

Dec. 16, 1969

G. H. MOREY

3,484,585

WATERPROOFED ELECTRIC RESISTANCE HEATING MANTLE

Filed Nov. 13, 1967

FIG-1

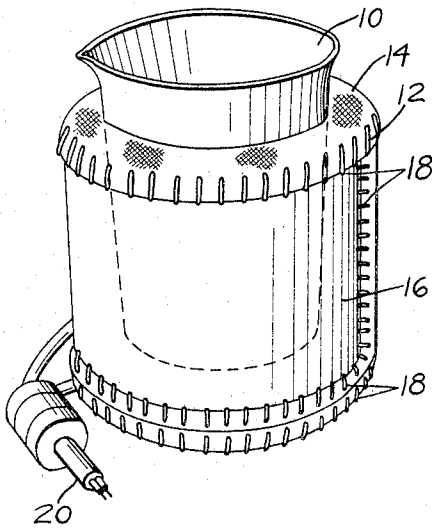


FIG-2

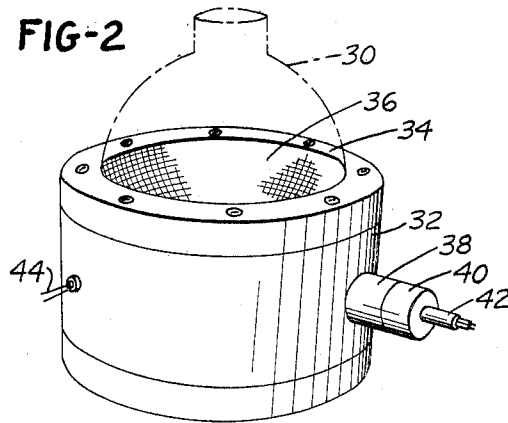


FIG-3

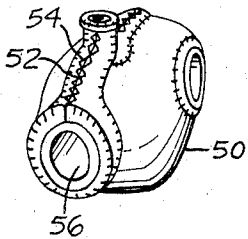


FIG-4

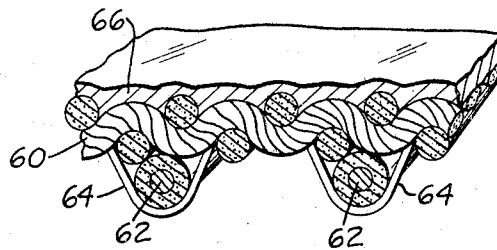
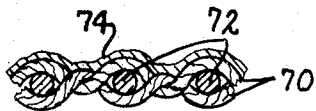


FIG-5



INVENTOR
GLEN H. MOREY
BY

Melvin A. Goolsby

1

2

3,484,585

WATERPROOFED ELECTRIC RESISTANCE HEATING MANTLE

Glen H. Morey, Terre Haute, Ind., assignor to Templeton Coal Company, Terre Haute, Ind., a corporation of Indiana

Filed Nov. 13, 1967, Ser. No. 682,267
Int. Cl. H05b 3/58, 3/34, 3/68

U.S. Cl. 219—535

4 Claims

ABSTRACT OF THE DISCLOSURE

Electric resistance heating mantle in which electric resistance heating means, such as wire, is stitched to one side of a textile-like support which, on its other side, is adapted to engage the article to be heated thereby, such as a vessel, or conduit or fitting, and in which a fluid impervious coating layer is applied to the textile-like support on the side toward the article being heated to prevent liquid from passing through the textile-like support member.

The present invention is concerned with electric resistance heating elements and, in particular, electric resistance heating elements of the type that are supported on a textile-like material and brought into adjacent relation with an article or vessel to be heated.

Such resistance heating elements are known and, in general, take the form of one or more layers of textile material which is to be disposed adjacent the article or vessel to be heated and on the back of which is supported an electric resistance heating element such as a wire or ribbon. Electrical insulating and heat insulating material is then supported on the other side of the resistance heating wire or tape and this electrical and heat insulating material may be contained, both in a further textile-like layer, or within a metal housing.

Heating elements of this nature are referred to as heating blankets or heating mantles and are sold widely for the purpose of heating flasks and beakers and other reaction and treatment vessels in, for example, the laboratory, or for small production runs, and are also employed for heating pipes and valves and other pieces of chemical equipment employed in the laboratory, or for production purposes, or the maintaining of a predetermined temperature is desired.

The textile-like materials referred to are generally fabrics made from quartz fibers or from glass fibers, or asbestos fibers, so to withstand the sometimes substantial temperatures developed by the heating blankets and heating mantles.

When glass fibers are used in forming the fabrics the temperature limit is generally on the order of about 450 degrees centigrade, but when asbestos or quartz fibers are employed, substantially higher temperatures can be attained up to, for example, 1700 to 1800 degrees Fahrenheit.

In certain instances the heating blankets, or heating mantles, are employed in locations where spillage of liquids may occur, either through breakage of a glass vessel being heated or from failure of a metal fitting or the gasket of a pipe joint with which a heating blanket is associated. Such spilled liquid will pass through the textile-like material or fabric adjacent the article being heated and will be collected in the electrical and heat insulation on the outside of the resistance wire or tape. This insulation is normally in the form of a wool-like material and can retain a substantial quantity of the spilled liquid.

In most cases, the liquid will eventually drain off and

the insulation will dry out and the heating blanket or mantle will be restored to full operating efficiency. However, there are circumstances in which a time limit is set on the interval that can elapse from the time a liquid, such as salt water, spills on the heating blanket or mantle and the blanket or mantle is restored to full operating efficiency. For example, the Underwriters' Laboratories specifies for heating mantles provided with a metal housing that the electrical resistance between the resistance wire or tape and the housing must be a minimum of 50,000 ohms. A heating mantle having dry insulation therein will easily meet this test, but when large amounts of salt water are spilled into the heating mantle, it is not possible to evaporate a sufficient amount of this spilled liquid from the insulation within the time limit of one hour to restore the resistance to the required 50,000 ohms.

In attempting to solve this problem, the fabric material, which was to be adjacent the article to be heated, was waterproofed by the application of a high temperature resistant waterproofing paint in order to coat the yarns of the fabric and to fill the interstices between the yarns so that liquid could not pass therethrough. This resulted in fabrics that were substantially impervious to the passage of liquid, but it was discovered that fabrics so treated were too stiff to form into heating mantles for fitting the contours of the vessels or articles to be heated thereby.

Accordingly, the present invention proposes to construct the heating mantle or heating blanket to the desired configuration so that it will fit and make good contact with the vessel or article to be heated and then apply a high temperature waterproofing paint by brushing, or spraying, or flowing, the paint onto the said fabric and, thereafter, baking the paint in an elevated temperature to cure it.

This procedure proved to be quite satisfactory and the heating mantle would resist penetration by salt water for several days and the resistance between the resistance wire and the metal frame of the heating mantle remained well above the minimum limit.

With the foregoing in mind, it is a particular object of the present invention to make a fluid impervious heating mantle or blanket of the nature referred to.

It is a still further object to provide a fluid impervious heating blanket or mantle of the nature referred to and a method of making the same which is relatively inexpensive and which has long life.

A still further object is the provision of a waterproofed heating blanket or heating mantle and a method of making the same in which the waterproofing does not in any way interfere with the transfer of heat to the vessel or article being heated.

The foregoing objects of the present invention, as well as still other objects and advantages thereof, will become more apparent upon reference to the following detailed specification taken in connection with the accompanying drawings in which:

FIGURE 1 is a perspective view showing a heating mantle having a fabric exterior and adapted for heating beakers of glass or metal;

FIGURE 2 is a view similar to FIGURE 1 but shows a heating mantle of the type employed for heating flasks and having an external metal frame;

FIGURE 3 is a perspective view showing a heating blanket of the type which is shaped to fit about a special piece of equipment which could have, as shown, three or more connecting conduits;

FIGURE 4 is a perspective view showing a fragment of the waterproofed fabric to which the resistance wire or tape is applied and which fabric is provided with a waterproofing layer on the side opposite the resistance wire or tape; and

FIGURE 5 shows the electric heating element in the body of the textile-like support member.

Referring to the drawings somewhat more in detail, in FIGURE 1 beaker 10, which may be glass or metal, is disposed within the heating mantle generally indicated at 12 and which is provided with a relatively coarse fabric layer 14 adjacent the beaker and on the side of which opposite the beaker is stitched an electric resistance heating wire or tape. Surrounding the fabric 14 and the stitched on resistance wire or tape is a body of electrical and heat insulation, which may be glass wool, or quartz, or asbestos wool and enclosing this insulating material is another fabric layer 16. The stitching indicated at 18 joins all of the fabric layers together and forms the completed heating mantle. A cable 20 supplies electrical energy to the heating mantle and the mantle may, if desired, be provided with a thermostatic control element.

In FIGURE 2, the heating mantle illustrated is for the purpose of supplying heat to a flask 30. The heating mantle comprises a metal frame 32, aluminum, for example, and the frame is provided with an open top 34 that receives the lower portion of the beaker. Suspended in the open top of the frame is the fabric 36 which is contoured to fit the bottom of the flask and to the underside of which is stitched, or otherwise suitably attached, the electric resistance heating wire or tape. The inside of frame 32 around the fabric 36 is filled with electrical and heat insulating material. A receptacle at 38 is provided for receiving plug 40 on the end of an electric cable 42 for supplying electrical energy to the heating mantle. The heating mantle may be provided with a thermostat from which leads 44 are taken for the purpose of controlling the supply of energy to the heating mantle.

FIGURE 3 shows an electric heating blanket 50 of about the same type illustrated in FIGURE 1, except that the blanket 50 is specially contoured to fit about an irregularly shaped article or fitting where several conduits are joined. To this end the blanket 50 may be provided with a joint at 52 where lacing 54 is provided which secures the heating blanket about the article to be heated. As in the case of the blanket or mantle shown in FIGURE 1, the heating blanket at 50 is provided with a fabric layer 56 adjacent the article being heated by the blanket and to which layer the resistance heating wire or tape is applied.

FIGURE 4 shows a typical arrangement wherein reference numeral 60 indicates the layer of relatively coarse fabric, or textile-like material, to which wires 62 are stitched as by stitches 64. The region on the side of fabric 60 to which the resistance wire 62 are stitched is that region which contains the wool-like electrical and heat insulating material. The other side of the fabric 60 is that side thereof which engages the vessel or article to be heated.

FIGURE 4 shows the layer at 66 which seals fabric 64 against the passage of liquid therethrough. It will be noted that this layer coats the yarns of the fabric and also fills the interstices therebetween so that the fabric is completely waterproofed. The coating 66, which may be sprayed on, brushed on, or flowed on, is, as mentioned, applied after the heating mantle or heating blanket has taken its final form so that even though the fabric is stiffened by the application of the sealing coating thereto, this still does not interfere with the proper engagement of the vessel or article to be heated by the fabric layer.

I have found that a coating material of the following composition is suitable for my purposes:

A high heat resistant aluminum powder is dispersed in a silicone base and a solvent such as toluene. When the treated surface is heated to a few hundred degrees Fahrenheit the material fuses to form a hard elastic coating. A number of suitable compositions are available commercially. The best one found is known under the trade name of Heat-Rem H-170 and is manufactured by Speco Inc., Cleveland, Ohio. Surfaces treated with this material withstand temperatures up to 1700° F.

In FIGURE 5, yarns 70 are woven, knitted, crocheted, 75

or otherwise arranged to form the body of a textile-like support member and imbedded therein are the resistance wires 72. Coating 74 on at least one side of the textile-like member waterproofs and seals the support member.

High temperature paints are well known and may comprise many pigments, including metal pigments, such as finely divided aluminum, and are in most cases also waterproof. Any such high temperature paint capable of withstanding temperatures up to, say 1700 degrees Fahrenheit, and being insoluble in the liquid most likely to be spilled on the blanket would be satisfactory for my purposes.

The heating devices above described have the resistance heating element stitched to one side of a textile-like support member, which can be either woven or knitted or otherwise fabricated from fibers or yarns. However, it is also possible to incorporate the resistance heating element directly in the textile-like member as by weaving the resistance element together with the yarns, or by forming the textile-like member about the resistance element as by crocheting, or the like. In each case, the textile-like member can be waterproofed by the practice of the present invention and it is, therefore, intended to comprehend such devices within the purview of the present invention.

It will, accordingly, be understood that I do not wish to be circumscribed by the specific examples and illustrations included in this application, but desire to encompass within the purview of my invention such adaptations and modifications of structure and composition of materials as may be deemed fairly to fall within the scope of the appended claims.

What is claimed is:

1. A heating device comprising: a textile-like member adapted to be positioned adjacent an article such as a vessel to be heated, electrical resistance heating means carried by said member beneath the surface of the member which is adjacent the article to be heated and in spaced relation to the said surface, and a liquid impervious heat resistant coating mounted directly on and adhered to and sealing the side of said surface on the said member which is adjacent the article to prevent liquids from passing into said textile-like member from said surface to the region of the member carrying said heating means whereby said heating means is protected from fluids spilled on said member or leaking from or boiling over from an article or vessel being heated by the said heating device, said textile-like member is a relatively coarse woven fabric having substantially the shape of the surface of the article to be engaged by the heating device, said fabric is formed of yarns made from fibers selected from the class of refractory fibers that includes glass, asbestos and quartz.

2. A heating device according to claim 1 in which said coating is a high temperature resistant paint.

3. A heating device according to claim 1 in which the resistance heating means is stitched to said textile-like member on the side thereof opposite the side of the member which engages the article to be heated.

4. A heating device according to claim 1 in which the resistance heating means is imbedded in the body of the textile-like member.

References Cited

UNITED STATES PATENTS

2,572,695	10/1951	Briscoe et al.	219—535
2,718,584	9/1955	Hariu	219—527 X
2,719,213	9/1955	Johnson	338—212
2,739,220	3/1956	Morey	219—535
3,153,140	10/1964	Theodore et al.	219—549
3,205,341	9/1965	Bull	219—528

VOLODYMYR Y. MAYEWSKY, Primary Examiner

U.S. Cl. X.R.

219—456, 529, 545