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Thibault

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[54] **ELECTRICAL HEATING ENVELOPES**

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[52] **U.S. Cl.**..... **219/535,** 219/430, 219/432, 219/433, 219/437, 219/521, 219/529, 219/530, 219/544

[51] **Int. Cl.** **H05b 3/58**

[58] **Field of Search** 219/430, 432, 433, 436, 219/437, 438, 439, 441, 456, 521, 528, 529, 530, 531, 535, 540, 544

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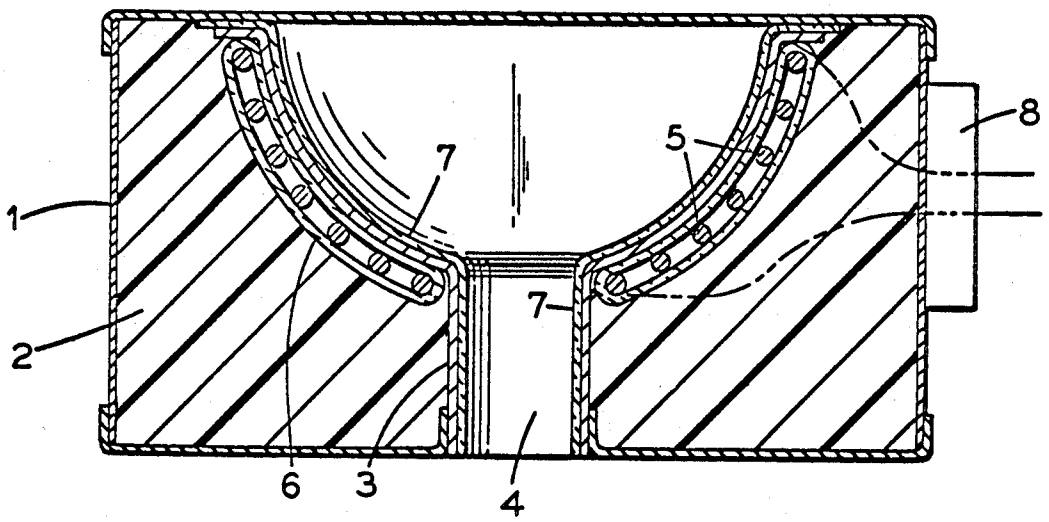
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[57] **ABSTRACT**

An electrical heating envelope which includes a metallic layer interposed between a vessel, the contants of which are to be heated, and the heating elements which supply the thermal energy. The metallic layer will typically be comprised of non-magnetic material and a layer of resilient insulating material may be positioned between the plate and vessel.

5 Claims, 2 Drawing Figures



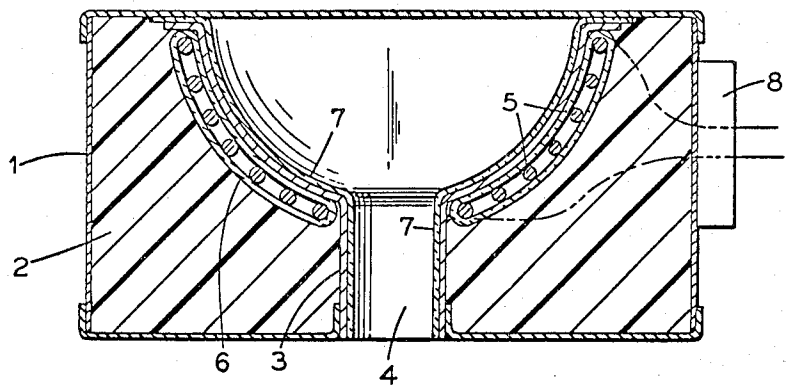


FIG. 1

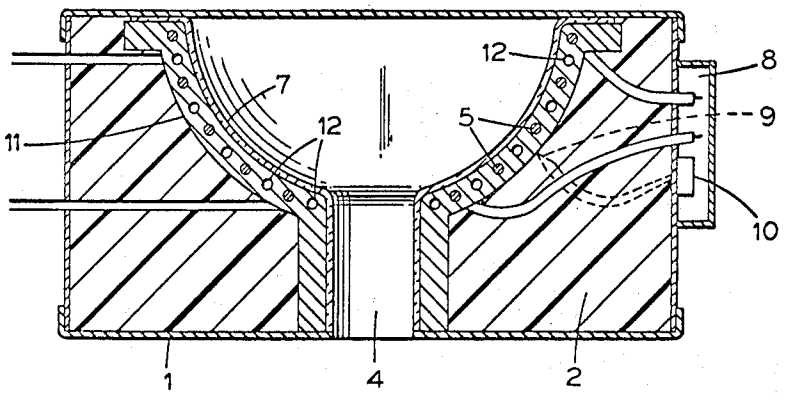


FIG. 2

ELECTRICAL HEATING ENVELOPES

This is a division, of application Ser. No. 157,551, filed June 28, 1971, now U.S. Pat. No. 3,772,500.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to heating of the contents of vessels such as, for example, containers comprised of glass. More specifically, this invention is directed to electrical heating envelopes for industrial or domestic use. Accordingly, the general objects of the present invention are to provide novel and improved methods and apparatus of such character.

2. Description of the Prior Art

Methods of and apparatus for electrically heating the contents of a flask or other container are well known in the art. The typical prior art device will comprise a generally cylindrical shaped outer envelope which may, for example, be comprised of aluminum. The envelope forms a housing for resistors which function as heating elements. The resistors are usually insulated by glass or asbestos braiding and are sewn within asbestos fabric placed between two glass fiber layers. The insulating and supporting medium for the resistors is positioned in such a manner as to distribute the resistors regularly about the entire lower surface of a vessel which may receive the substances to be heated.

The prior art heated envelopes of the type briefly discussed above are characterized by a number of well known deficiencies. Firstly, the heat transfer efficiency of these devices is not particularly high. Secondly, in cases where the actual container for the material to be heated is comprised of a material such as glass which fractures easily, the prior art devices provide no protection for the heating elements which may become damaged by the contents of the container in the case of a container wall failure.

Further deficiencies of prior art heating envelopes include the fact that they typically are not flameproof and therefor pose a safety hazard. Also, in the interest of regulating the operating temperature, prior art heating envelopes have provided only for the control of current to the heating elements or resistors. Considering the mass of the resistors, this is at best a slow control method which is lacking in precision.

SUMMARY OF THE INVENTION

The present invention overcomes the above discussed and other deficiencies and disadvantages of the prior art by providing a novel and improved technique for electrically heating the contents of containers and a heating envelope for use in the practice of such technique. In accordance with the present invention, a metallic plate member is interposed between the heating elements and the recipient of the heat. The metallic plate member will preferably be comprised of a non-magnetic material and a sheet of insulating fabric may be positioned between the plate and heat recipient.

In accordance with one embodiment of the invention, the metallic plate member is in the form of a block which is sufficiently thick so as to enable the heating element resistors to be embedded therein. The block may also be provided with passages through which a coolant may be circulated in the interest of temperature control. Also in the interest of temperature control, the invention may include a thermocouple or equivalent device which senses the temperature of the metallic plate and, through appropriate circuitry, regulates the flow of current to the heating elements and/or the flow of coolant through the passages in the metallic plate member.

BRIEF DESCRIPTION OF THE DRAWING

The present invention may be better understood and its numerous objects and advantages will become apparent to those skilled in the art by reference to the accompanying drawing wherein like reference numerals refer to like elements in the several figures and in which:

FIG. **1** is a cross-sectional, side elevation view of a first embodiment of the invention; and

FIG. **2** is a cross-sectional, side elevation view of a second embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference now to FIG. **1**, the housing for the heating appliance of the present invention is indicated at **1**. Housing **1**, which may be comprised of any suitable material, will typically have a cylindrical outer shape and the voids therein will be filled with a thermal insulating material **2** of glass wool or other equivalent material.

A non-magnetic sheet metal member **3** is shaped so as to provide a seat for a container, not shown, which will function as the recipient of heat produced by the present invention. Thus, by way of example, plate **3** may be contoured so as to receive a glass flask and the plate may be provided with a tubular neck receiving portion **4** which accepts the tubular necks with which certain flasks are provided.

The heating element for the embodiment of FIG. **1** comprises a plurality of resistors **5** which are sewn, in a manner well known in the art, into and enveloped by an asbestos sheet **6**. The metallic member **3** is covered by another asbestos sheet member **7** which prevents contact between the heat recipient and the heated metallic member **3**. Asbestos sheet **7** also compensates for small differences in shape and size between the recipient container and the contour of member **3**.

Electric current for heating purposes is delivered to the resistors **5** via a standard connector **8**. The delivery of current to the resistors and the operation of the invention are in accordance with well known technology and will not be described herein.

Referring now to FIG. **2**, the second disclosed embodiment of the invention will be described only insofar as it departs structurally from the previously described embodiment. A principal difference between the embodiments of FIGS. **1** and **2** is that the non-magnetic sheet metal member **3** is in the form of a block **11** in the FIG. **2** embodiment. As shown, in the FIG. **2** embodiment the metallic block **11** will be sufficiently thick so as to enable the resistors **5** to be embedded therein. The metallic block may be obtained by casting or by metalization; that is, by pulverizing the material on a bed of fabric which is preferably the insulating fabric, the electrical resistors becoming embedded during the pulverization. The metallic block may also be produced by other equivalent processes.

Also in accordance with the FIG. **2** embodiment, the member **11** may be provided with a refrigeration circuit

defined by tubes or passages **12** formed in or enveloped by the material which defines the block **11.** A coolant may be circulated through passages **12** when it is desired to rapidly reduce the temperature of member **11** and the contents of the heat recipient container.

It is to be noted that the asbestos sheet member **7** of the FIG. **2** embodiment may be either separate from the member **11** or may be integral therewith depending upon the method of manufacture employed in the fabrication of the metal block.

As shown in FIG. **2,** the connector **8** is liquid-tight and flameproof. The connector housing contains a conventional temperature regulator **10** which is supplied with an input signal from a thermocouple **9;** thermocouple **9** either being embedded in member **11** or in contact with an inner surface of metal member **11.** The operation of and circuitry comprising temperature regulator **10** are in accordance with the state of the art and will not be described in detail herein. It is to be noted, however, that the thermocouple and regulator provide for the automatic control of the extent of heating through controlling the delivery of current to the heating elements. In this manner, the temperature of the appliance may be maintained below the minimum temperature above which a flash may be produced. A flash could result either through breakage of the heated recipient flask or by passage of vapors escaping from the flask into contact with the block **11.**

If deemed desirable, the regulator **10** may also be employed to control the flow of coolant through the passages **6.**

As will now be obvious to those skilled in the art, the present invention provides for better protection of the heating resistors in the case of breakage of the heat recipient container. Similarly, the use of a non-magnetic heat transfer member, in the nature of metal members **3** and **11,** permits agitation to be affected from below by magnetic means. The asbestos sheet **7** prevents direct contact between the heated surface of metal members **3** and **11** and the walls of the recipient container.

While preferred embodiments have been shown and described, various modifications and substitutions may be made thereto without departing from the spirit and scope of the present invention. Thus, while the invention has been described in the environment of a heating envelope for delivering thermal energy to flasks and other containers, it may be applied to such devices as heated reactors, heated funnels, heated muffs, heated feeding bottles, heated basins, heated fondues and other devices. Accordingly, it is to be understood that the present invention has been described by way of illustration and not limitation.

What is claimed is:

1. An electrical heating envelope for supporting and heating containers comprising:

a thermally insulating housing;

reentrant vessel receiving means disposed within said housing and supported thereby, said vessel receiving means including a first member comprised of a heat conductive metal which defines a recess shaped to receive a container to be heated;

electrically energized heating means positioned within said housing in contact with a first surface of said first member, said heating means substantially conforming to said first surface, said heating means including a plurality of resistors enclosed in an electrically nonconductive envelope; and

an inner member including a layer of thermal insulating fabric material interposed between the second surface of said receiving means first member and a container to be heated whereby containers to be heated are disposed in said recess on said fabric material.

2. The apparatus of claim **1** wherein said vessel receiving means first member is comprised of nonmagnetic material.

3. The apparatus of claim **1** wherein said heating means envelope comprises: thermal insulating fabric.

4. The apparatus of claim **3** wherein said housing and vessel receiving means define a void therebetween and wherein said void is filled with a thermal insulating material.

5. The apparatus of claim **2** wherein said vessel receiving means first member is comprised of nonmagnetic material.

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