 2;

Figure 6 is a sectional view taken on the line and in the direction of the arrows 6—6 of Figure 2;

Figure 7 is a vertical sectional view similar to the sectional portion of Figure 1 but showing alternative construction;

Figure 8 is a fragmentary view similar to the top fragment of Figure 2 but showing alternative construction thereof; and

Figure 9 is a wiring diagram showing the electrical circuitry for the instant invention.

In Figure 1 there is shown the immersion heater generally designated 10 comprising an elongated tube 11 having a closed bottom 12 and a top peripheral flange 13 secured thereto. The peripheral flange 13 is provided with at least two oppositely positioned apertures in which bolt assemblies 14 may be inserted to secure the flange 13 to a congruent flange 15 of cup 16 with a congruent gasket therebetween as later explained.

Cup 16 forms a cap and is provided with a top apertured surface through the apertures of which penetrate a

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dome 20, thermostat adjusting screw means 21 and an electric cable 22 and sleeve or sheath 23 therefor.

Around the cable 22 is an armor or spring 25, the helical end 26 of which penetrates the top of the cup 16 about sheath 23 as shown in Figure 2. The spring is thus axially anchored by the penetration of the helical end 26.

To the exterior end of the cable is secured a plug 30 having connecting prongs 31, 32 and 33. Prongs 31 and 32 are to be connected to lines L1 and L2 respectively and prong 33 will be grounded.

The interior of the cup 16 is occupied by a resilient seal 35 of the form shown which has a periphery forming a congruent gasket between flanges 13 and 15 when they are in the position shown in Figure 1. This seal provides the flange 36 congruent with flanges 13 and 15 and having apertures which are aligned with the apertures in flanges 13 and 15 so that bolt assemblies 14 may penetrate the apertures in each, be drawn tight to draw the flanges 13, 15 and 35 into intimate abutment and provide a fluid tight assembly. The seal 35 is of a resilient nature, usually of rubber. It is provided with a thickened portion 40 seated in the dished portion of cup 16 having apertures 41, 42, 43 therein. Aperture 41 adjacent its top exterior end is provided with an annular recess joined to an intermediate portion of reduced diameter in turn joined to an inner portion of enlarged diameter formed by depending sleeve 44. In the recess is seated the dome 20 which extends through a cooperating aperture in cup 16 and has a peripheral flange adapted to engage the underside of the top of cup 16 and to seat in the annular recess. A neon lamp 50 is positioned in the sleeve 44 and extends into the reduced portion of aperture 41 and is maintained in position by frictional engagement with the resilient material forming the sleeve. This lamp when lighted will be visible through translucent dome 20 which may be of any suitable translucent or transparent material, usually glass or plastic.

Seal 16 is formed so that aperture 43 is within an extending integral sleeve 51 at its upper end which sleeve has an inside diameter such that it frictionally engages tightly the outside diameter of the cord 22. An annular shoulder is formed in the seal at the bottom of aperture 43 against which the end of cable 22 seats. Three wires 45 L1, L2 and L3 are sheathed in cable 22. Line L3 is connected to one of the bolt assemblies 14 between the flanges 36 and 13 as shown in Figure 2 to ground the heater. The end of the cable 22 is sealed with rubber or otherwise to prevent entrance of moisture through the jute sleeves normally provided around wires L1, L2 and L3 by cable 22 as shown in Figure 2.

Penetrating cooperating central apertures in the cap 16 and seal 35 is screw 21. Screw 21 is an elongated rod-like member having a flange 60 in abutment with the underside of seal 36, a second flange 61 and a third flange 62. Flanges 61 and 62 straddling portion 63 of thermostat 64. Portion 63 provides a transverse end wall, interior of tube 11 but spaced from the inside diameter thereof and having the configuration of Figure 5. Secured thereto is a pair of opposed outrigger runners 65 as shown best in Figure 6.

The outrigger runners extend the length of the thermostat (from top to bottom as shown in Figure 2) and are joined at the other end thereof to a body portion 66 of the configuration best shown in Figure 4.

Each of the outrigger runners 65 is provided with opposed top and bottom flanges 70 and 71 extending from body portion 66 to a terminal end 72 spaced from body portion 63 as indicated in Figure 2. The terminal ends 70 for flanges 70 (as will be apparent by reference to Figure 3) serve as a stop for the slider 73.

Slider 73 is threaded upon threaded end 74 of screw

21. Thus, as screw 21 is turned (by axial immobilization because of flanges 61 and 62 with reference to portion 63) the rotation of threaded portion 74 will cause slider 73 to move upwardly or downwardly with reference to Figure 3 by engagement of the threaded portion with a hexnut or other threaded member 75 which is immobilized within slider 73. Slider 73, as well as thermostat 74, is usually of synthetic resinous material but in any event is non-electrically conductive. Slider 73 is provided with a bevelled surface 76 declined from right to left as shown in Figure 3 for engagement with contact member 80. Thus, as the slider 73 is forced downwardly with reference to Figure 3, it will engage contact member 80 moving it to the right toward contact member 81 and as it is moved upwardly with reference to Figure 3, it will release engagement with contact member 80 and allow this member, because of its natural resiliency, to assume a spaced relation with reference to contact member 81.

Slider 73 also has top to bottom recesses with reference to Figures 2 and 3 in an enlarged portion 81 which recesses receive outrigger runners 65 for preventing rotation of the slider as screw 21 is rotated, and for restraining the slider 73 so that rotational movement of screw 21 is translated into axial movement of slider 73.

As stated previously the outrigger runners 65 form a pair of spaced parallel members joining body portions 63 and 66. The outrigger runners 65 throughout body portion 66 are joined by an integral central web 82 providing opposed top and bottom recesses 83 and 84. The web 82 as shown in Figure 3 is provided with an aperture in which is positioned an insulating sleeve 85 which extends through associated apertures in contact members 80 and 81 and bimetallic thermostatic element 86 as well as associated apertures in insulating blocks 90, 91 and 92. The blocks 90, 91 and 92 serve to space and retain members 80, 81 and 86 in insulated non-contactual relation.

The blocks 90, 91 and 92 and members 80, 81 and 86 are retained in the association as shown in Figure 3 by a screw 93 positioned in sleeve 85 and having a square retaining nut 94 engaged by lugs 95 provided by the recess 84 in body portion 66 as shown in Figure 4.

The members 80, 81 and 86 are thus held by body portion 66 and extend in the space bounded by body portions 63, 66 and outrigger runners 65. Members 80, 81 and 86 are elongated and members 80 and 81 are provided with contacts 100 and 101 in normally spaced relation. Member 81 is provided with a turned end 102 which is adapted to be engaged by juxtaposed end of bimetallic strip 86.

Thus, contacts 100 and 101 are in normally spaced relation. The spacing of such relation may be increased or decreased by positioning the slider 73 downwardly or upwardly with reference to Figure 3. When the bimetallic strip is cold, it will engage the turned end 102 forcing contact 101 into engagement with contact 100 and completing the circuit. As it becomes warm it will move rightwardly with reference to Figure 3 and release bias upon end 102 whereupon the normal resiliency of member 81 will cause contacts 100 and 102 to again resume spaced relation.

In such manner the bevelled surface 76 of slider 73 engages the turned end 103 of member 80 for adjusting the gap between contacts 100 and 101. It is noted that no current flows through the bimetallic strip 86 but current is confined solely to members 80 and 81.

In the modification of the device shown in Figure 7, the tube 11A is elongated and heating element 110 is replaced by two axially aligned heating elements 110A and 110B each similar thereto. These heating elements may be connected in series or in parallel as desired and such positioning serves to provide a greater heated axial length and thus to distribute heat more evenly from the heater into liquid being heated.

In the modification shown in Figure 8, a seal 35A is provided similar to seal 35 except that in this instance sleeve 51A similar to sleeve 51 is made integral with the end of cord 22A similar to cord 22. This insures that the entire unit may be lifted by the cord 22A without disengaging the cord from the seal and consequently the heater and associated structure may be elevated by the cord as desired.

The circuitry for the heater is shown in Figure 9 in which the lines L1 and L2 designate power leads. From line L1 a circuit extends to juncture 115 and thence via resistor 112 to light 50 and thence to juncture 116. At the same time a circuit extends through heating element 110 to juncture 118 thence to contact element 81 when engaged with contact element 80 and thence to juncture 117 on line L2. The circuit is established when elements 81 and 80 are in contact as shown in Figure 3 and disestablished when they are separated as shown in Figure 9. A circuit likewise extends from juncture 116 through condenser 111 to juncture 117. Thus, when the contacts 100 and 101 of elements 80 and 81 are closed, electricity will be supplied to the heating element and to the resistor 112 through the lamp 50 and thence through condenser 111 to line L2. The lamp 50 will thus be lighted when the plug 30 is plugged into an appropriate source of current supply. When the bimetallic strip 86 is heated to move rightwardly with reference to Figure 3, it will permit the spacing of contacts 100 and 101 of members 80 and 81 and the heating element will be de-energized. As many widely differing embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that the specific embodiments described are given by way of example only and the invention is limited only by the terms of the appended claims.

What is claimed:

1. In an immersion heater having a tubular member and a closure cap therefor, the improvement comprising a resilient seal member having a sleeve for retaining an indicator light in fluid tight reception therein, a second sleeve for receiving an end of an electric cable in fluid tight reception and an aperture for receiving and supporting a thermostat adjustment screw in fluid tight reception.
2. In an immersion heater an electric cable joined to a flanged seal member, said flanged seal member being positioned between and secured to a closure cap and a flanged portion of a tubular heating element filling and sealing the space between said flanged portion and cap.
3. In an immersion heater, a body member having a flanged open end, a cooperating cap member having a periphery congruent therewith, a resilient seal member between said cooperating cap and said flanged end and likewise having a periphery congruent therewith, means securely drawing said cap member, flanged end and resilient seal member into cooperating fluid-tight abutment and said cap having an aperture through which a connecting cable is adapted to extend and said cable being anchored to said seal member interior thereof by frictional engagement with said seal.
4. In an immersion heater, an elongated tubular element closed at both ends, an axially extending rod member extending from one of said closed ends into the interior of said tubular member, said rod having a threaded end interior of said tubular member, a bevelled slider engaging said threaded end, said slider adapted for movement along guiding means into communication with one of a pair of spaced contact members, and means for translating rotary movement of said rod member into linear movement of said bevelled slider whereby its bevelled surface will engage said one of said spaced pair of contact members for determining the spacing thereof.
5. The structure of claim 4 in which said means for translating rotary movement of said rod member into linear movement of said bevelled slider includes a body having a first portion penetrated by said rod member,

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having means axially immobilizing said rod member with respect thereto, and a slideway comprising parallel outrigger runners supporting said bevelled slider.

6. The structure of claim 5 further characterized by a second body member spaced by said runners from said first body member and having elongated contact elements secured thereto and extending in the direction of said first body member, one of said elements contacting said bevelled slider.

7. The structure of claim 6 in which the elongated contacts are secured at one end to an insulating means in parallel spaced relation and a bimetallic thermostatic element is secured in similar relation to said body member and exterior of said contact members.

8. In an immersion heater comprising an elongated body, the improvement comprising a thermostat adjusting rod extending in fluid-tight relation from said body and parallel to the elongated axis thereof, a thermostat positioned within said body including an insulated member including a first body portion and a second body portion spaced with reference thereto, said first and second body portions being joined by spaced parallel runners, said first body portion having an aperture therein, the end of said adjusting rod interior of said body penetrating said aperture and immobilized with respect to said body portion by a pair of lock rings, said rod member having a threaded end engaging a slider, said slider having lug means engaging said runners for preventing rotary movement thereof but permitting translatory movement thereof, stop means on said rails for determining the limit position of said bevelled slider, a pair of spaced elongated contact elements secured at one end to said second body portion and extending adjacent said first body portion,

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one of said contact members being positioned to be engaged by said bevelled slider as it is translated, a bimetallic thermostatic element positioned in spaced relation exterior of the other of said contact members, said bimetallic strip and said contact members being secured to said second body member by spaced insulating members having means maintaining the members in assembled relation.

9. In an immersion heater, an elongated tubular member having closed ends, an electrical cord penetrating one of said closed ends, said penetrated end having an indicator light and thermostatic adjustment means extending therefrom, a thermostat including a bevelled adjuster with recesses for slidably engaging said adjuster within a plurality of runners for axial movement within said tubular member, said thermostat positioned within said tubular member adjacent said closed end having said thermostat adjustment means extending therefrom and an axially aligned heating means positioned on the other side thereof and within said tubular member.

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