Aug. 27, 1963 S. J. TEMPLE 3,102,248

ELECTRIC HEATER ASSEMBLY

Filed Feb. 7, 1961

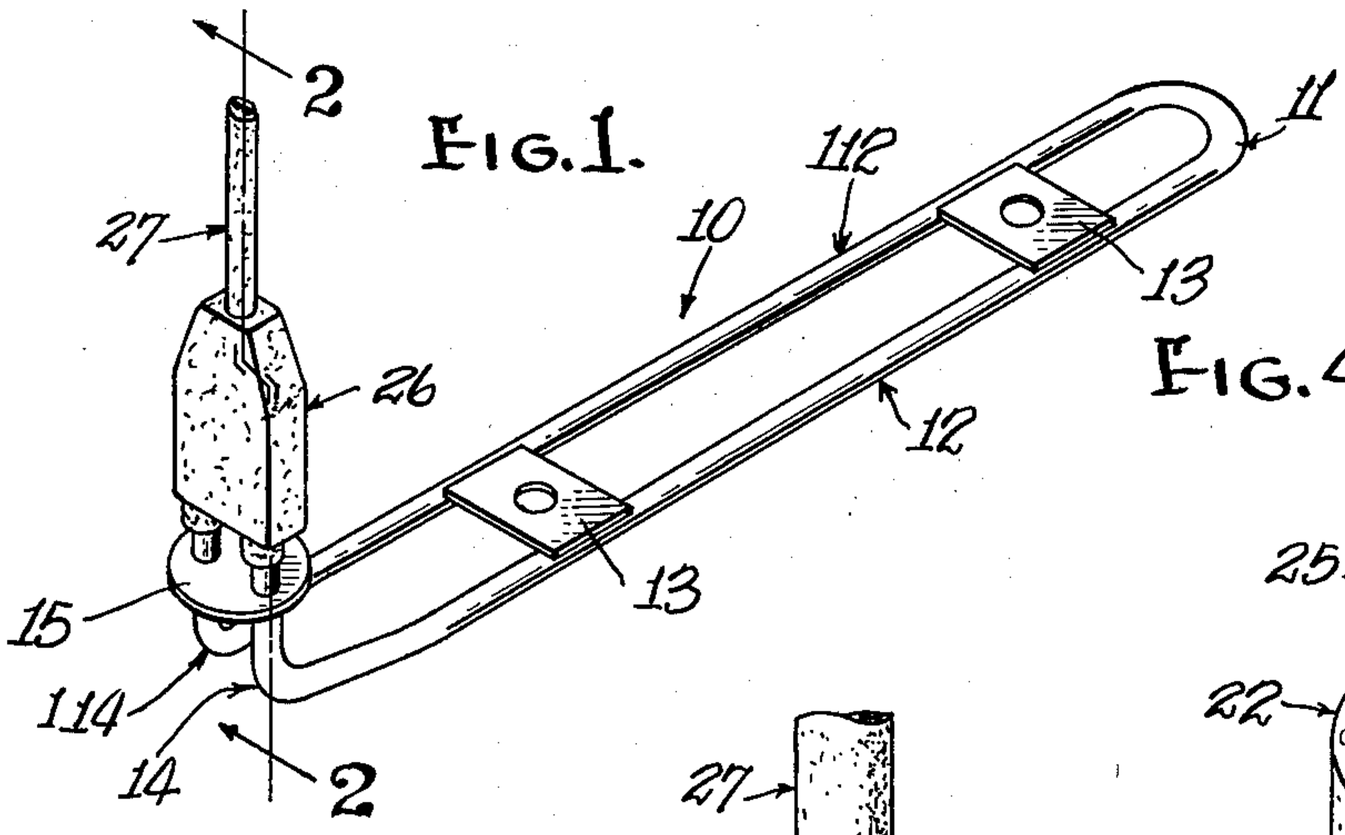


FIG. 1.

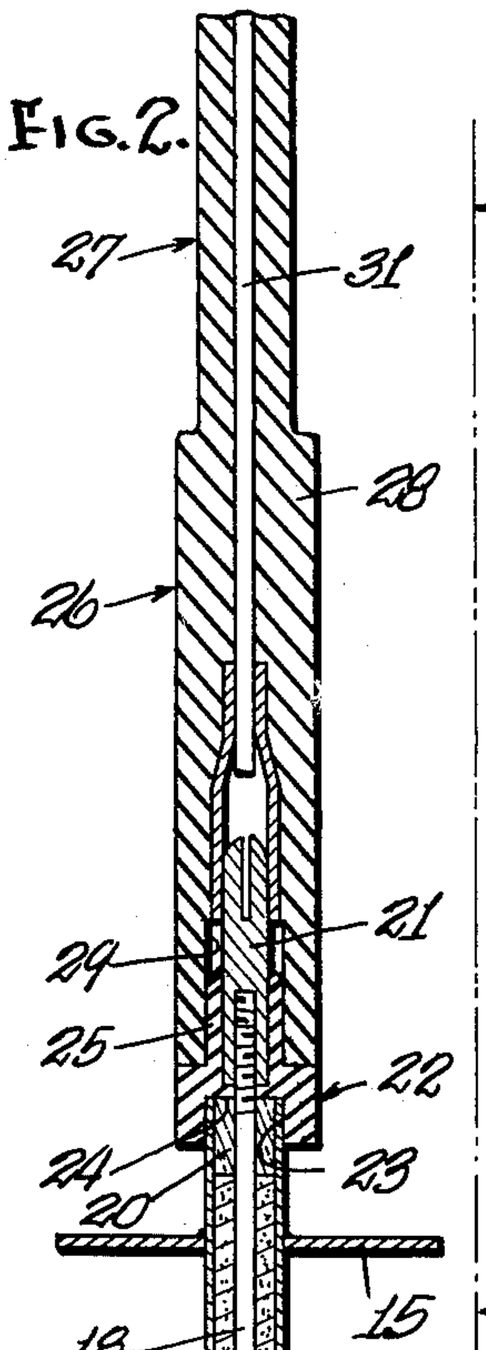


FIG. 2.

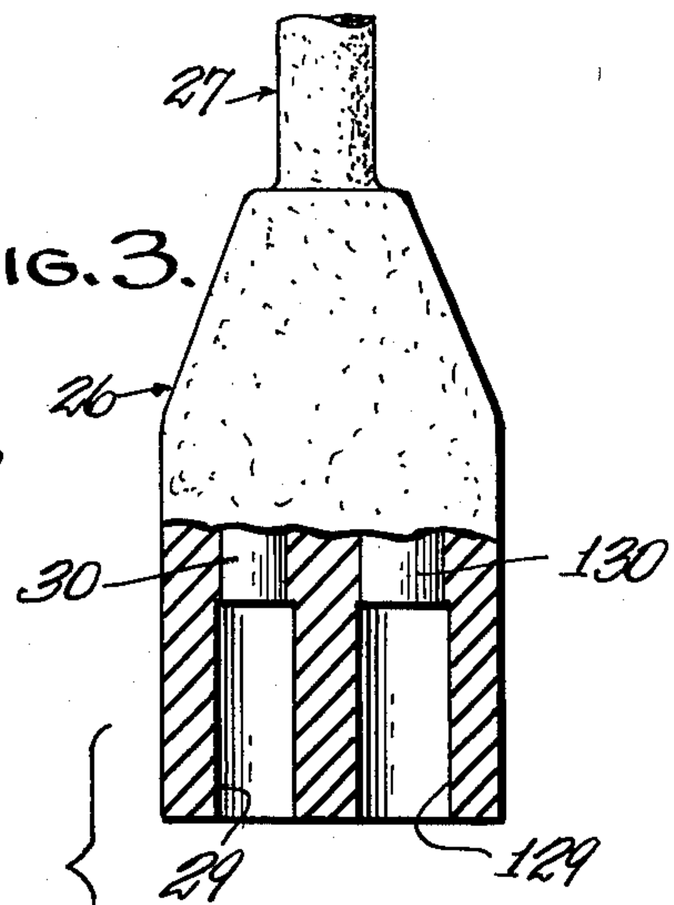


FIG. 3.

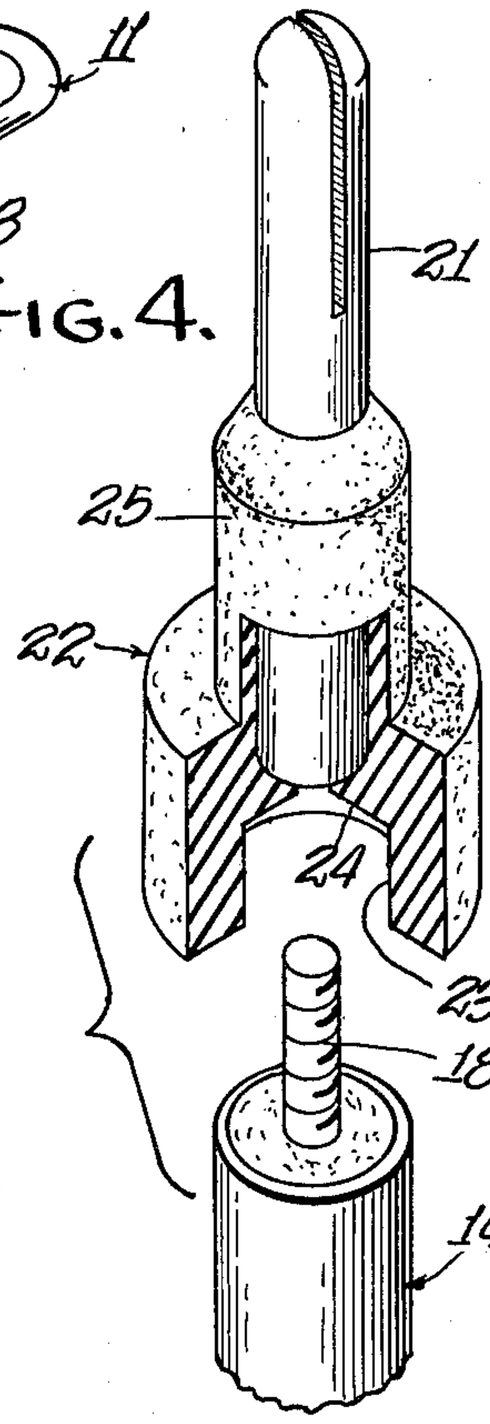
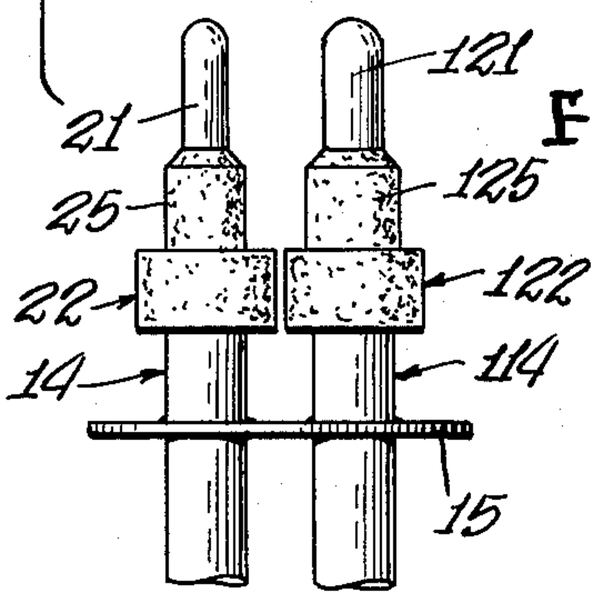


FIG. 4.



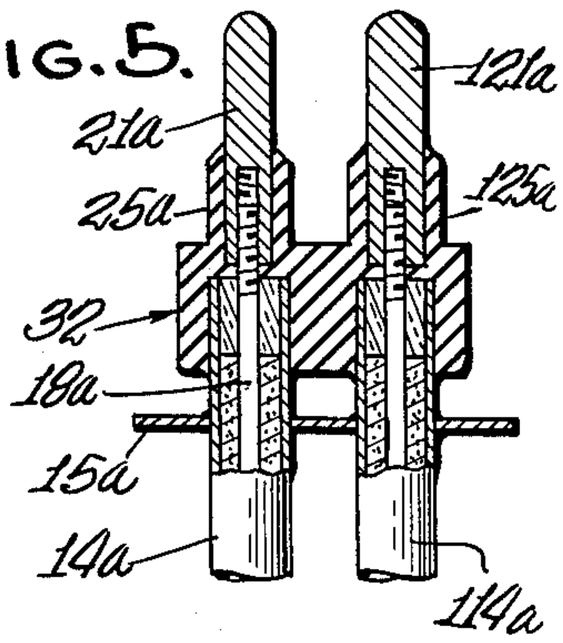


FIG. 5.

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ELECTRIC HEATER ASSEMBLY

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The present invention relates to electric heater assemblies, more particularly to an electric heater device having means for removably connecting the heater to a source of electrical energy, and the principal object of the invention is to provide new and improved assemblies of the character described.

There has long been a need for an electric heater readily connectable and disconnectable from a source of electrical energy by a waterproof connection. Prior art attempts to fulfill this need have resulted in complicated, expensive constructions which could not withstand hard use. The present invention, however, provides an assembly which, while low in cost, presents no shock hazard, is completely waterproof, and withstands all but the most severe abuse. Other advantages will readily become apparent from a study of the following description and from the drawings appended hereto.

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

FIGURE 1 is a perspective view of a heater assembly embodying a preferred form of the present invention,

FIGURE 2 is an enlarged, fragmentary sectional view generally corresponding to the line 2—2 of FIGURE 1,

FIGURE 3 is a fragmentary elevational view, at right angles to FIGURE 2, but partially broken away on the near side to illustrate interior construction and with certain parts separated from each other,

FIGURE 4 is an exploded, enlarged, fragmentary, broken, perspective view of certain details, and

FIGURE 5 is a fragmentary view similar to FIGURE 3 but of a modified structure.

While the present invention may be used with electric heaters employed in many different applications, it finds great utility in electric heaters employed in preheating steel plates or the like prior to welding thereof. Such heaters are widely used in the shipbuilding industry and also aboard ships when repairs must be made at sea. Heaters in this application are subject to considerable abuse, both from careless handling and from frequent exposure to and often complete immersion in water. Accordingly, the present invention will be disclosed in combination with heaters designed for the above-described, severe application although it will be understood that the invention is not limited to such heaters.

With reference to FIGURE 1, there is shown a metallic, tubular sheathed electric resistance heating element 10 bent to a hairpin shape to provide a bight portion 11 and spaced legs 12, 112. A pair of spaced-apart, apertured plates 13 are welded or otherwise secured between the legs for purpose of rigidity and to provide a means for securing the element against a surface to be heated. As herein disclosed, the free ends 14, 114 of legs 12, 112, hereinafter referred to as the terminal ends of the element, are bent at right angles to those leg portions adjacent the bight and are spaced somewhat closer together than such portions. For rigidity, means are also provided for connecting the leg free ends 14, 114 together, such means presently comprising a disk 15 through which pass respective leg ends and which is welded, brazed or otherwise affixed thereto.

Turning now to FIGURE 2, element 10 is the usual type wherein a coiled resistor conductor wire 16 is disposed within a tubular sheath 17 in spaced relation to the sheath ends. Terminal conductor pins 18 are electrically connected to respective ends of the coiled conductor within the sheath and extend therefrom a short distance beyond respective sheath ends. For a purpose to appear, the outwardly extending portion of each terminal pin is externally threaded. As is the usual practice, the interior of the sheath is filled with compacted, heat-conductive, electric-insulating material 19 which may stop short of respective sheath ends to form a pocket thereat. Each pocket may be filled with a suitable cementitious material 20 which retains the material 19 in position and partially protects the heater ends against moisture and other contamination.

With reference to the near element leg end 14 and as best seen in FIGURES 2 and 4, an elongated, electrical contact member 21 is threaded upon the projecting portion of the terminal pin 18. In the position of parts viewed, the lower end of member 21 is encased in a body 22 of flexible, dielectric material such as rubber which may be molded about the member. Body 22 projects beyond the lower end of member 21 as illustrated and has a downwardly facing recess 23 of a diameter to closely fit about the exterior of the element sheath 17. It is an important feature of the invention that the bottom 24 of the recess 23 is compressed against the end of the element leg portion 14 to form a seal when the member 21 is threaded upon the pin 18. For a purpose to appear, body 22 is reduced in diameter at 25 and stops short some distance below the upper end of the member 21 to leave such end exposed. Such member end is longitudinally slotted as illustrated in FIGURES 2 and 4 for transverse flexibility for a reason later to be seen.

If desired and to insure a better seal, recess 23 may be coated with a suitable adhesive prior to threading the member 21 on its terminal pin. It is to be noted that even if the body 22 is cemented in place, the member 21 and the body may be readily removed from the element terminal end in the event it is damaged (by breaking the cement body if present) and a new contact member assembled with the element terminal end.

Referring now to FIGURE 3, it will be noted that a member 121, substantially identical to 21, is secured to the terminal pin projecting from the end of element leg portion 114. Member 121 differs from 21 only in that it is slightly larger in diameter. Also, portion 125 of its body 122 is slightly larger in diameter than is portion 25 of body 22. In all other respects, member 121 and body 122 are identical with the previously described member 21 and body 22.

From the foregoing, it will be understood that with the members 21, 121 threaded on respective terminal pins, the ends of the element are sealed by means of bodies 22, 122 against the entrance of water or other harmful materials. It will also be understood that since member 21, 121 are electrically conductive, their connection to a source of electrical energy as will later appear will connect the resistor to such source.

The means provided for removably connecting the resistor 16 of the heater into an electrical circuit comprises a receptacle member 26 at the end of a flexible electrical cable 27 whose opposite end is connected in any suitable manner to a source of electrical energy. With reference to FIGURE 2, receptacle 26 and its associated parts will first be described solely with respect to element terminal end 14.

As seen in FIGURE 2, recepacle 26 presently comprises a body 28 of resilient dielectric material, such as rubber, molded to the end of the rubber sheathed electric cable 27. In the position of parts shown, the lower end of the body has a recess 29 whose cross-sectional size is such to frictionally fit with the reduced diameter por-

tion **25** of the body **22** in which the lower end of contact member **21** is embedded. Embedded within the body **28** in alignment with recess **29** but in spaced relation with the lower end of the body is a socket, or sleeve, **30** of an internal size to frictionally engage with the exposed end of the electrical contact member **21**. Sleeve **30** is connected in any suitable manner to one of the two electrical conductor wires **31** of the cable **27**.

With reference now to FIGURE 3, it will be noted that body **26** is of a size to span both element terminal ends **14**, **114** and has a downwardly facing recess **129** which is identical to **29** with the exception that it is proportioned to frictionally fit with the reduced diameter portion **125** of the body **122**. The body also carries a sleeve **130** in alignment with recess **129** which is identical to sleeve **30** with the exception that it is proportioned to frictionally engage with the exposed end of the electrical contact member **121**. Sleeve **130** is connected to the other electrical conductor wire of the cable **27** as will be understood.

With the parts separated as shown in FIGURE 3, energization of the heater merely requires that contact members **21**, **121** be inserted in their respective body recess **29**, **129** and the body forced down until its lower end bottoms against the upwardly directed faces provided by the bodies **22**, **122** at the lower ends of their reduced diameter portions **25**, **125**. It will be understood that this will establish electrical contact between the cable wires **31** and respective contact members **21**, **121** and therefore with respective ends of the resistor conductor wire **16** embedded within the element sheath **17**. It will also be understood that since the defining walls of the recesses **29**, **129** tightly grip about respective body portions **25**, **125**, a liquid-tight seal therebetween will be effected and since the bodies **22**, **122** are closely engaged with respective terminal ends **14**, **114** of the heating element, an unbroken, liquid-tight seal between the element sheath and the electrical cable **27** will thus be provided.

Obviously, receptacle member **26** may be separated from the heating element merely by withdrawing the contact members **21**, **121** from respective receptacle member recesses. Also, since reduced diameter portions **25**, **125** and their matching recesses **29**, **129** are different sizes, the receptacle member can be assembled with the element in only one way. This preserves proper polarity where such is desirable.

In the embodiment of the invention seen in FIGURE 5 wherein similar parts are identified by the same reference characters as before but with the suffix "*a*" added, it will be noted that the two rubber bodies **22**, **122** have been replaced by a single rubber body **32** which is not only molded about the contact members **25***a*, **125***a* but also about the free ends of the element terminal ends **14***a*, **114***a*. This construction will, of course, insure an even more positive seal at the element terminal ends; however, the ready replaceability of the electrical contact members,

in the event of damage, will be lost. Obviously, the previously described receptacle member **26** may be assembled with and disassembled from the construction shown in FIGURE 5 in the same manner as before described.

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:

In an electrical heating element having a metallic sheath with an electrical resistance element within and electrically insulated from said sheath and a terminal pin electrically connected to said resistance element and having a threaded end projecting outwardly of an end of said sheath, the improvement comprising a waterproof separable electrical connection between said terminal and a power conductor, including a metal plug, a rubber sleeve molded to and about one end surface and the adjacent end portion of said plug, the other end surface and adjacent end portion being uncovered, said sleeve having an axial opening in that portion covering said one end surface of said plug and aligned with an axial threaded opening extending from said one end surface inwardly of said plug, said plug opening threadedly receiving the threaded end of said terminal pin and being longer than such end so that when said plug is screwed home on said terminal pin, the rubber covering said plug one end surface is compressed between the latter and the adjoining end of said sheath to seal such sheath end, a metal socket electrically connected to said power conductor having an axial opening frictionally receiving the uncovered portion of said plug, a receptacle of rubber molded around said socket with the opening into the latter uncovered and passing said plug to and from connected relation with said socket, said sleeve having a shoulder which abuts and seals against an end surface of said receptacle when said plug is electrically received within said socket.

References Cited in the file of this patent

UNITED STATES PATENTS

2,059,008	Marquart	Oct. 27, 1936
2,127,544	Von Holtz	Aug. 23, 1938
2,409,004	Wall	Oct. 8, 1946
2,677,115	Stevens	Apr. 27, 1954
2,710,385	Sprigg	June 7, 1955
2,760,175	Dunn	Aug. 21, 1956
2,782,391	Kirk	Feb. 19, 1957
2,812,506	Merrill	Nov. 5, 1957
2,840,676	King	June 24, 1958