Dec. 31, 1963 L. D. DRUGMAND 3,116,401

ELECTRIC HEATERS

Filed June 22, 1960

Fig. 1

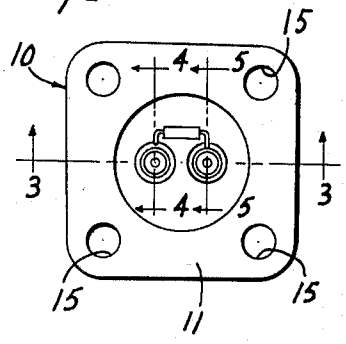


Fig. 2

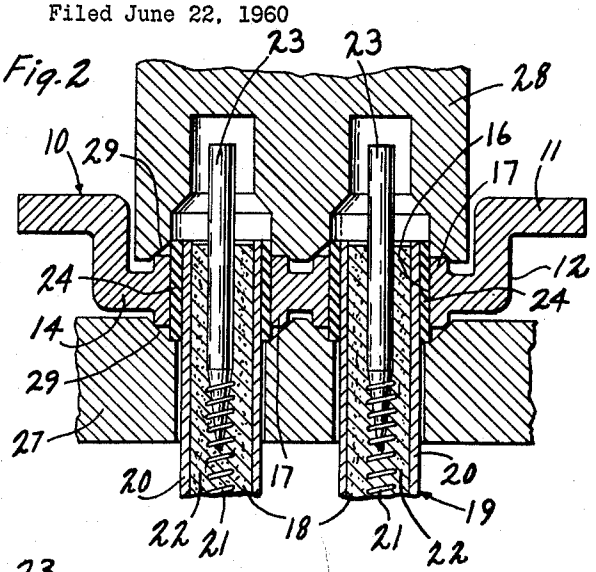


Fig. 3

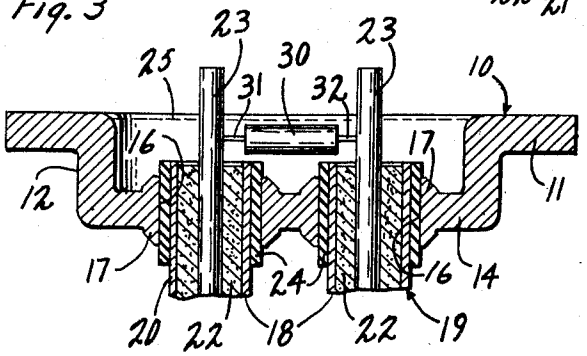


Fig. 4

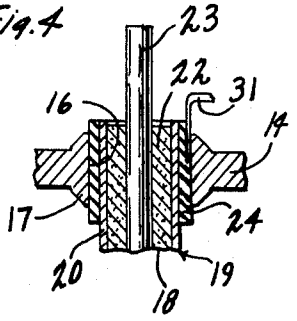


Fig. 5

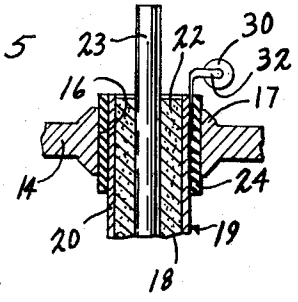


Fig. 6

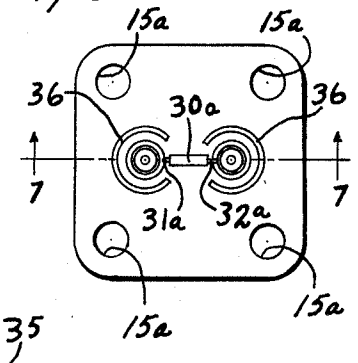
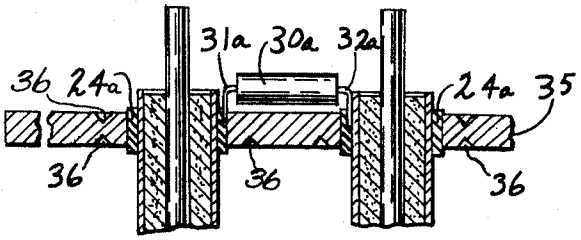


Fig. 7



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3,116,401
ELECTRIC HEATERS

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3 Claims. (Cl. 219—38)

My invention relates to electric heaters, more particularly to an improved heater construction and mounting, and method of making the same, for protecting against corrosive valvanic action, and the principal object is to provide new and improved products and methods of the character described.

The patents to Boggs et al., No. 2,723,340, and to Dicome, No. 2,810,815 adequately discuss the need for protection of an electric heater against the damaging effects of galvanic current generated in a water heater and therefore no further discussion will be made in this application.

The present invention is an improvement over the constructions disclosed in the aforementioned patents and the advantages of the present invention will become apparent from a reading of the following specification in connection with the accompanying drawing.

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

FIGURE 1 is a plan view of an electric heater showing one embodiment of my invention.

FIGURES 2 and 3 are similar enlarged sectional views, FIGURE 3 being fragmentary and corresponding to the line 3—3 of FIGURE 1 and showing heater construction after a certain pressing operation, and FIGURE 2 illustrating the heater construction prior to a pressing operation, the press dies being fragmentarily shown.

FIGURES 4 and 5 are enlarged fragmentary sectional views corresponding respectively to the lines 4—4 and 5—5 of FIGURE 1.

FIGURE 6 is a plan view of another embodiment of my invention, and

FIGURE 7 is an enlarged fragmentary sectional view corresponding generally to the line 7—7 of FIGURE 6.

Referring to FIGURES 1 through 5 of the drawings, the embodiment therein disclosed comprises a mounting member 10, here shown to have a flat flange portion 11 and a slightly conical inwardly dished portion 12 providing a flat bottom wall 14.

The flange portion 11 is preferably rectangular (square) in plan and provided with holes 15 at its corners to pass fastening bolts (not shown) which secure the mounting member 10 to a tank wall. Attention is directed to the aforementioned Boggs and Dicome patents for details of mounting the heater to the water tank wall.

The mounting member 10 may be formed of any suitable material and at the present time it is preferred to make this member as a brass forging. The bottom wall 14 is formed with a pair of openings 16, 16, each margined at its opposite ends by collars 17, 17 which are integral with the wall 14 and extend from opposite sides thereof.

The two legs 18, 18 of a hairpin type electric heating element 19 are disposed through respective openings 16, as shown in FIGURE 2. Generally, the heating element comprises a metal sheath 20 enclosing a resistor 21, the latter being embedded within compacted, powdered refractory material 22, such as magnesium oxide, to electrically insulate the resistor from the sheath and to conduct heat from the resistor to the sheath. Terminal pins 23 are electrically and mechanically connected to opposite ends of the resistor 21 and extend outwardly of respective legs 18. A suitable end seal, not shown, may be disposed within the terminal ends of the heating element.

Insulating sleeves 24 are disposed between adjoining surfaces of the openings 16 and sheath legs 18. The material from which the sleeves are made should possess good electrical insulating qualities and at the same time should embody a limited degree of resiliency for a purpose later to appear. Sleeves made of nylon have been used with good effect.

The sleeves 24 are preferably a little longer than the length of the openings 16 through which they pass, as seen in FIGURES 2 and 3, and have a fairly close fit with the adjoining surfaces of the openings 16 and sheath legs 18. A proper assembly may be effected by cementing the sleeves to the adjoining parts, or by filling the recess of the dished portion 12 to a level, as indicated by the dotted line 25 in FIGURE 3, with a suitable epoxy resin.

However, to insure against any leakage which may be caused by vibration, or otherwise, it is preferred to effect a mechanically tight engagement between the sleeves 24 and adjoining parts. One manner in which such engagement may be effected is shown in FIGURE 2, wherein lower and upper dies 27 and 28 are disposed on opposite sides of the mounting member and are relatively movable to close upon such member.

The dies 27, 28 are formed with conical openings 29, the inner smaller diameter of which is just slightly larger than the outer diameter of the nylon sleeves 24. When the dies 27, 28 are closed upon the mounting members, the surface of the openings 29 peripherally engage about the terminal ends of the collars and deform such collars radially inwardly to exert a high pressure against the sleeves and the sheath and thereby firmly support the electric heating element 19 from the mounting plate 10. The pressure exerted by deformation of the collars will compress and deform the sleeves 24 and the sheath legs 18, but no attempt to show such compression or deformation has been made in FIGURE 3. The sleeves 24 being somewhat resilient, suitably seal the openings 16, 16 against leakage of liquid from the tank. Also, the resiliency of the sleeves will insure that vibration will not loosen the heater assembly or cause leakage through the openings 16.

In order to insure a predetermined amount of galvanic current flow between the mounting member 10 and the sheath of the heating element 19, a resistor 30 is interposed therebetween. The resistor may be of any suitable commercially available type, and preferably is of the radio type, comprising a cylindrical body with current conducting leads 31, 32 extending from its opposite ends.

The method of assembly herein before disclosed lends itself well to inclusion of the resistor assembly since it is only necessary to insert the lead 31 between the exterior surface of the sleeve 24 and the adjoining surface of the opening 16 (see FIGURE 4) and to insert the lead 32 between the interior surface of the other bushing 24 (see FIGURE 5) and the adjoining surface of the heater sheath. When the collars 17 are inwardly deformed, the resulting inward directed pressure will insure good electrical engagement between the leads 31, 32 and the respective adjoining surface. Since the sleeves 24 are somewhat resilient, the leads 31, 32 will be adequately surrounded to prevent leakage of liquid through the openings 16.

Because of space limitations, the resistor 30, as seen in FIGURE 1 is disposed to one side of a line drawn through the longitudinal axes of the heater legs 18, and the upper die 28 is formed with a recess (not shown) which provides clearance for the resistor.

Many parts of the embodiment shown in FIGURES 6 and 7 are similar to parts hereinbefore described and therefore such similar parts will be identified with the same reference numerals with the suffix "*a*" added.

In the embodiment of FIGURES 6 and 7, a flat plate

35 may be used as the mounting member. The plate 35 may be formed by a stamping operation and bolt holes 15*a* and inner holes 16*a*, 16*a* may be formed in the same operation.

The leads 31*a*, 32*a*, as before, are interposed between the sleeves 24*a* and the adjoining parts of the mounting member and heater sheath. Since the plate 35 is flat, no collars (such as collars 17, 17) are provided. In this case, the dies (similar to dies 27, 28) may be formed with an almost closed circular projection (not shown) which is V-shaped in cross-section so that when the dies are closed upon the opposite sides of the mounting plate, V-shaped grooves 36, 36 are formed in the opposite sides. The grooves 36 on the top of the plate 35 are circular and almost closed, as seen in FIGURE 6, clearance being provided to avoid injury to the resistor leads 31*a*, 31*a*, or to the resistor 30*a*. The grooves 36 on the bottom of the plate 35 may be circular and entirely closed, as suggested in FIGURE 7, to insure that a good fluid seal is made.

The V-shaped grooves 36 crowd the metal of the mounting plate surrounding the openings 16*a*, 16*a* inwardly toward the axis of each opening to effect the assembly and sealing pressure hereinbefore mentioned. Since each top groove 36 is almost a completely closed circle, the slight interruption therein will not affect the assembly and sealing pressure exerted, especially when the lower grooves 36 are completely closed circles.

In view of the foregoing, it will be apparent to those skilled in the art that I have accomplished at least the principal object of my invention and it will also be apparent to those skilled in the art that the embodiments 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 embodiments are illustrative only, and that my invention is not limited thereto.

I claim:

1. An electric heater assembly, comprising a metallic mounting member having a pair of openings therein, a dielectric sleeve closely fitting within each of said openings, an electric heating element having a metallic sheath, portions of the latter closely fitting within and extending into respective ones of said sleeves and being firmly connected to said mounting member, means for regulating flow of electric current between said sheath and said mounting member and having a pair of electrical connection leads, one of said leads being disposed between and in contact with the defining wall of one of said openings and the adjoining outer surface of the corresponding sleeve to place said one lead in electrical contact with said defining wall and thus in electrical contact with said mounting member, and the other of said leads being disposed between and in contact with the exterior surface of the sheath portion and the interior surface of the sleeve at the other of said openings to place said other lead in electrical contact with said sheath.

2. The construction according to claim 1 wherein metal of said mounting plate adjoining said openings is deformed radially inward to exert an inward pressure against respective sleeves and sheath portions to seal the openings against leakage of liquid therethrough and to effect good electrical contact at said leads.

3. The construction according to claim 1 wherein said mounting plate has integral collars extending therefrom and margining said openings, and wherein said collars are deformed radially inwardly to exert an inward pressure against respective sleeves and sheath portions to seal the mounting plate openings against leakage of liquid therethrough and to effect good electrical contact at said leads.

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