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3,536,893

IMMERSION HEATER

Filed Sept. 24, 1968

FIG. 1

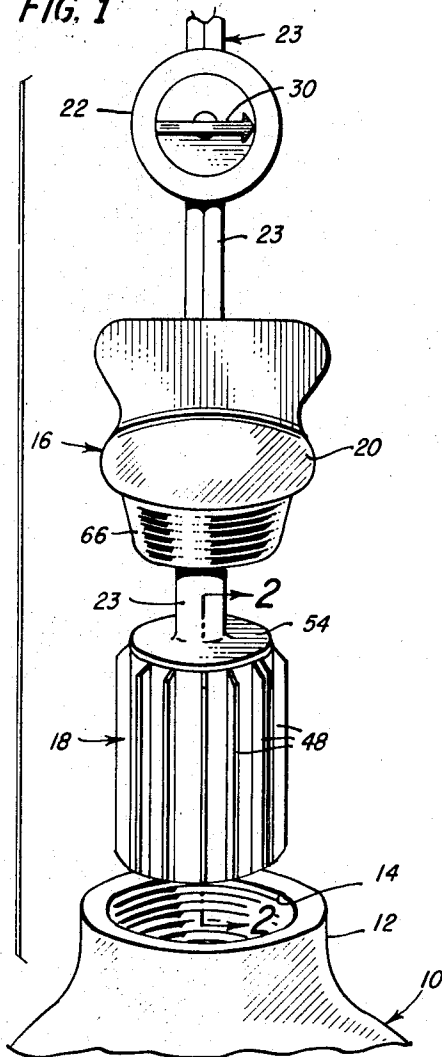


FIG. 2

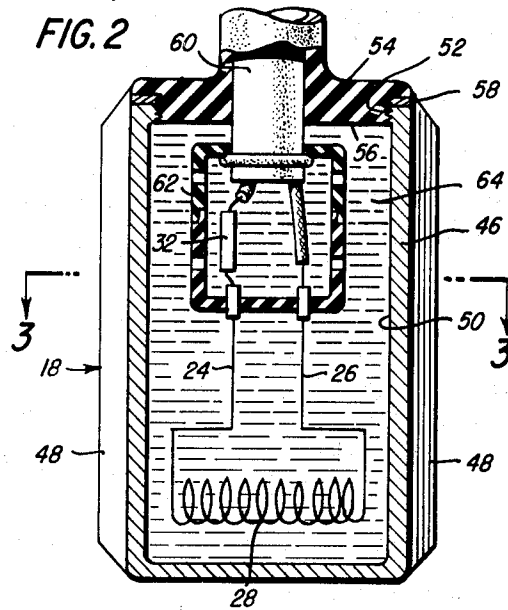


FIG. 4

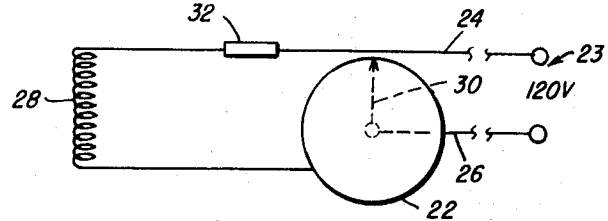


FIG. 3

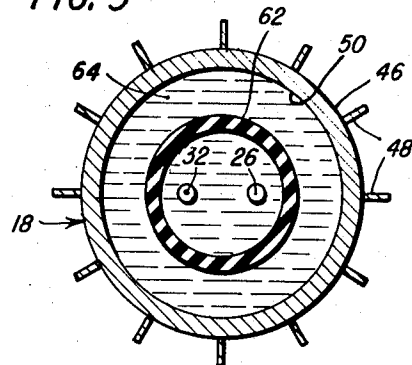
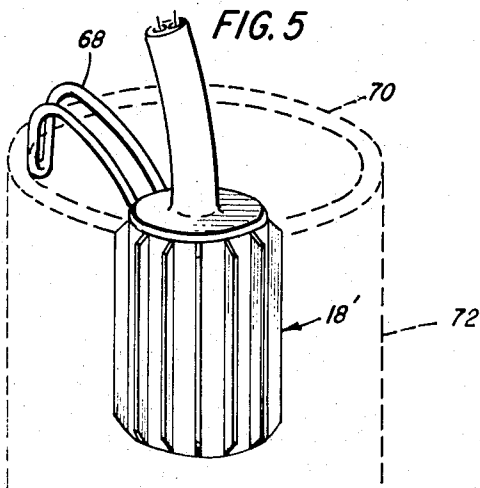


FIG. 5



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IMMERSION HEATER

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4 Claims

ABSTRACT OF THE DISCLOSURE

An immersion heater in which the resistance heating elements are surrounded by a substantially non-freezable fluid in a closed compartment, which fluid will not conduct an electrical current, and the fluid attains a uniform, thermostatically controlled temperature to heat by conduction a fluid in which the heater is immersed.

The heating of hot water bottles, water for tea, instant coffee, photographic chemicals, engine lubricating oil, combustion fuels, dye baths, etc., has been a constant problem. Portable heaters, if inexpensive, have generally not been of the type providing a uniform ascertainable temperature, have not been universally adopted because the inherent fear of current shorts and shock, particularly when used to heat water, for example, as well as the explosion potential when warming fuel and oil.

When heating hot water bottles, for example, the hot water bottle was initially too hot to handle when applied to a portion of one's anatomy and when cool enough to be applied would not provide the deep, penetrating heat generally prescribed for treating aches, strains, etc. If heating pads or blankets were used, temperature variations occurred at the areas the fabric thickness differed, and hot spots tend to develop at the area in which heating elements are located. Further, heating pads tend to dehumidify the air causing inflammation and/or irritation and even burning at the areas on which the heating pad is applied.

A primary object of the invention is to provide an immersion heater suitable for use in a hot water bottle, open pan or vessel containing water or fluids, or which can be applied directly to portions of the anatomy without danger of shorts, burning or harm to the user.

Another object of the invention is to provide a portable heating device useable with a conventional power outlet or any other source of current and which includes resistance heaters immersed in a sealed compartment containing a fluid which will not conduct electrical current whereby more accurate control and more even distribution of heat can be attained in a body of liquid being heated; the unit being capable of being energized by both direct (D.C.) or alternating (A.C.) currents.

These together with other objects and advantages will become apparent from a consideration of the following description together with the accompanying drawing forming a part hereof, wherein:

FIG. 1 is an exploded perspective view of the immersion heater of the invention shown with a fragmentary portion of a hot water bottle and incorporating a closure cap for the bottle;

FIG. 2 is an enlarged vertical section taken on the plane of line 2—2 of FIG. 1;

FIG. 3 is a horizontal section taken on the plane of line 3—3 of FIG. 2;

FIG. 4 is a wiring diagram generally showing the electrical circuit of the immersion heater; and

FIG. 5 is a perspective view illustrating the invention in another mode of use, i.e. for heating fluid in a receptacle.

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Referring to the drawing in detail, a fragmentary portion of a hot water bottle is indicated generally at 10 and incorporates a filling spout 12 having an internally threaded opening 14.

Indicated generally at 16 is an immersion heater including a heater portion 18, closure cap 20 and current variable-resistance control switch 22 of any suitable character.

Referring to FIG. 4, a line 23 includes conductors 24 and 26 connected to a suitable source of current, i.e. A.C., D.C., conventional 120 volt outlet, etc. The conductors 24 and 26 are connected in series to a resistance-wire heating element 28 through the variable-resistance, control switch 22 which is conventional. The switch includes an adjustable switch element 30 which is adjustably positioned depending upon the current to be directed to element 28. Interposed in series in line in conductor 24 is a conventional thermostatic control 32, i.e. bimetallic type, for example, which will open the circuit when a maximum temperature is reached.

Referring to the heater portion 18 and FIGS. 1, 2 and 3, the heater portion comprises a hollow, substantially cylindrical body 46 preferably having a plurality of thin, radially extending, longitudinal thin heat conducting fins 48 integral with the outer surface. The body 46 can be produced from any suitable heat conducting material, i.e. plastic, metal, etc., and the fins 48 increase surface contact with fluids being heated.

The body 46 is hollow and defines a chamber 50 internally threaded at 52 at its upper end. A closure cap 54 having a lower threaded hub 56 engages the threads 52 and a sealing gasket 58 is interposed between the cap 54 and the upper edge of body 46. The cap 54 has sealed therein a depending conduit 60 which supports therein the conductors 24, 40, 42, 44 as well as a perforated housing 62. A fluid 64 which is not an electrical conductor, i.e. oil or the like, and which is substantially non-freezable, fills the chamber 50. The conductors 24, 26, thermostatic control 36 and resistance heater 38 are surrounded by the fluid 64.

Energization of the resistance heater 38 results in heating fluid 64 and body 46 and fins 48. The thermostatic control 36 will be surrounded by the fluid 64 and controls maximum temperature and the fluid heated is not contacted by element 38. By heating the body of fluid 64 surrounding the heater element 28 in the chamber 50, a relatively fine degree of uniform temperature control is attained in direct relation to the temperature of the confined fluid 64 in chamber 50 and thermostatic control 36. Further, the fins 48 provide an increased contact surface for rapidly bringing up to a control temperature water contained in bottle 10, for example.

The line 23, as seen in FIG. 1, has sealingly fixed thereto to closure cap 20 which is threaded at 66 to engage threads 14 of spout 12.

Referring briefly to FIG. 5, the heater portion 18' of the immersion heater includes an integral hook 68, for example, whereby the heater portion 18' can be hung on the edge 70 of a receptacle 72, such as a cup, pan or the like.

What is claimed is:

1. An immersion heater comprising:

a heater comprising a hollow body (46) of a heat conducting material and including a plurality of integral, longitudinally-extending and radially-projecting, thin heat conducting fins (48),

said body including an opening in one end and being closed at the opposite end;

a thermally-conductive, electrical-insulating fluid (64) contained in said body;

an apertured cap (54) including means sealingly and removably retaining the cap on the open end of said body for permitting access therein, a pair of current

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conductors (24, 26) projecting through said cap and sealed thereat,

a resistance heater element (28) connected to said current conductors in said body and immersed in said fluid,

a thermostatic control (32) connected in series to one of said current conductors in said body; and

a substantially rigid, perforated housing (62) mounted on said current conductors beneath said cap and enclosing said thermostatic control (32) therein and substantially fixedly supporting said resistance heater in said fluid whereby removal of said cap effects removal as a unit of said perforated housing, thermostatic control and resistance heater, and the electrical insulating fluid exteriorly of said perforated housing must change temperature before the fluid in the housing effects operation of said thermostatic control.

2. The structure as claimed in claim 1 including an adjustable, variable-resistance switch connected to one of said current conductors exteriorly of said closure cap for controlling maximum current directed to said resistance heater.

3. The structure as claimed in claim 1 including means operatively connected to said current conductor and comprising a closure cap for removable receipt in a receptacle containing a fluid to be heated.

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4. The structure as claimed in claim 1 in which said body includes hook means for suspending said body in a receptacle containing a fluid to be heated.

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219—319, 326, 381, 437, 439, 530