

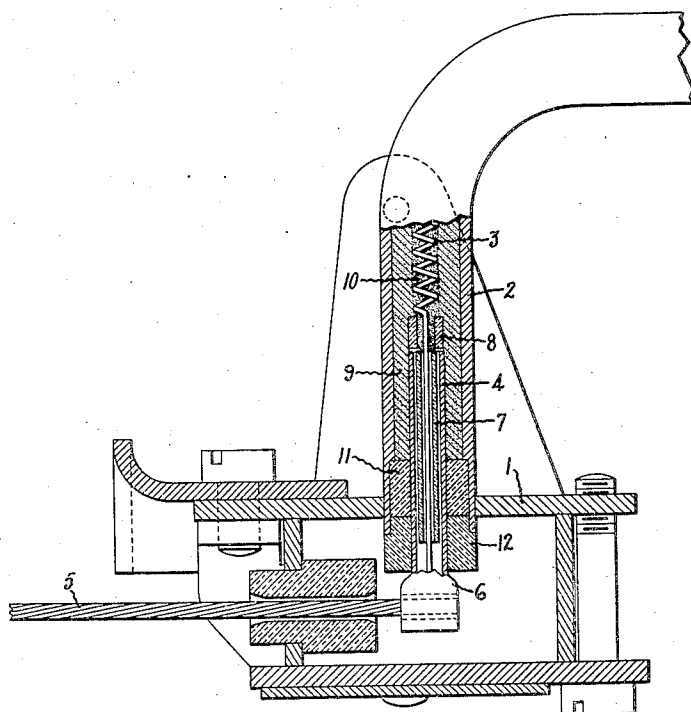
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ELECTRIC HEATER

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ELECTRIC HEATER

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3 Claims. (Cl. 201—67)

This invention relates to electric heater elements of the kind in which the resistor wire or strip is enclosed in a sheath and insulated therefrom by a metallic oxide packing which is formed by treatment of the metal or a salt of the metal when in position in the sheath.

The invention has particular reference to the provision of terminals for such heater elements.

The object of the invention is to produce an improved heater element in which the resistor and metallic oxide packing are protected against corrosion and deterioration, more particularly due to moisture, and which is of a strong and rigid construction.

According to the present invention, a short length of metallic tubing is inserted within the sheath of the heater to constitute a terminal for the resistance member, in such a manner that the tubing surrounds the end portion of the resistance or a lead secured thereto, and filling the sheathing with a suitable expansively oxidizable metal, such as magnesium, or a salt thereof, so as to surround the resistance and the terminal tube along a portion of its length and then treating the metal to form the metallic oxide packing, the terminal being located substantially centrally in the sheath during the packing process, and finally sealing the end of the sheath in a moisture-proof manner and inserting a bushing of refractory material to protect the sealing material.

The invention also comprises an electric heater element of the kind referred to in which the end of the resistor wire is surrounded by a short length of metallic tubing constituting a terminal and spaced from the sheath, the resistance member and also the terminal tube for a portion of its length being surrounded by a magnesium oxide packing, whilst the end of the sheath is provided with a cap of refractory material through which the terminal passes, and sealing material is interposed between the magnesium oxide packing and the refractory cap.

For a more complete understanding of this invention, reference should be had to the accompanying drawing in which the single figure is a sectional view of the end portion of a heater element and the structure therefor arranged in accordance with this invention.

In the drawing, 1 indicates a terminal box which supports the heater element, which terminal box may be suitably hinged or pivoted to a stove framework to permit of the removal of the heater element. A sheath 2 of the heater element passes through the side of the terminal box.

A resistor member 3 is mounted within the sheath. A metallic terminal tube 4 surrounds the end portion of the resistor 3 and projects downwardly beyond the mouth of the sheath to provide a connection for a supply lead 5. This may be effected as in the manner shown by pinching together the sides of the tube 4 around the lead 5 as indicated at 6, the end of the resistor 3 being of course held within the pinched portion 6 so as to make electrical connection; the sides of the tube end are welded or soldered together. A spacing tube 7 of silica or other suitable material is interposed between the resistor 3 and the terminal tube 4, whilst a collar 8 of steatite or other heat resisting material surrounds the resistance adjacent the end of the metallic tube 4 and serves primarily as an electrical insulator, this being desirable on account of the potential difference that will exist between the resistor at this point and the metallic tubing owing to the fact that it is the extreme end portion of the resistor which is connected to the tubing 4. Metallic oxide packing 9 surrounds the resistor 3 and the upper part of the terminal tube 4. This packing is preferably obtained by filling the sheath with metallic magnesium and then passing steam through the sheath to convert the metallic magnesium to magnesium oxide. Sand 10 may be packed around the coiled portion of the resistor 3.

The end of the sheath 2 is sealed by a bead 11 of vitreous material which is fused or sintered in position by heat. Such material may be glass or lead borate, but is preferably a mixture comprising one part of lead borate and two parts of zirconium cement. The latter material consists of zirconium silicate with a bonding material such as ball clay. As shown in the drawing, the bore of the sheath may be enlarged for the accommodation of the sealing material. A cap 12 inserted in the mouth of the sheath 2 protects the sealing material against external damage, and this cap is preferably held in position by the flattened portion 13 of the terminal tube. In some cases the terminal tube may be made relatively long so that the end portion of the sheath does not become heated to the extent which it would if the coiled portion of the resistor extended to the end of the sheath.

In making the heater element, the resistor 3 is first inserted in the sheath and then the collar 8 placed around it and the terminal tube 4 and spacer 7. The metallic magnesium or other metal or metallic salt is inserted in the sheath so as to surround the resistor element and a

portion of the terminal tube 4, as shown in the drawing. The metal packing is then treated by steam or in other manner to convert it to the oxide. During this process a temporary collar 8 may be inserted in the end of the sheath so as to locate the tube 4 centrally of the sheath. Thereafter the sealing 11 is fused or sintered in position and finally the cap 12 is inserted in the end of the sheath, and the end portion 6 of the terminal tube is pressed flat around the end of the resistor and the lead 5 and is sealed by soldering or welding.

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

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

1. The method of making a heater element of the kind having a helical resistor member located within a sheath and insulated therefrom by a metallic oxide which comprises forming a resistance conductor into a helical coil having a straight terminal end portion, inserting said coil in a sheath with said end portion in the end of said sheath, inserting a metallic tube constituting a terminal for said resistor member within the sheath so as to surround the straight end portion of said resistance, connecting the straight end portion of said resistance to the outer end of said metallic tube, inserting an electrically insulating sleeve in the sheath between the turns of the helical coil and the inner end of said tube to prevent the turns from accidentally engaging the inner end of the tube, filling the sheath with a metal that expands when oxidized so as to surround said resistor, said insulating sleeve and also the terminal tube along a part of its length, then treating said metal to form the metallic oxide that packs the sheath, said insulating sleeve and terminal tube being located substantially

centrally within the sheath during said packing process, and finally inserting sealing material in the end of the sheath and a bushing of refractory material to protect said sealing material.

2. An electric heating element comprising a helical resistor member having a straight end portion, a sheath enclosing said resistor member and insulated therefrom by electrically insulating material, the said end portion of the resistor member being surrounded by a length of metallic tubing constituting a terminal and spaced from the sheath, means connecting the outer end of said straight end portion with the outer end of said metallic tubing, an electrically insulating sleeve interposed between the turns of said helical resistance and the inner end of said tubing surrounding the straight end portion of said resistor member so as to prevent the turns of said resistor member from contacting the adjacent end of said metallic tubing, said insulating material surrounding the resistance member and also the terminal tube for a portion of its length, and holding said insulating sleeve between said turns and said tubing.

3. An electric heating element comprising a resistor member, a sheath enclosing said resistor member and insulated therefrom by electrically insulating material, the end of the resistor member being surrounded by a length of metallic tubing constituting a terminal and spaced from the sheath, a tube formed of an electrically insulating material within the terminal tube separating the tube from the portion of the resistor member received in it and centering said portion of the resistor member in the tube, said insulating material surrounding the resistance member and also the terminal tube for a portion of its length, the end of said sheath being provided with a cap of refractory material through which the terminal passes and sealing material interposed between the insulating material and the refractory cap.

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