Nov. 6, 1956 J. W. HARRISON 2,769,891

ELECTRIC IMMERSION HEATER

Filed Jan. 10, 1955

FIG.1.

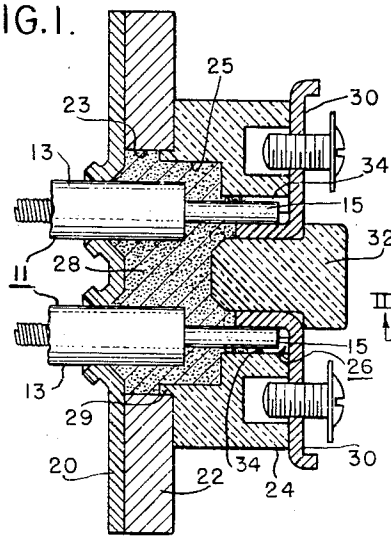


FIG.2.

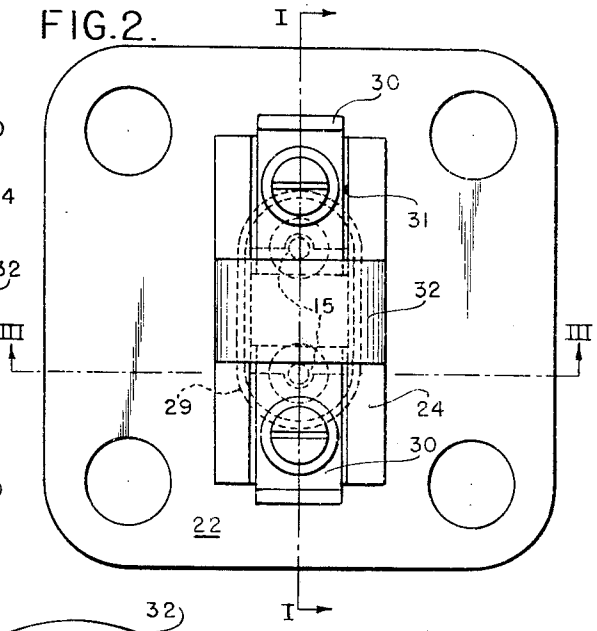


FIG.3.

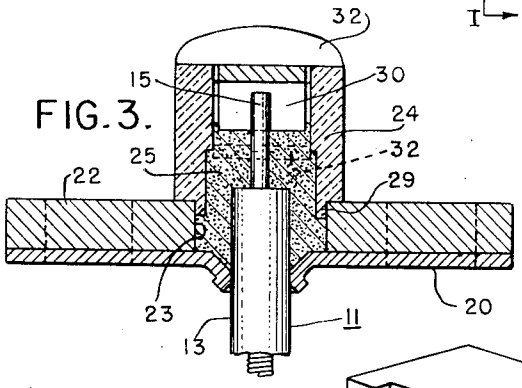
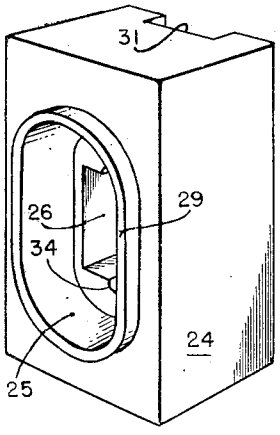


FIG.4.



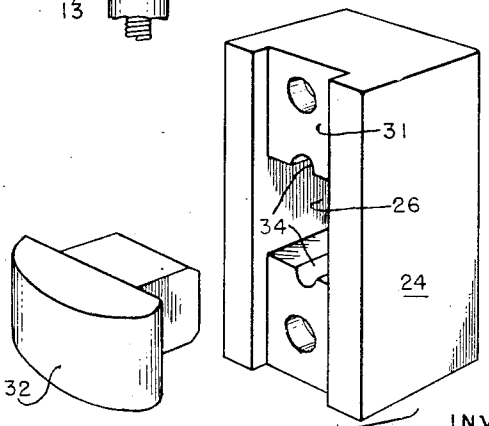


FIG.5.

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ELECTRIC IMMERSION HEATER

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4 Claims. (Cl. 219—38)

This invention relates to a sheathed electrical immersion heating device for mounting in the wall of a liquid containing receptacle.

It is an object of this invention to simplify the construction of a hermetic seal about the heater terminals in a heater of the above type.

It is another object of this invention to provide an improved sturdy construction, for mounting and for making electrical connections, in a heater of the above mentioned type in which a molten hermetic sealing material may be poured and formed about the heater terminals without requiring the use of auxiliary molding apparatus.

In accordance with this invention a sheathed heater is bent with its sheathed end portions parallel and adjacent to each other. The terminal ends of the heater extend through a corrosion resistant sheet. A clamping plate having a central opening therein abuts the sheet to reinforce it. Abutting the outer side of the clamping plate is an insulating terminal block having a recess therein aligned with the opening in the plate. The opening in the plate and the recess in the block define a cavity into which the terminal portions of the heater extend and within which the heater sheath terminates. The heater terminals extend to the outside of the block for making electrical connections thereto. The cavity is accessible by means of a passage in the block through which molten sealing material is poured to form an electrically insulating hermetic seal between the sheath and the heater terminals. After pouring the sealing material into the cavity an insulating plug may be inserted to close the passage.

These and other objects are effected by the invention as will be apparent from the following description taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a vertical section taken along the line I—I of Fig. 2 and showing the mounting and terminal portion of an electric heater with the main body of the sheathed resistance element cut away;

Fig. 2 is a front elevation of the mounting and terminal construction shown in Fig. 1;

Fig. 3 is a section taken along the line III—III of Fig. 2;

Fig. 4 is a perspective view showing the inner side of the electrically insulating block that abuts the clamping plate in the assembly shown in Figs. 1 through 3; and

Fig. 5 is a perspective view showing the outer side of the same insulating block and the insulating plug that is received in a passage in the block.

The sheathed heater **11** comprises a helically coiled electrical resistant element positioned in a corrosion resistant tubular metal sheath **13** and insulated therefrom by an insulating material such as magnesium oxide. The heater is bent in the shape of a hairpin or any other desired shape with the end portions of the heater extending generally parallel and adjacent to each other. Terminal pins **15** are electrically connected to the resistance element and extend from within each end of the sheath and are electrically insulated therefrom.

The sheathed end portions of the heater **11** extend through a corrosion resistant copper sheet **20**. The sheath **13** is bonded and hermetically sealed in the sheet **20** preferably by brazing. A heavy steel clamping plate **22** having a central opening **23** therein abuts the sheet **20**. Abutting the side of the plate **22** opposite the sheet **20** is a ceramic insulating block **24** having a recess **25** aligned with the opening **23** in the plate. The plate opening **23** and the recess **25** in the block define a cavity into which the terminal portions of the heater extend and within which the heater sheath **13** terminates. The heater terminals extend to the outside of the block for making electrical connections thereto.

The cavity **23—25** is accessible by means of a passage **26** in the block through which molten sealing material **28** may be poured to form an insulating hermetic seal between the sheath **13** and the terminal pins **15**. After the material **28** sets or hardens it firmly supports the clamping plate **22** and insulating block **24** relative the sheet **20** and the sheath **13**. The electrically insulating sealing material **28** is preferably of the type which will set quickly and which does not require a curing operation. A highly refined asphalt material designed for high temperature use is one of many such suitable materials.

The clamping plate **22** has a flat surface that abuts and is coextensive with the sheet **20**, except at the center opening **23** that accommodates the end portions of the heater **11**. The wall of the opening in the plate **22** is spaced from the sheath **13** to permit the sealing material **28** to readily flow completely around the end portions of the sheath **13** that extend through the sheet **20**. A lip **29** is formed on the block **24** around the edge of the recess and extends into the opening in the plate **22** with a snug fit. This lip is provided primarily to reduce the leakage of the molten sealing material between the block **24** and the plate **22**, but it also assists in positioning the plate relative the block during assembly. This invention may be practiced without using the lip, however, since the sealing material when set will hold the clamping plate in fixed position.

The electrical heater terminals comprise terminal strips **30** attached to the terminal pins **15**. The terminal strips extend along opposite sides of the central pasasge **26** in the insulating block **24** and are bent to lie in a channel **31** along the outer surface of the block. An insulating plug **32** closes the passage **26** and provides mechanical support for the portions of the terminal strips **30** within the passage and maintains the terminals in spaced relationship. Opposite walls of the passage **26** in the block have grooves **34** to receive the terminal pins. The terminal strips **30** are spot welded to the terminal pins **15** on the sides of the latter opposite the recesses so that the strips **30** provide flat surfaces to be engaged by the plug **32**.

The terminal strips **30** are straight when attached to the pins **15** and extend generally parallel to the latter. During assembly the clamping plate **22** and insulating terminal block **24** are positioned on the heater by slipping them over the terminal strips **30** and the latter are thereafter bent to the position shown in Fig. 1 to hold the block and plate in fixed positions. The assembly is then heated to drive off moisture and the cavity is filled by pouring the molten insulating material **28** through the pasasge **26**. While the insulating material **28** is still soft the plug **32** is inserted and compresses the material to force it into the ultimate confines of the cavity.

A heater made in accordance with this invention will maintain a very good hermetic seal between the termi-

nals and the ends of the heater sheath to keep all moisture and other contaminants out of the sheath. It will also be very strong mechanically. The heater terminals are firmly supported and any normal stresses thereon will not detrimentally affect the hermetic seal.

While the invention has been shown in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof.

What is claimed is:

1. An immersion heater for mounting in the wall of a liquid containing receptacle comprising a sheath having an electrical resistance element therein, said sheath having adjacent, generally parallel end portions, a corrosion resistant sheet, said end portions extending through said sheet with a fluid-tight seal therebetween, a clamping plate having a central opening and a flat surface abutting said sheet, an insulating block abutting said plate and having a recess therein aligned with the opening in said plate, said recess and central opening defining a cavity within which the ends of said sheath terminate, said block having a passage therethrough providing access to said cavity, an electrical terminal connected to said element and extending from within each end of said sheath, through said passage and exteriorly of said block, and a settable electrically insulating sealing material disposed in said cavity, said material being in a set condition and providing a hermetic seal between said terminals and said sheath, said passage being of sufficient size to readily permit pouring of said insulating material into the cavity prior to the setting of the material.

2. An immersion heater for mounting in the wall of a liquid containing receptacle, comprising a sheath having an electrical resistance element therein, said sheath having adjacent, generally parallel end portions, a corrosion resistant sheet, said end portions extending through said sheet with a fluid-tight seal therebetween, a clamping plate having a central opening and a flat surface abutting said sheet, an insulating block abutting said plate and having a recess therein aligned with the opening in said plate, said recess and central opening defining a cavity within which the ends of said sheath terminate, said block having a passage therethrough for pouring a settable sealing material into said cavity, an electrical terminal connected to said element and extending from within each end of said sheath, through said passage and exteriorly of said block, electrically insulating sealing material in said cavity providing a hermetic seal between said terminals and said sheath and a plug positioned in said passage to close the latter and mechanically support said terminals relative said block.

3. A heater for mounting in the wall of a liquid containing receptacle comprising a sheath having an electrical resistance element therein, said sheath having adjacent, generally parallel end portions, an electrical terminal connected to said element and extending from within each end of the heater sheath, a corrosion resistant sheet fastened to said sheath in fluid-tight relationship adjacent said end portions, a clamping plate abutting said sheet and having a central opening, an insulating block abutting said plate and having a recess therein aligned with said central opening, a lip on said block around the edge of said recess extending into said opening with a snug fit, said recess and central opening defining a cavity within which the ends of said sheath terminate, said block having a passage therein providing access to said cavity, and electrically insulating sealing material in said cavity providing a seal between said terminals and said sheath, said passage being of sufficient size to permit pouring of said insulating material while in a liquid state into said cavity, said terminals extending through said passage and exteriorly of said block.

4. A sheathed heater for mounting in the wall of a liquid containing receptacle comprising a sheath having an electrical resistance element therein, said sheath having adjacent, generally parallel end portions, an electrical terminal pin connected to said element and extending from within each end of the heater sheath, a corrosion resistant sheet fastened to said sheath in fluid-tight relationship adjacent said end portions, a clamping plate abutting said sheet and having a central opening, an insulating block abutting said plate and having a recess therein aligned with said central opening, a lip on said block around the edge of said recess extending into said opening with a snug fit, said recess and central opening defining a cavity within which the ends of said sheath terminate, said block having a pasasge therein providing access to said cavity, a settable electrically insulating sealing material in said cavity providing a hermetic seal between said terminal pins and said sheath, said passage being of sufficient size to permit pouring of said insulating material while in a pourable condition into said cavity, a terminal strip for each of said terminal pins attached thereto and extending along opposite sides of said passage, said strips extending exteriorly of said block and being bent outwardly from said passage to lie along the outer surface of said block, and a plug positioned in said passage between said terminal strips to close said cavity and to provide mechanical support for said terminals.

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