

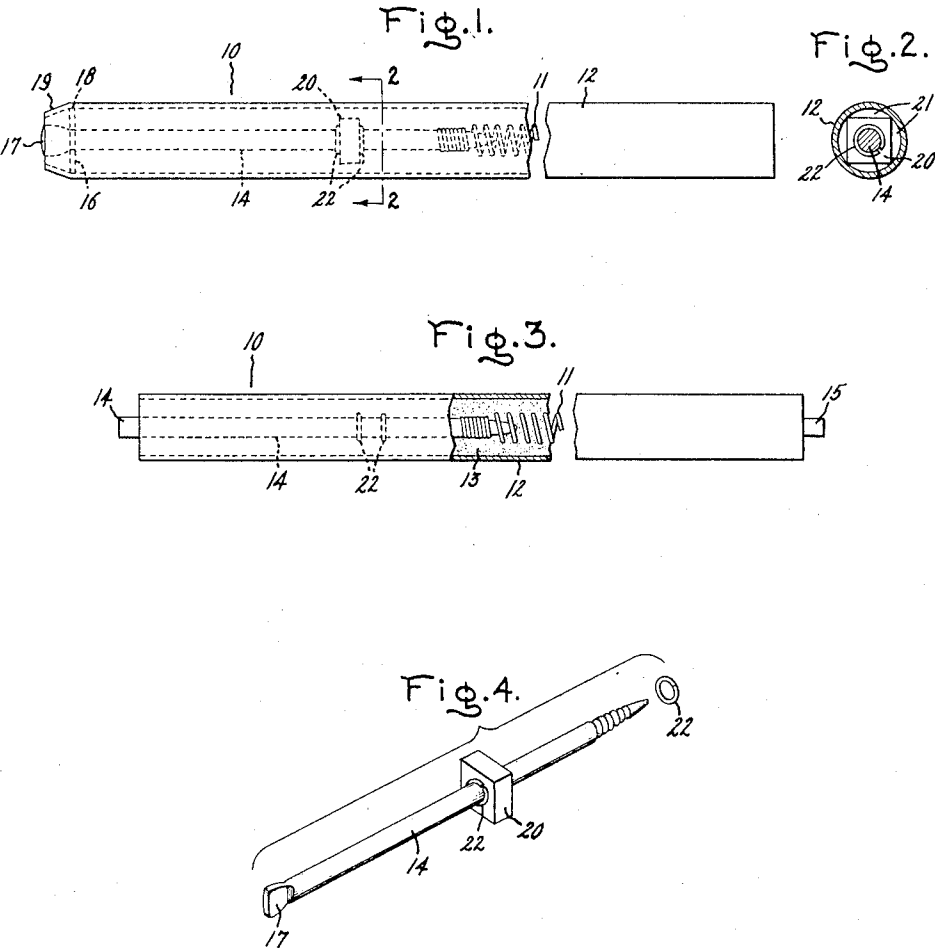
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ELECTRIC HEATER

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ELECTRIC HEATER

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This invention relates to electric heaters, more particularly to electric heaters of the sheathed type, and it has for its object the provision of simple, reliable and efficient means for supporting the terminals thereof.

More particularly, this invention relates to sheath wire heating units wherein the resistance conductor is embedded in a compacted mass of granular insulating material enclosed in a metallic containing sheath. To the ends of the resistance conductor are secured terminals which project from the sheath. In the construction of the heating unit, the resistance conductor with the terminals attached is first temporarily secured centrally in the sheath, for example, by securing the outer ends of the terminals; and then the sheath is filled with granular insulating material, and its length increased and its diameter reduced to compact the insulating material by swaging, rolling or drawing the sheath. Also, electrically insulating centering members have been provided as additional means for centering the terminals in the sheath during the construction of the unit in order to prevent displacement of the terminals and resistance conductor. These centering members are in the form of washers threaded on the terminals; and in certain cases they have been held in their proper positions on the terminals by flattening the terminals or upsetting them in order to form outwardly extending projections on opposite sides of the washers.

Once the terminals have been flattened to upset them there is no way of replacing a washer in case one becomes broken or seriously damaged. Moreover, the upsetting and flattening of the terminals weaken them at times to such an extent that they pull apart when the length of the sheath is increased and its diameter reduced, thereby causing open circuits. In addition, the flattening and upsetting operations work harden the terminals, and it is impossible to anneal them since the insulating washers are on the terminals and would be destroyed in the process.

This invention contemplates the provision of improved means for holding the washers on the terminals, and in one form thereof this means is in the form of resilient clips which resiliently engage the terminal on opposite sides of the washer so as to hold it in place. The clips in one embodiment are in the form of broken coils or rings of metal which have resiliency to grip the terminal with sufficient force to remain in place while the heater unit is being made.

For a more complete understanding of this invention, reference should be had to the accom-

panying drawing in which Fig. 1 is a fragmentary elevation of a sheathed heating unit at one stage in the process of making the heating unit; Fig. 2 is a sectional view taken through the line 2—2 of Fig. 1 and looking in the direction of the arrows; Fig. 3 is a fragmentary elevation illustrating the electric heating unit after it has been made; and Fig. 4 is a perspective view of a terminal of the heater of Figs. 1—3, and illustrating supporting means therefor arranged in accordance with this invention.

Referring to the drawing, this invention has been shown in one form as applied to an electric heating unit 10 having a helical or sinuous resistance conductor 11 extending centrally of a metallic sheath 12. The heating element 11 in the finished heating unit (Fig. 3) is embedded in a compacted mass of powdered, heat-refractory, electrically-insulating material 13, such as powdered magnesium oxide. A pair of terminals 14 and 15 are secured to the opposite ends of the resistance element 11. These terminals also are embedded in the compacted mass of insulating material 13, and they have their ends projecting from the sheath, as shown in Fig. 3. The resistance conductor may be secured to the terminals in any suitable way, but preferably it will be threaded on them, as shown.

In making the heating unit shown in Fig. 3, the opposite ends of the resistance conductor 11 are threaded on the ends of the terminals, and then the assembly of resistance conductor and terminals is inserted into the sheath. Prior to the assembly of the terminal 14 with the resistance conductor, a solid washer 16 is threaded on it, the washer being prevented from moving outwardly from the terminal by means of a flattened portion 17 provided on the end of the terminal. This washer 16 seats in a recess 18 provided in the end of the sheath, as shown in Fig. 1. The sheath is peened over as indicated by the numeral 19 in order to secure the washer in its position in the recess 18. It will be understood that the opposite terminal—the right-hand one as viewed in the drawing—will also be provided with a flattened section similar to the section 17, but in this case it will be provided with an aperture and through this aperture there will be provided a pin which is received in a recess in the sheath similar to recess 18 in order to hold the outer end of this terminal in place. The insulating material 13 is loaded through this right-hand end of the sheath with the sheath in an upright position, the material being retained by the solid washer 15 at the bottom.

After the sheath has been loaded it is elongated so as to reduce its diameter to thereby highly compact the insulating material 13. This may be accomplished by swaging or rolling or drawing the sheath through a suitable die. Following this, the ends of the sheath are cut away so as to leave the outer ends of the terminals projecting from it.

In order to support the inner ends of the terminals 14 and 15 during the loading and swaging operations so as to prevent displacement of the terminals from the center of the sheath, an electrically insulating washer 20 is threaded on each terminal at a point remote from the fixed outer end, as shown in Figs. 1 and 4. The insulating washer has a non-circular shape—that shown in the drawing being substantially square. By reason of this arrangement the corner sections of the washer coact with the sheath to prevent displacement of the washer crosswise of the sheath, and hence prevent displacement of the terminal and the resistance conductor connected with it from the center line of the sheath. Also, because of this arrangement spaces 21 are left between the insulating washer and the sheath through which the insulating material may flow past the washer.

The insulating washer 20 is held in its proper position with relation to the terminal by means of a pair of resilient clip-like members 22 positioned on opposite sides of the washer, as clearly shown in the drawing. Each of these members is in the form of a broken ring or coil which has a diameter somewhat smaller than the diameter of the terminal so that when it is threaded on the terminal it is expanded somewhat. Furthermore, the clips are formed of a resilient, springy material so that when they are inserted on the terminal and expanded they grip the terminal with sufficient force to prevent slipping lengthwise of the terminal, whereby they hold the washers firmly in place while the sheath is being loaded and while it is being compacted.

While the insulating washers are formed of a material which is rigid to hold the terminals central during the loading operation, it is readily destructible when subjected to the pressure of the sheath on it during the swaging or drawing or rolling operation. And while any suitable electrically insulating material having these characteristics may be used, I prefer to form the washers of lava.

It will be understood, therefore, that in making the heater as previously described, the insulating washers 20 will be threaded upon the terminals and secured by their clips 22 before the terminals are secured to the resistance conductor 11. Then the sheath may be loaded and swaged as previously described. During the swaging operation, the insulators are destroyed and in the finished heater perform no useful function.

It will be observed that I have provided means

for supporting the terminals which does not necessitate flattening sections of the terminals or upsetting them in any way to provide ears. But on the contrary, I have provided a relatively simple, inexpensive, and efficient means for holding the washers in place. If for any reason it should be desired to replace a washer it is merely necessary to slip the outer ring off the terminal and then remove the washer. The washer may then be replaced by threading it on and replacing the outer clip 22.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In an electric heating unit comprising a sheath, compacted granular insulating material within said sheath, a resistance conductor embedded in and supported in said insulating material, and a terminal for said resistance conductor also embedded in and supported by said insulating material, means for supporting said terminal within said sheath while said insulating material is inserted in the sheath and compacted comprising an insulating spacing member threaded on said terminal, and resilient members on opposite sides of said spacing member frictionally engaging said terminal to prevent displacement of said member with reference to said terminal.

2. In an electric heating unit comprising a sheath, compacted granular insulating material within said sheath, a resistance conductor embedded in and supported in said insulating material, and a terminal for said resistance conductor also embedded in and supported by said insulating material, means for supporting said terminal within said sheath while said insulating material is inserted in the sheath and compacted comprising an insulating spacing member threaded on said terminal, and resilient clips encircling said terminal on opposite sides of said spacing member engaging said terminal with sufficient force to prevent displacement of said spacing member, but yielding to permit withdrawal thereof from said terminal.

3. Supporting means for the terminal of a sheathed heater wherein the terminal is of rod-like form comprising an electrically insulating centering member threaded on said terminal, and a pair of broken-ring-like resilient clips threaded on said terminal on opposite sides of said member resiliently engaging said terminal to prevent displacement of said member lengthwise of said terminal.

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