SHEATHED TUBULAR ELECTRICAL HEATER

Robert D. Bremer, Dayton, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

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1. Claim. (Cl. 338—239)

This invention relates to a domestic appliance and more particularly to a sheathed tubular electrical heater having two spaced electrical terminals at one end and to its construction and manufacture.

It is an object of this invention to provide a simple easily made tubular sheathed heater having one end permanently sealed by a synthetic rubber plug containing two spaced electrical terminals connected to the opposite ends of a loop of resistance wire extending within the sheath.

It is another object of this invention to provide a simple means preventing shorting across the terminals of a tubular sheathed heater.

These and other objects are obtained in the form shown in the drawings in which the two spaced electrical terminals extend through a resilient synthetic rubber plug closing one end of the sheath. These terminals are connected to the opposite ends of a loop of resistance wire extending through the sheath embodied within the powdered insulating material. The end opposite the terminals is compacted to hold the looped end tightly within the insulation and then the end is filled and closed to seal it. The end containing the synthetic rubber plug is then swaged down until the plug is compressed tight enough to insure that it is permanently held. The plug is provided with an external fin between the terminals to increase the effective surface path between the terminals. The intermediate portion of the tubular sheath is then pressed into a triangular shape to compact the insulation and to hold the resistance wire in place.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Figure 1 is a vertical sectional view, partly diagrammatic, of my improved tubular sheathed heater being filled with powdered insulation material;

Figure 2 is a fragmentary section view illustrating the core forming the upper end of the sheath;

Figure 3 is a sectional view through the sheath only taken along the line 3—3 of Figure 2;

Figure 4 is a fragmentary sectional view showing the swaging of the terminal end of the sheath;

Figure 5 is a fragmentary sectional view partly in elevation showing the pressing of the major portion of the sheath into a triangular shape; and

Figure 6 is a cross section substantially along the line 6—6 of Figure 5.

Referring now to the drawings and more particularly to Figure 1 there is shown a tubular sheath 20 of some suitable material such as high chromium steel. In this view, the two terminals 22 and 24 have been inserted through the synthetic rubber plug 26 having axially extending apertures through which the terminals 22 and 24 extend. The inner ends of the terminals 22 and 24 are firmly held in properly spaced axially parallel relation by a crushable ceramic bushing 27, made for example of low temperature lava or clay, located immediately above the plug 26. During the manufacture of the heater, this bushing 27 serves to hold the terminals 22 and 24 spaced parallel to each other and spaced from and parallel to the tubular sheath 20. The terminals 22 and 24 are prevented from moving upwardly by a cap shaped clamping block 28 mounted but not attached to the lower end of the tubular sheath 20. The block 28 is provided with set screws 30 and 32 by which the terminals 32 and 34 are clamped in the spaced parallel axially extending apertures in the block.

Connected to the upper inner ends of the terminals is a loop of finely coiled resistance wire 34. This loop is supported by a hook 48 suspended from a removable funnel 50 seated upon the top of the tubular sheath 20 to hold the two sides of the loop of resistance wire 34 stretched in spaced parallel relationship between the hook 48 and the terminals 22 and 34 out in radial contact with the sheath. A supply of powdered insulation material 51 is discharged from the spout 52 into the funnel 50. The top of the tubular sheath 20 is held by a mechanical shaker 53 which shakes the sheath sufficiently to cause the powdered insulating material 51 to pack itself around the loop 34 of resistance wire. When the sheath is sufficiently filled with the powdered insulated material the hook 48 and the funnel 50 are removed. The portion of the sheath near the hook 48 is then squared and compacted to firmly hold the adjacent insulating material and the adjacent portions of the resistance wire 34 firmly in place as shown in Figure 2 and 3 by a suitable piece 54. This end of the sheath 20 is then completely filled with the powdered insulated material 51 and closed by a cap 58 which is sealed to the sheath 20 to close this end of the sheath. The clamping fixture 28 is then removed by loosening the clamping screws 30 and 32.

This sheath 20 has an initial diameter of one-half inch. The plug end is then swaged down in a swaging machine designated by the reference character 60 to a diameter of .450 inch. This compacts the insulation 51 and crushes the ceramic bushing 27 and also simultaneously squeezes the plug 26 sufficiently to hold it tightly in position in sealing relationship with the terminals 22 and 24 within the end of the sheath 20 and to move it axially and firmly into contact with the crushed bushing 27. This provides an adherent permanent resilient hermetic seal for the terminal end of the heater which will not leak even under pressure. Another portion of the plug 26 will be forced outside the sheath 20 as shown in Figure 4. This portion is provided with an integral outwardly extending fin 63 extending from side to side between the terminals 22 and 24 as shown in Figure 1. To prevent moisture from promoting surface arcing the exposed surface of the plug 26 and the adjacent exposed portions of the terminals 22 and 24 have applied thereto a water repellent. Such a water repellent may be applied by brushing, spraying or dipping. As one example a 2% solution of linear methylpolysioxanes in naphthalene may be brushed or sprayed thereon to provide a water repellent surface. The particular linear methyl polysioxanes used have a viscosity of about 1000 cs. and a formula CH3(CH3)5SiO(Si(CH3)3). They are also known as methyl silicone oils or fluids. The naphthalene readily vaporizes to leave a thin water repellent film of methylpolysioxanes upon the plug to prevent surface arcing. This provides a moisture free long surface path between the terminals upon the plug 26 of synthetic rubber to prevent surface arcing between the terminals 22 and 24. The plug 26 is of some suitable synthetic rubber such as Buna N or silicone rubber.

After this swaging operation the sheath 20 between the two swaged end portions is pressed by a flat bottomed
upper member 62 into a long V-shaped notch 64 in a lower die 66 to compact it into a triangular shape. This compacts the insulation within the sheath so that it is efficient as an electrical insulator and a heat transfer medium. The compacted powdered insulation also holds to the two portions of the loop 34 separate from each other and from the sheath 20 to prevent any short circuiting. The manufacture is therefore simple and inexpensive and provides an excellent sheath heating unit having two terminals at one end which makes it especially useful in any installation where the opposite end is relatively inaccessible. The synthetic rubber plug provides a resilient seal which is so expansible that it will not leak as readily as the ceramic type seal. It is also much less brittle and therefore much more unlikely to be damaged. In this way an improved more durable and longer lived tubular sheath heating unit is provided.

In accordance with the provisions of Rule 78a, reference is made to the following prior filed application: S.N. 338,464 filed February 24, 1953.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claim which follows.

What is claimed is as follows:

An electric heater including an outer tubular sheath, two electrical conductors extending side by side in spaced relation longitudinally within the sheath, compacted insulating means within said sheath surrounding and holding said conductors in spaced relation, spaced metal terminals protruding from one end of said sheath and each having its inner end connected to one of said conductors, and a plug of resilient elastic synthetic rubber surrounding and holding said terminals parallel to but spaced from each other and also holding said terminals spaced from the adjacent portion of the sheath, said plug having its major portion permanently held under radial compression abutting the insulating means solely by the gripping of the contacting portions of the sheath within an end of the sheath and also having a minor portion protruding from an end of the sheath, said plug having an integral fin protruding outwardly from said minor portion between said terminals for preventing arcing over the surface of the plug between the terminals.

References Cited in the file of this patent

UNITED STATES PATENTS