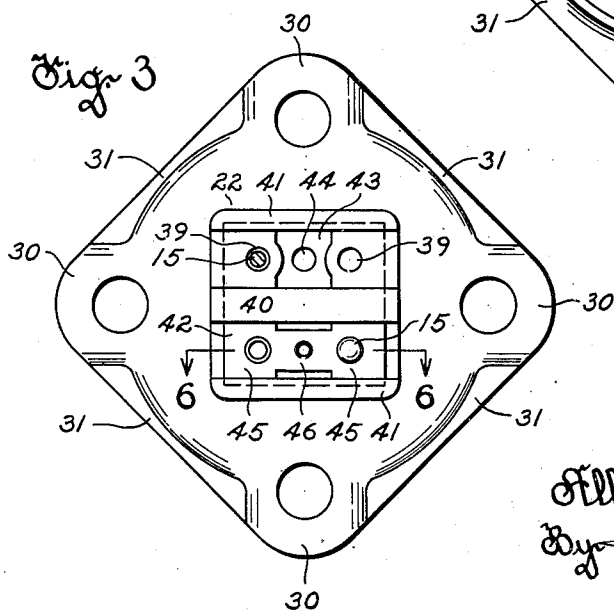
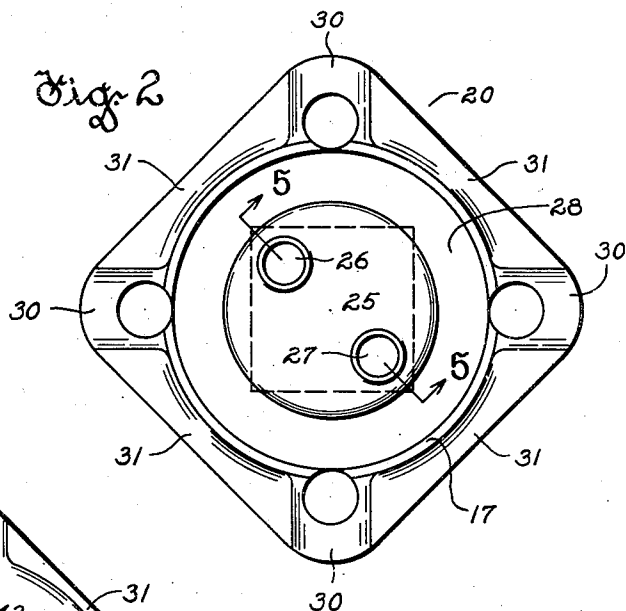
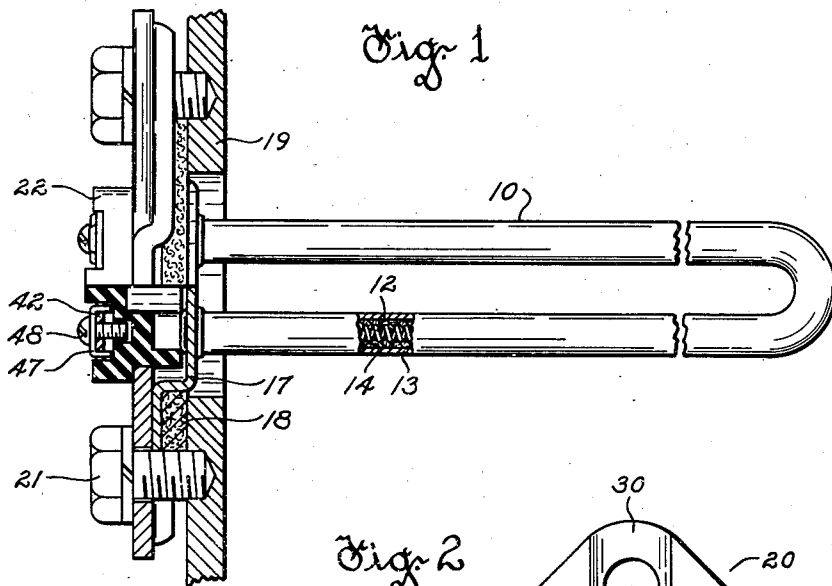


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2 Sheets-Sheet 1



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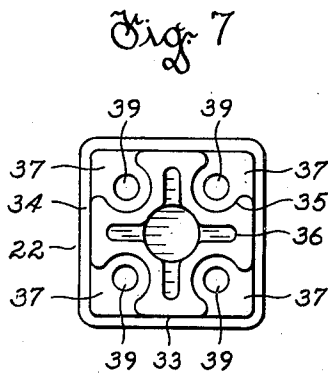
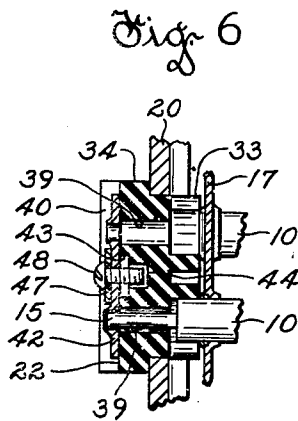
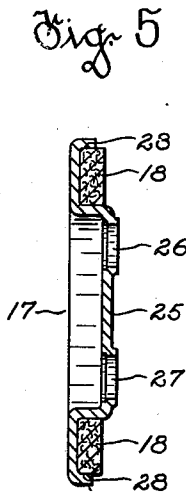
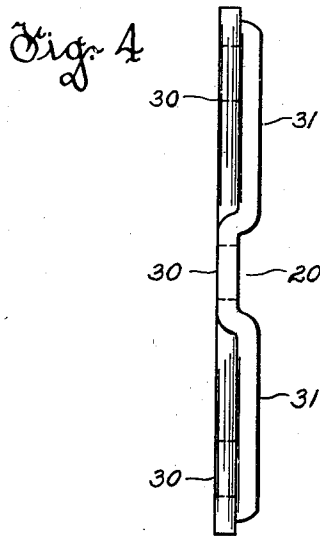
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ELECTRIC IMMERSION HEATER

2,471,609

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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ELECTRIC IMMERSION HEATER

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7 Claims. (Cl. 219—33)

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This invention relates to electric heaters equipped with mounting means.

The invention which is particularly applicable to immersion type water heaters carries forward the teachings of the Hadaway Patent No. 1,281,157, October 18, 1918, said patent teaching end securement and sealing of a sheathed heater to a copper plate which equipped with gasket closes the entrance opening for the heater into a fluid container, the gasket and plate being clamped to the container by a centrally open mounting plate, and protecting the latter from attack by the fluid within the container.

The present invention has among its objects to improve said Hadaway construction in numerous respects including greater ruggedness for a given amount of material employed and better support and protection for the electric terminals of the heater.

Another object is to utilize an insulating terminal block for the heater as a means for holding the mounting plate in assembled relation with the heater when the heater terminals are fixed to terminal plates carried by said block.

Another object is to provide for securement of the heater and its mounting parts in assembled relation without even extending the heater sheath through or into engagement with the mounting plate.

Another object is to provide a gasket plate formed to receive and per se retain in place thereon the gasket to be clamped against the receptacle.

Another object is to provide a mounting which without change except in the number of openings provided in the gasket plate may be employed for one or more heating elements, as for example a single tubular heater bent into a hairpin form or elongated coil form, or alternatively a plurality of elements each of hairpin or other form.

Other objects and advantages will hereinafter appear.

The accompanying drawing illustrates a preferred embodiment of the invention which will now be described, it being understood that the embodiment illustrated is susceptible of various modifications without departing from the scope of the appended claims.

In the accompanying drawing,

Figure 1 is a side elevational view of a heater inclusive of mounting means, the heater being shown as projecting through a tank wall, the tank wall and certain parts of the heater mounting means being shown in section;

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Fig. 2 is a rear elevational view of the heater mounting means shown in Fig. 1;

Fig. 3 is a front elevational view of the heater mounting means shown in Fig. 1, certain of the terminal plates being omitted;

Fig. 4 is an edge view of the mounting plate;

Fig. 5 is a section through the gasket plate taken on line 5—5, Fig. 2;

Fig. 6 is a sectional view through the terminal block shown in Fig. 3, the section being taken on line 6—6, Fig. 3, and certain associated elements being shown in assembled relation therewith, and

Fig. 7 is a rear elevational view of the terminal block shown in Fig. 3.

The heater shown in Fig. 1 is a so-called tubular heater 10 bent into hairpin form. This heater preferably comprises a helical resistor 12 surrounded by a seamless and bendable tubular metal sheath 13 from which it is spaced and insulated by a highly compacted mass of granular insulating material 14, said helix having straight terminal leads 15 (Fig. 6) extending from the ends of the sheath. The terminal leads have their inner ends embedded in the compacted granular insulation and may or may not be sealed within the sheath. This type of element which is well known may be formed in any of the various ways now known, whereas as will appear the mounting means to be described is applicable to other types of heating elements.

Briefly set forth the heating element 10 has the terminal portions of its sheath projected into and snugly fitting within openings in a gasket plate 17 carrying a gasket 18, said gasket plate to be clamped against the receptacle wall 19 by a mounting plate 20 which commonly is bolted to the wall 19, one bolt 21 being shown in Fig. 1. The mounting plate 20 is centrally recessed to receive a shouldered insulating block 22, said block being recessed to receive the terminal portions of the heater sheath and carrying on its outer face terminal plates to which the lead wires 15 after passing through the block are secured, as best shown in Fig. 6. The terminal portions of the heater sheath, as best shown in Fig. 6, fit snugly in the recesses in the terminal block, and as shown in Fig. 7 the terminal block is rectangular in cross section to pass through and to fit snugly within a rectangular opening in the mounting plate, said opening being shown by dotted lines in Figs. 2 and 3.

The gasket plate 17, preferably brass, is circular, as shown in Fig. 2 and in cross section is preferably of the shape shown in Fig. 5. Thus is provided a circular central portion 25 having open-

ings 26 and 27 to receive the terminal portions of the heater sheath, and also an annular channel 28 concentric with and offset from said central portion 25, said channel forming a retaining seat for an annular gasket 18. As will be understood, the diameter of the gasket plate is such as to enable complete closure by the plate of the opening in the wall 19 for entrance of the heater, the gasket affording a seal between the plate and the wall. Also as will be understood, the joints between the heater and the gasket plate are to be sealed as by silver soldering. The terminal portions of the heater sheath are preferably projected through the gasket plate to extend somewhat beyond the offset forming the gasket channel and into recesses in the terminal block, said block being receivable by said gasket plate in the central pocket provided by offsetting the gasket channel. As shown in Fig. 2, the outer flange of the gasket channel is notched for clearance of the bolts for attaching the mounting plate to the receptacle, this provision being made primarily to adapt the mounting to existing receptacles but otherwise being unnecessary. As will be noted, this construction of the gasket plate materially increases its strength and rigidity as the support for the heater.

The mounting plate 20, preferably steel, is shown as being rectangular although it might be of other shapes, and is shown as having a rectangular central opening which also might be of different contour to match the contour of the terminal block employed. Such plate, as will be understood, must be rugged and to obtain the required ruggedness with less material the plate is formed to offset from its central and corner parts its intermediate marginal parts, as best shown in Fig. 4, which shows in edge elevation three corner parts 30 and two offset intermediate marginal parts 31. The degree of offset may be as desired but preferably it is as depicted in Fig. 4 which shows offsetting to a degree doubling the overall thickness of the plate.

The terminal block 22 is shown as having a rectangular portion 33 fitting snugly within and extending through the central opening of the mounting plate 20 and as also having an enlarged outer rectangular portion 34 to abut the mounting plate 20. Thus the mounting plate is confined between the gasket plate and portion 34 of the terminal block when said block is secured to the heater. The end of portion 33 of the terminal block, as best shown in Figs. 6 and 7, is provided with a projecting and meandering rib bounded by lines 35 and 36, which rib is accommodated by the gasket plate within the space provided by offsetting the gasket channel. The contour of the rib is such as to leave the block with inset corner ledges 37, all in the same plane, and said block has at its four corners circular recesses 39 opening at such ledges, each to accommodate with snug fit a heater sheath terminal portion. Where a single heater of the form shown is employed only two of the recesses 39 are so utilized but it is preferred to form the block to make possible the use of two heaters, it being understood that in such event the gasket plate would be provided with additional openings. Two diagonally disposed recesses 39 align with the gasket plate openings 26 and 27 shown in Fig. 2, and as earlier explained the terminal portions of the heater sheath are projected through the gasket plate openings into recesses 39 of the terminal block. The heater and the block are thus interlocked against relative rotary play while the matching

contours of the block and the receiving opening in the mounting plate interlock said block and plate against relative rotary play. The heater being supported by the gasket plate and said plate being of the rugged construction shown it is unnecessary to have the heater sheath project into the insulating block farther than is required for interlocking purposes, and hence the penetration need be no more than that shown in Fig. 6.

However, the recesses 39 are preferably continued through the block to permit the heater lead wires to extend through and project beyond the outer end of the block, as shown in Fig. 6, for attachment to terminal plates seated on the block. The outer face of the block, as best shown in Figs. 3 and 6, has a transverse central rib 40 and parallel side ribs 41 of slightly less height which form with rib 40 two channels to receive flat terminal plates 42, each extending substantially the full length of its channel to overlie two recesses 39. Midway between each two such recesses the terminal block has a substantially rectangular depression 43 and centrally thereof a further depression 44 of circular form. The terminal plates 42 as shown each comprise rectangular end portions 45 connected by a narrower strip 46 to be straddled by a U-shaped plate 47. The legs of plate 47 extend into recess 43 and said plate which constitutes a wire clamping plate has passing therethrough with a loose fit a binding screw 48 threading into the strip 46 of the terminal plate.

The end portions 45 of each terminal strip have therein openings aligning with the block recesses 39, which said portions 45 overlie. Thus the heater lead wires may be projected through the block and the heater plates for securement to said plates by welding or in any other preferred manner. The heater and its associated mounting parts and terminal block are thus secured together in assembled relation.

As will be understood, where a single heater of the form shown is employed it will be desired to employ two terminal plates of the form described, connecting one of the heater leads to one plate and the other heater lead to the other plate, preferably in the manner described. It is to enable such connections that the heater is projected into diagonally disposed recesses in the rectangular block. The attachment of each terminal plate at one end to its respective heater lead is adequate to retain the plates in place on the block and the two plates thus secured jointly afford adequate securement of all parts in assembled relation.

Also as will be understood, where two heaters are employed it may be desired to modify one or both terminal plates, but in any event each of the heater terminal leads will be secured to a terminal plate and collectively the plates will afford equal or greater securement of the heater and its associated parts in assembled relation.

What I claim as new and desire to secure by Letters Patent is:

1. In combination, a sheathed electric immersion heater, a gasket clamping plate to close the entrance opening for said heater into a receptacle and to shield hereinafter specified elements, said heater having its sheath projecting through said plate and having therewith fluid tight connection, an insulating terminal block into which the heater sheath projects with snug fit after passing through said plate, a mounting plate through which said block extends, said mounting plate being confined between the first mentioned plate and an abutting part of said block,

and terminal plates located on the outer end of said block, to which the terminal leads of said heater are led through said block and to which said terminal leads are secured for electrical connection therewith and for securement of said block to said heater after assembly therewith of said mounting plate.

2. In combination, a sheathed electric immersion heater, a plate to close the entrance opening for said heater into a receptacle and to shield hereinafter specified elements, said heater having its sheath projecting through said plate and having therewith fluid tight connection, said shield plate being formed with a channel surrounding and offset laterally from its central portion, a gasket carried by said plate in its said channel, an insulating block into which the heater sheath projects with snug fit after passing through said plate, a mounting plate through which said block extends for entry into the central pocket provided in said shield plate by offset of its gasket channel, said mounting plate being confined between said shield plate and an abutting part of said block, and said block being secured to said heater.

3. In combination, a sheathed electric immersion heater, a plate to close the entrance opening for said heater into a receptacle and to shield hereinafter specified elements, said heater having its sheath projecting through said plate and having fluid tight connection therewith, said plate being formed with a channel surrounding and offset laterally from its central portion, a gasket carried by said plate in its said channel, an insulating block into which the heater sheath projects with snug fit after passing through said shield plate, a mounting plate through which said block extends for entry into the central pocket provided in said shield plate by offset of its gasket channel, said mounting plate being confined between said shield plate and an abutting part of said block, and said block being secured to said heater, said mounting plate having in the same plane a central portion and outwardly extending portions to receive attaching bolts and having marginal portions intermediate of said bolt receiving portions offset laterally toward said shield plate.

4. A sheathed electric immersion heater having a gasket carrying plate to close and seal the entrance opening for said heater into a receptacle, said plate having a central portion through which said heater projects and with which said heater has fluid tight connection, and said plate having concentrically about its said central portion and offset laterally therefrom an annular channel to receive and retain in place its gasket.

5. In combination, a sheathed electric immersion heater, a plate to close the entrance opening for said heater into a receptacle and to shield hereinafter specified elements, said shield plate having a central portion through which said heater projects and with which said heater has fluid tight connection, and said shield plate being marginally formed to provide a retaining seat for an annular gasket offset laterally from and surrounding the central portion of said plate, and a mounting plate to bear against and clamp said shield plate to a receptacle, said

mounting plate having in the same plane a central portion and outwardly extending bolt receiving portions, and having marginal portions intermediate said bolt receiving portions offset toward and clearing said shield plate.

6. In combination, a reflexed sheathed electric immersion heater, a gasket plate to close the entrance opening for said heater into a receptacle and to shield hereinafter specified elements, said heater having its sheathed ends projected through said plate and having fluid tight connection therewith, an insulating terminal block recessed to receive the sheathed ends of said heater projecting from said plate, a mounting plate through which said block extends, said mounting plate being confined between said shield plate and an abutting part of said block, and separate terminal plates having definitely spaced seats on the outer end of said block, said heater having its terminal leads extended through said block and each through one of said terminal plates, and said terminal leads being secured to their respective terminal plates for electrical connection therewith and for securement of all aforesaid elements, including said terminal plates, in assembled relation.

7. In combination, a reflexed sheathed electric immersion heater, a gasket plate to close the entrance opening for said heater into a receptacle and to shield hereinafter specified elements, said heater having its sheathed ends projected through said plate and having fluid tight connection therewith, an insulating terminal block recessed to receive with snug fit the sheathed ends of said heater projecting from said plate, a mounting plate through which said block extends with a fit to prevent relative rotary play of said mounting plate, and said mounting plate being confined between said gasket plate and an abutting part of said block, and separate terminal plates having definitely spaced seats on the outer end of said block, said heater having its terminal leads extended through said block and each through one of said terminal plates, and said terminal leads being secured to their respective terminal plates for electrical connection therewith and for securement of all aforesaid elements, including said terminal plates, in assembled relation, said gasket plate being marginally offset toward said mounting plate to form a gasket seat, and said mounting plate having in the same plane a central portion and outwardly extending portions to receive securing bolts and having intermediate marginal portions offset towards but clearing said gasket plate.

ALLAN P. CHARBONNEAU.

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