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IMMERSION HEATER ASSEMBLIES

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Fig. 1.

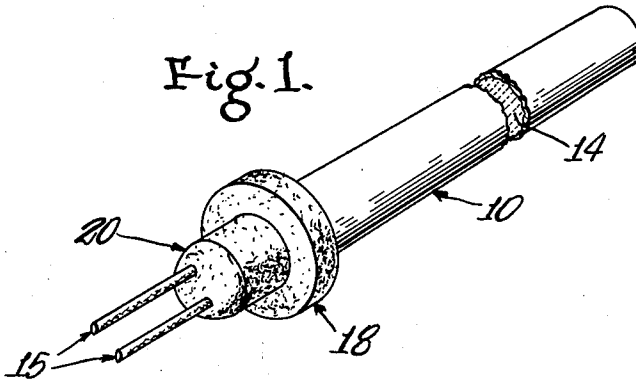


Fig. 2.

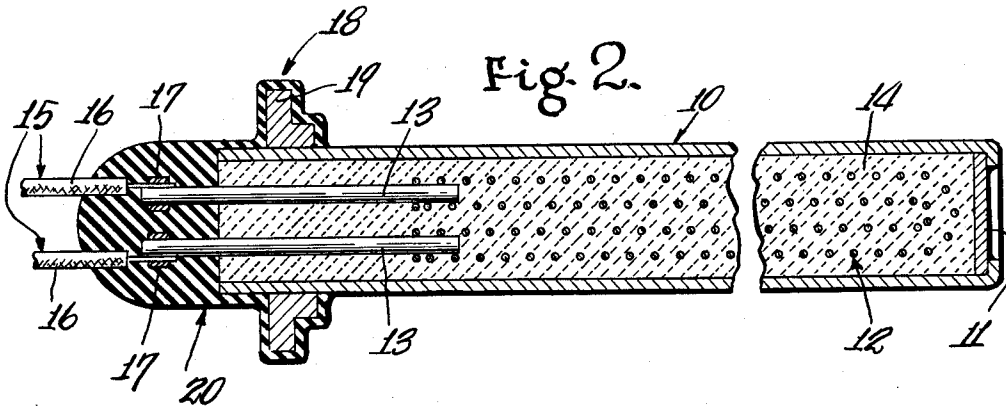
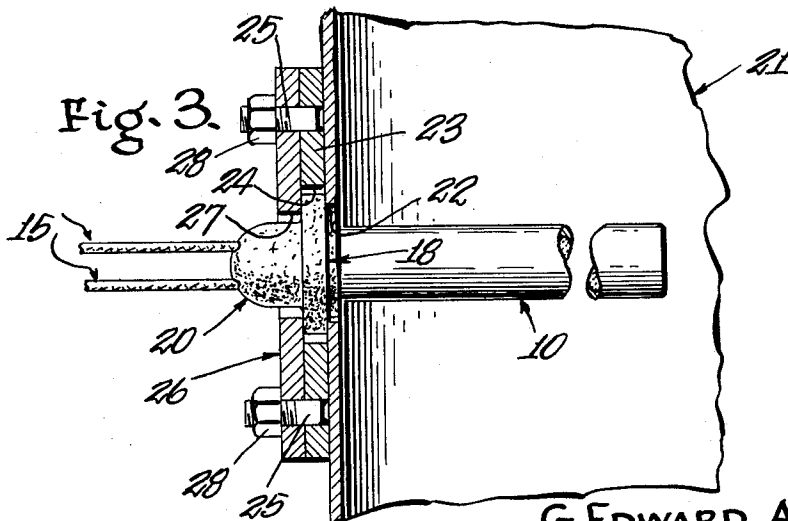


Fig. 3.



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IMMERSION HEATER ASSEMBLIES

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1 Claim. (Cl. 219—523)

The present invention relates to electric heater assemblies, more particularly to electric heater assemblies of the immersion type for heating water or other fluid within a container, and the principal object of the invention is to provide new and improved heater assemblies of the character described.

One of the most common, and most efficient arrangements for electrically heating water or the like within a tank or other container is to directly immerse an electric heating element in the water by passing it through an opening in the tank wall. While many prior art designs have functioned satisfactorily, they have possessed a common fault in that they have been unduly expensive both in initial cost and in installation.

The present invention provides a much simplified assembly which, while at least equally efficient as prior art designs, is much lower in cost and is sufficiently flexible for various types of applications. These and other advantages will readily become apparent from a study of the following description and from the appended drawing.

In the drawing accompanying this specification and forming a part of this application there is shown, for purpose of illustration, an embodiment which the invention may assume, and in this drawing:

FIGURE 1 is a broken perspective view of an immersion heater constructed in accordance with the present invention,

FIGURE 2 is an enlarged, broken view of the heater in longitudinal section, and

FIGURE 3 is a reduced-size, fragmentary sectional view through a typical assembly of which the heater shown in FIGURES 1 and 2 forms a part.

As best seen in FIGURE 2, the heater herein disclosed is of the well-known, tubular sheathed embedded type. As presently constituted, such heater comprises an elongated tube 10, or sheath, preferably of a non-corrosive metal. One end of such tube may be hermetically sealed in any suitable manner as by welding a disk 11 in position at such end.

Disposed within the tube 10 in spaced relation from the left, or open end of the tube is a resistor conductor 12 herein shown in the form of an elongated coil doubled back on itself to provide a loop adjacent the closed end of the tube. Terminal conductor pins 13 are electrically connected in any suitable manner to respective ends of the resistor coil 12 and project in spaced, side-by-side relation outwardly of the left end of the tube. In the customary manner, the interior of the tube is filled with compacted electric-insulating, heat-conductive material 14 which immobilizes the pins and the resistor and electrically insulates them from the tube yet which readily transmits heat from the resistor to the tube. Since the portion of the tube enclosing the resistor 12 is frequently referred to as the heat-generating portion of the element while the portion enclosing the terminal pins 13 is frequently referred to as the terminal, or cold-end portion of the element, such nomenclature will hereinafter be employed.

For conducting electrical energy to the terminal pins 13 and thus to the resistor 12, a pair of flexible electrical leads 15, having dielectric coverings 16, each have a bared end electrically connected to a projecting end of a respective terminal pin 13 by suitable clips 17 or the like. As will be evident, the opposite ends of leads 15 are adapted to be connected to a suitable source of electrical energy.

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For a purpose to appear, the left end of tube 10 provides a radially extending annular flange 18. While various expedients could be employed to provide such flange, it is preferable to utilize a separate, ring-like member 19 which is suitably secured to the tube in spaced relation from its end. Such securement may be effectuated by means of a press fit, crimping, brazing, or by various types of welding, it being understood that only a sufficiently strong mechanical connection need be provided without concern as to whether such connection is fluid tight.

In order to seal the left end of the present element against moisture or other deleterious substances, to protect the connection between the leads 15 and the terminal pins 13 against shorts and grounds, to prevent fluid from leaking along the tube between the latter and member 19 and to provide a gasket sealing surface for a purpose to appear, the entire left-hand end of the present heater is encapsulated in a body 20 of cured, rubber-like material. Such material preferably extends from the insulated coverings of the leads to a point beyond the ring-like member 19. At the present time, body 20 is preferably molded in position by disposing the left-hand end of the heater, with the leads attached, in a mold cavity which is then filled with the rubber-like material in plastic form. The mold will then be heated to cure the rubber-like material and bond it to the adjoining portions of the tube, the member 19 and the lead coverings 16 to form an integral, hermetically sealed assembly.

Mounting the completed heater in a container such as a water heater tank 21, illustrated in FIGURE 3, is simplicity itself. The wall of such tank is formed with an aperture 22 which is large enough to pass the heater tube but small enough to prevent passage therethrough of the heater flange 18. Under certain circumstances it may be found desirable to flatten the tank wall adjacent the aperture 22. Secured to the exterior of the tank wall adjacent the tank aperture 22 is a plate 23. This plate may be spotwelded or otherwise secured in position, it being understood that only a strong mechanical juncture therebetween need be provided and not one that is waterproof as well. Plate 23 is formed with an aperture 24 located generally concentric with the tank aperture 22 and is herein shown to be large enough to freely pass the element flange 18. In the present embodiment, plate 23 carries a plurality of outwardly projecting, threaded studs 25 for a purpose to appear.

Completing the heater mounting is a clamp plate 26 having an aperture 27 large enough to freely pass that portion of the body 20 to the left of the element flange 18 but small enough to prevent passage therethrough of the latter. Plate 26 is suitably apertured to freely pass respective studs 25 and is clamped against plate 23 by means of nuts 28 threaded on such studs.

It will be noted that with the parts assembled as illustrated in FIGURE 3, plate 26 engages the element flange 18 and presses it against the exterior of the tank adjacent its aperture to close the latter. Since flange 18 is encapsulated in the rubber-like body, the latter provides a fluid-tight seal between the element and the tank which positively prevents escape of fluid from the latter. Leads 15 will obviously be connected to a suitable source of electrical energy to provide for heater energization.

While plate 23 is herein shown provided with studs 25, other arrangements could be employed. For example, the plate could be threaded to receive cap screws if adequate thread engagement can be obtained. Furthermore, plate 23 could even be eliminated if the tank wall were sufficiently heavy to either support the studs directly or to provide adequate thread engagement for cap screws.

In view of the foregoing it will be apparent to those skilled in the art that I have accomplished at least the

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principal object of my invention and it will also be apparent to those skilled in the art that the embodiment herein described may be variously changed and modified, without departing from the spirit of the invention, and that the invention is capable of uses and has advantages not herein specifically described; hence it will be appreciated that the herein disclosed embodiment is illustrative only, and that my invention is not limited thereto.

I claim:

An immersion heater for assembly with an apertured wall of a container, comprising an electric heating element having a metal sheath, a metal flange rigidly connected to and located at one end of said sheath and extending radially outwardly thereof, a resistance conductor within said sheath and having a terminal conductor projecting outwardly of the extremity of said sheath one end, an insulated lead wire having a bared end which has electrical and mechanical connection with said terminal conductor, said lead wire projecting from said terminal conductor and adapted to place the latter and said resistance conductor in an electrical power circuit, a rubber material encapsulating the exposed surfaces of said flange and said mechanical and electrical connection and the insulation of said lead wire adjoining such connection and pro-

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viding an unbroken rubber covering from and about said flange to the insulation of said lead wire, said heating element from adjacent to said flange to the opposite end of said element being adapted to project through the container wall aperture and into the container to heat the contents thereof, the rubber covered surface of said flange adjoining said wall providing a resilient face of larger area than the container wall aperture for overlying and closing the latter, and means for holding said heating element assembled with the container wall and compressing said resilient flange face against the wall portion of said container which exteriorly margins said container aperture to provide a liquid-tight seal between the container and said element.

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