June 27, 1944. R. E. BRODIE 2,352,159

TERMINAL STRUCTURE

Filed June 27, 1942

Fig. 1.

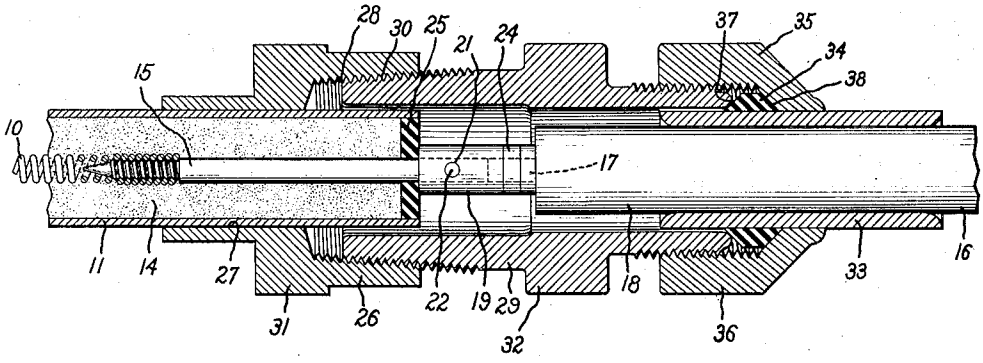
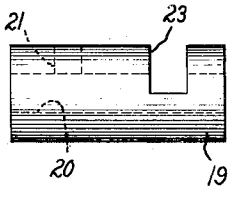


Fig. 2.



Inventor:
Ruthford E. Brodie,
by Harry E. Dunham
His Attorney.

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TERMINAL STRUCTURE

Ruthford E. Brodie, Lanesboro, Mass., assignor to General Electric Company, a corporation of New York

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1 Claim. (Cl. 174—77)

This invention relates to terminal structures, more particularly to a terminal structure for an electric heater, and it has for its object the provision of an improved terminal structure having means for sealing the terminal of the heater.

Although not limited thereto, this invention has particular application to electric heaters of the encased or sheathed type wherein a resistance conductor embedded in an electrically insulating and heat conducting material is enclosed by an outer metallic protective casing.

In one of its aspects, this invention contemplates the provision of improved means for sealing the terminal of electric heaters of this type whereby the heater is rendered impervious to water, oil, gas and like fluids.

In accordance with this invention, a supply lead for the heater is provided with a cover formed of a suitable electrically insulating yielding material, such as rubber. Surrounding a section of the cover is a rigid sleeve which is compressed upon the section. A cylindrical member is fitted around the terminal of the heater, and has one end surrounding a section of the rigid sleeve on the lead cover; the opposite end of this cylindrical member is rigidly secured to the sheath in such a fashion that it has a fluid-tight connection with it. Mounted on the end of the cylindrical member that surrounds the rigid sleeve is a suitable member which preferably will be in the form of a gland nut; this member functions to compress a yielding packing ring tightly against this end of the cylindrical member and inwardly against the sleeve on the cover so as to effect a fluid-tight connection between the sleeve and cylindrical member.

For a more complete understanding of this invention, reference should be had to the accompanying drawing in which Fig. 1 is a fragmentary sectional view of an electrical heater of the sheathed type provided with a terminal structure arranged in accordance with this invention; and Fig. 2 is an enlarged vertical elevation of a suitable connector member for connecting a supply lead to the terminal of the heater of Fig. 1.

Referring to the drawing, this invention has been shown in one form as applied to an electric heater of the sheathed type comprising a helical resistance conductor 10 arranged within and centrally of a metallic sheath 11, and also supported in spaced relation with reference to the sheath by a highly compacted mass 14 of heat refractory and heat conducting, electrically insulating material, such as powdered magnesium oxide. As shown, the resistance conductor 10 has one end secured to a metallic terminal 15 which is also supported in the insulating material 14 in a central position in the sheath 11. This terminal member, as shown, projects from the end of the sheath.

The electric heater is supplied by means of a suitable supply lead 16 comprising a conducting core 17 and a yieldable cover 18, preferably formed of rubber. The cover 18, as shown, is stripped back from the end of the conducting core 17; and this stripped section of the core is electrically connected to the projecting end of the terminal 15 by means of a suitable metallic connector member 19. The connector member 19 is provided with an axially arranged bore 20 which receives the projecting end of the terminal, and the stripped end of the core 17, as clearly shown in Fig. 1. The connector member 19 is provided with an opening 21 arranged at right angles to the bore 20 and through this opening is inserted a suitable brazing material 22 which functions to secure the connector to the terminal and to electrically connect it with the terminal. The connector is further provided with a transverse slot 23 which opens into the bore 20, as clearly shown in Fig. 2, and into which a suitable soldering material 24 is inserted in order to electrically and mechanically connect the connector with the stripped end of the conducting core 17 of the lead.

Preferably and as shown, a suitable electrically insulating washer 25 will be inserted in the end of the sheath over the insulating material 14. In other words, this washer is inserted between the insulating material and the inner end of the connecting member 19. The washer may be formed of any suitable insulating material, but preferably will be made of mica.

The connector structure further comprises an adapter member 26 which has a centrally arranged bore 27 for receiving the terminal end of the sheath, as shown. The adapter member is secured to the sheath to effect a fluid-tight joint with it in any suitable manner, as by brazing. The adapter member 26 has in general the shape of a cup, and is mounted on the sheath so that its inner wall 28 is spaced somewhat from the outer wall of the sheath.

Interposed in this space is one end of a suitable cylindrical member 29. This end, as shown, has a taper threaded connection 30 with the adapter member. Preferably, the threads will be coated with a suitable sealing varnish before the members are assembled so that after they are assembled a fluid-tight connection will be established between them. Preferably, the adapter

member 28 will be provided with a non-circular section 31, such as a hexagonal section, and the member 29 will be provided with a similar section 32 for accommodating a wrench or other similar tool to facilitate the threading of the two members together.

Secured to the lead 16 is a metallic sleeve 33 formed of a relatively soft material, such as copper. This sleeve is compressed upon a section of the rubber cover 18 of the lead; the sleeve may be compressed on the cover by means of swaging it on. Before the sleeve is applied to the cover and swaged down, the cover section will be covered by means of a suitable rubber cement which will set after the sleeve has been assembled with it and swaged in order to effect a fluid-tight joint between the sleeve and cover.

A fluid-tight joint is effected between the sleeve and the cylindrical member 29 by means of a suitable packing ring 34. This ring may be formed either of a suitable yielding non-metallic packing material, such as rubber, or of a metallic packing material, such as brass or copper. The ring, as shown, is mounted on the outer surface of the sleeve 33 and it is pressed tightly against the outer end of the member 29 and inwardly tightly against the sleeve by means of a suitable packing nut 35 which is in the nature of a gland nut threaded on the end of the member 29, as shown. This nut also is provided with a suitable non-circular section 36, such as a hexagonal section, for receiving a wrench or similar tool to facilitate threading the nut on the member 29.

Preferably, the outer end of the cylindrical member 29 will be provided with a curved or inclined surface 37 and the nut will be provided with a coacting surface 38, which surfaces force the ring 34 tightly against the sleeve 33 when the nut is threaded in on the member 29.

It will be observed that the sleeve 33 is relatively elongated as compared with the length of the packing ring 34. This is desirable for it provides a long low pressure contact surface with the rubber cover 18 of the lead. The shorter the sleeve, the higher the contact pressure must be in order to effect a tight joint between the sleeve and cover; and as high pressures applied to rubber likely will cause permanent deformation which in turn will cause the joint to become loose fitting, the sleeve has been elongated, as shown, in order to reduce the unit pressure.

The sleeve 33 pressed slightly and cemented to the rubber cover 18, and the packing material 34 pressed tightly against the sleeve and between the nut 35 and the adjacent end of the cylindrical member 29 effect a fluid-tight connection between the member 29 and the lead 16. Likewise, the connections between the opposite end of the member 29 and the adapter member 26 and between the adapter member 26 and the sheath 11 effect a fluid-tight joint between the other end of the member 29 and the sheath. In other words, a fluid-tight connection is established between the sheath and the lead.

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:

In an electric heater provided with a metallic sheath, and a terminal projecting from one end of said sheath, a terminal structure for said heater comprising a cup-shaped metallic adapter member, means securing said adapter member to said sheath so as to effect a fluid-tight joint between said adapter member and sheath, said adapter member having an inner wall spaced from the outer surface of said sheath, an electrical supply lead having a conducting member and a rubber insulating cover, connection means connecting said conducting member to said terminal, a cylindrical member housing said connection means having one end received in the space between said inner wall of said adapter member and said sheath and in threaded engagement with said inner wall so as to effect a fluid-tight joint between said end and said adapter member, a copper sleeve swaged on said rubber cover and having one end received in the other end of said cylindrical member, a yielding packing ring surrounding said metallic sleeve, and a gland nut threaded on said other end of said cylindrical member compressing said packing ring against said end and into intimate contact with said metallic sleeve.

RUTHFORD E. BRODIE.