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ELECTRIC HEATING DEVICE

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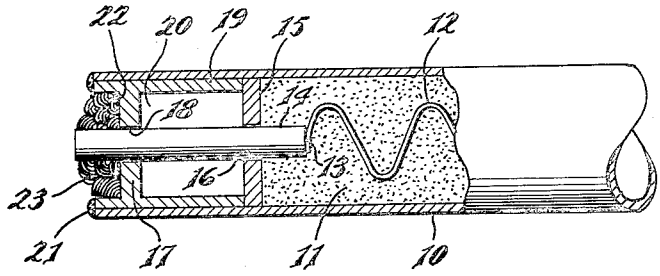

Fig. 1.

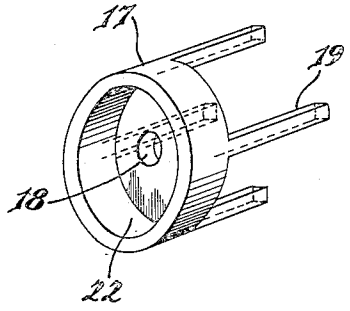

Fig. 2.

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ELECTRIC HEATING DEVICE

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3 Claims. (Cl. 201—63)

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The present invention relates to electric heating devices and more particularly to the means of fastening the grounded end of a metal-encased, oxide-filled heater element to the metal casing to provide a terminal end.

In certain types of electric heating devices, the use of a heating wire or element enclosed or encased in a metal sheath has become quite common. Such heating units usually employ a granular refractory material such as magnesium-oxide as an insulating filling within the sheath to prevent electrical contact between the metal sheath and the electric heating wire. Also, it is the usual practice to electrically connect one end of the heating wire to the metal sheath thus providing a grounded end so that an electrical circuit may be established through the heater wire by connecting the terminals of a power source to the unconnected end of the heater wire and to the grounded metal sheath. The characteristics of the magnesium-oxide filler material are such that quantities of gases are evolved when such material is subjected to heat. Considerable trouble has therefore been encountered when soldering, welding or otherwise electrically and mechanically connecting the grounded end of the heater wire to the metal sheath because of the necessary application of heat to the metal sheath which is transmitted to the magnesium-oxide filler. This is particular objectionable when the grounded end of the heater unit comprising the end of the sheath to which the heater wire is joined, is required to have a vacuum-tight joint; the gassing of the magnesium-oxide filler upon the application of heat having the tendency to cause porosity in the welded joint.

It is therefore a principal object of this invention to provide a means of electrically and mechanically joining the grounded end of a heater wire encased in a refractory-oxide filled metal sheath to the metal sheath in such manner as to provide a vacuum-tight joint, there being provision for the escape of gases evolved from the oxide filler before the final vacuum-tight joint is made and provision for the entrapment of the heat generated in the final joining operation to prevent the heat from further affecting the oxide to cause the generation of gases.

Further objects and advantages of this invention will be apparent by reference to the following specification and drawing in which:

Fig. 1 is a side elevation partly in section of the grounded heater end to show the joint of this invention; and

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Fig. 2 is a perspective elevation of the spacer element used in the invention.

In Fig. 1 of the drawings, a portion of a metal encased heating unit is shown to be comprised of an outer metallic sheath 10 filled with a granular refractory insulating material such as magnesium-oxide 11 and enclosing an electric heating wire 12. The electric heating wire 12 is fastened at 13 to a terminal member 14 which in the case of the grounded end of the heater unit as shown is to be electrically and mechanically connected to the metal sheath 10. A washer disk 15 formed of any suitable material and having a central aperture 16 slightly larger in diameter than the terminal 14 is inserted as shown to retain the magnesium-oxide filler 11 in place. A metallic spacer member 17, shown in perspective in Fig. 2, is likewise provided with a central aperture 18 of slightly larger diameter than the terminal 14 and is inserted within the end of the sheath 10 as shown in Fig. 1. It will be noted that the depending legs 19 of the spacer 17 are so arranged to abut the washer disk 15 and to provide a dead air space 20 for the entrapment of vapors generated during the final joining operation.

With the spacer 19 in place as shown in Fig. 1, heat is applied to the ends of the metal sheath and spacer to produce the fused weld 21. During this heating and welding operation, any gases evolved from the magnesium-oxide filler 11 are permitted to escape through the spaces between the terminal 14 and the slightly larger apertures 16 and 18. Thereafter, the entire end of the heater unit between the cupped end 22 of the spacer 17 and the end of the terminal 14 is filled with weld or solder metal 23 as shown. During this final joining operation, the applied heat is entrapped within the dead air space 20 and thus prevented from reaching the magnesium-oxide filler material 11 in such magnitude as to cause more gases to be evolved which would tend to create pores in the weld material 23 forming the final vacuum-tight joint. Thus, in such manner, a vacuum-tight joint for the grounded end of a metal encased and oxide filled heater unit is obtained.

Considering the foregoing description, it will be noted that when applying the relatively large amount of heat to effect the welding of the sheath to the spacer 17 at 21, the gas evolved from the refractory-oxide filler is permitted to escape through the apertures 16 and 18. However, to effect the weld at 23, the heat is not applied directly to the sheath 10 but is transmitted thereto only through the spacer element 17 and

to its legs 19. This feature when combined with the dead air space 20 prevents the application of any great amount of heat to the refractory-oxide 11 so that no gases are evolved to deleteriously affect the weld 23 and produce pores therethrough.

We claim:

1. An electric heating device comprising a metallic sheath containing a granular refractory filler material and enclosing an electric heater wire, a metallic spacer member inserted within and welded to one of the terminal ends of said sheath, said spacer member having a central aperture to receive the terminal end of said electric heating wire, said aperture being of slightly greater diameter than the diameter of the terminal end of said heating wire, a disk washer having a central aperture slightly larger than the diameter of the terminal end of said heating wire, said washer being positioned around the terminal end of said heating wire and within said sheath between the filler material and said spacer, said spacer being shaped to provide an air space between said washer and the end of said sheath that is devoid of said granular refractory material, the terminal end of said heating wire being welded to said spacer in the region of the spacer aperture to provide a vacuum-tight joint between the spacer and said terminal end, the gases evolved from said filller material during the beginning of the welding operation escaping through said apertures.

2. An electric heating device comprising a metallic sheath containing a magnesium-oxide filler and enclosing an electric heater wire, a metallic spacer member inserted within and welded to one of the terminal ends of said sheath, said spacer member having a central aperture to receive the terminal end of said electric heating wire, said aperture being of slightly greater diameter than the diameter of the terminal end of said heating wire, said spacer being shaped to provide an air space devoid of said filler material, the terminal end of said heating wire being welded to said spacer in the region of the spacer aperture to provide a vacuum-tight joint between the spacer and said terminal end, the gases evolved from said filler material during the beginning of the welding operation escaping through said aperture.

3. An electric heating device comprising a metallic sheath containing a magnesium-oxide filler and enclosing an electric heater wire, a metallic spacer member inserted within and welded to one of the terminal ends of said sheath, said spacer member having a central aperture to receive the terminal end of said electric heating wire, said aperture being of slightly greater diameter than the diameter of the terminal end of said heating wire, a disk washer having a central aperture slightly larger than the diameter of the terminal end of said heating wire, said washer being positioned around the terminal end of said heating wire and within said sheath between the filler material and said spacer, said spacer being shaped to provide an air space between said washer and the end of said sheath that is devoid of said filler material, the terminal end of said heating wire being welded to said spacer in the region of the spacer aperture to provide a vacuum-tight joint between the spacer and said terminal end, the gases evolved from said filler material during the beginning of the welding operation escaping through said apertures.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,003,176	Daly	May 28, 1935
2,308,459	Schwarzkoff	Jan. 12, 1943