June 23, 1953 H. H. GOLDSTAUB 2,643,324

ELECTRIC HEATING DEVICE

Filed Sept. 19, 1951 5 Sheets-Sheet 1

FIG. 1A.

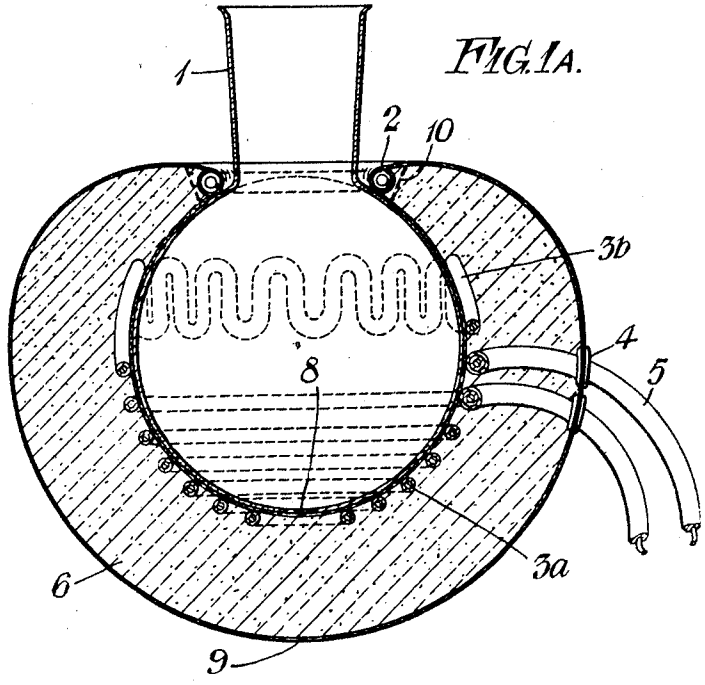
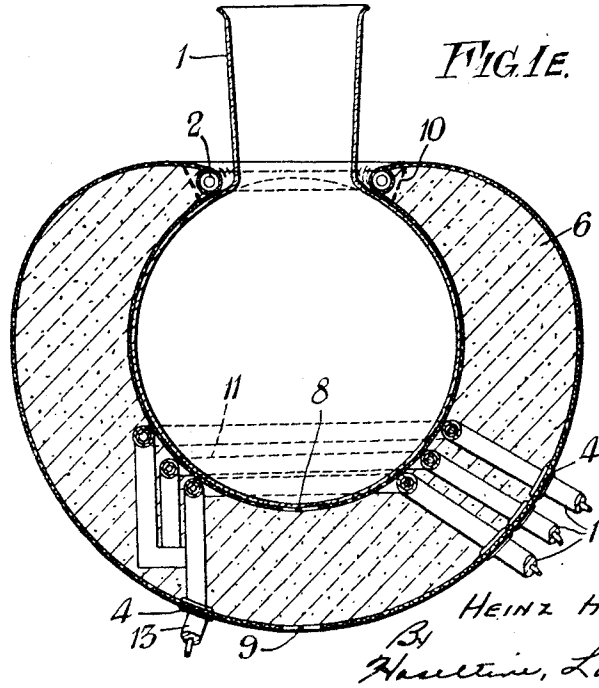


FIG. 1E.



INVENTOR
HEINZ HERBERT GOLDSTAUB
By Hamilton, Lake & Co.
AGENTS

June 23, 1953 H. H. GOLDSTAUB 2,643,324

ELECTRIC HEATING DEVICE

Filed Sept. 19, 1951 5 Sheets-Sheet 2

FIG. 1B.

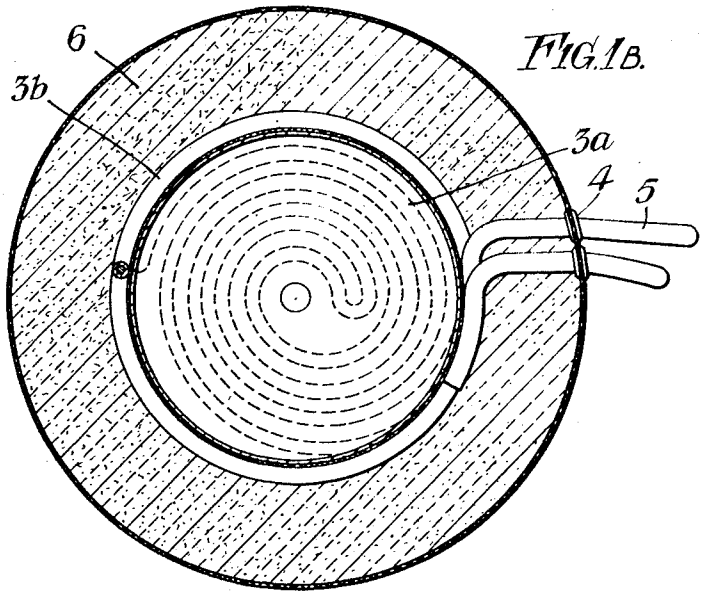
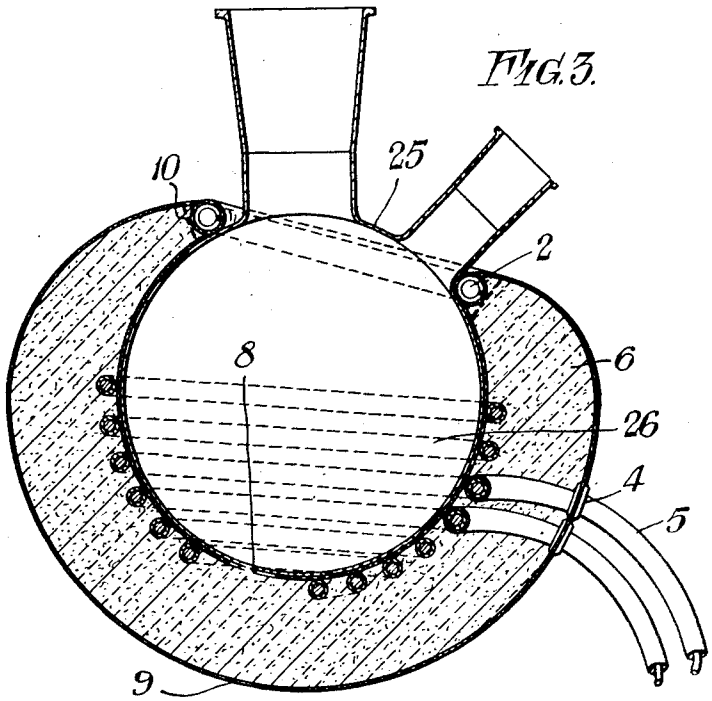


FIG. 3.



INVENTOR
HEINZ HERBERT GOLDSTAUB
By: Haseltine, Lake & Co.
AGENTS

June 23, 1953 H. H. GOLDSTAUB 2,643,324

ELECTRIC HEATING DEVICE

Filed Sept. 19, 1951 5 Sheets-Sheet 3

FIG. 1c.

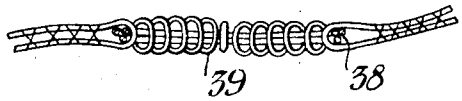
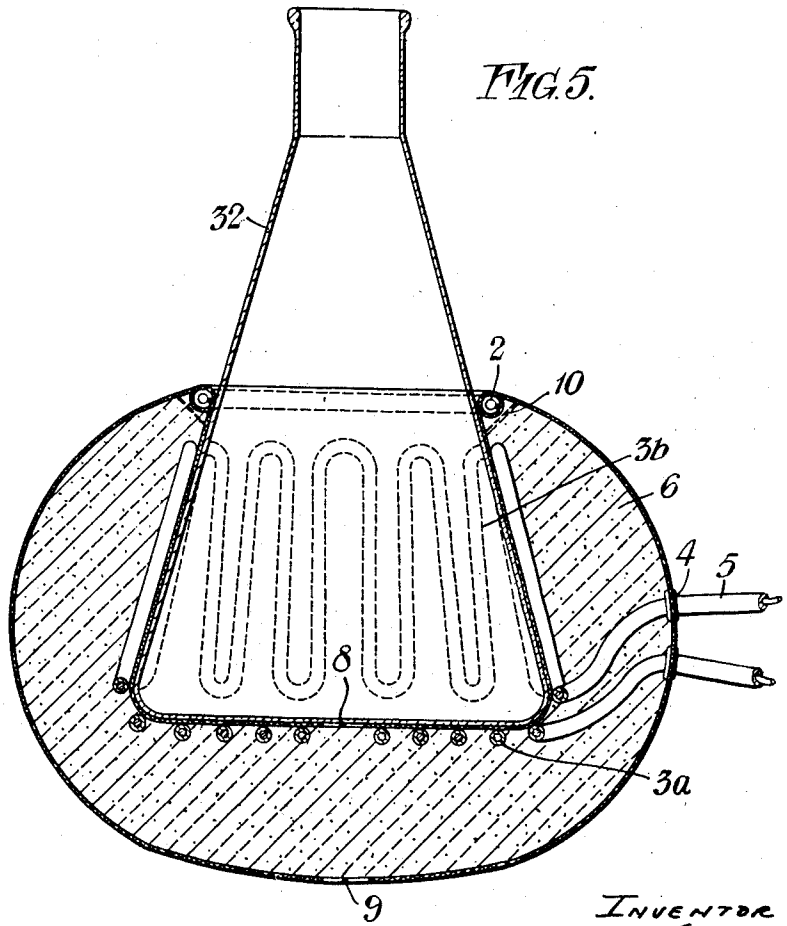


FIG. 5.



INVENTOR
HEINZ HERBERT GOLDSTAUB
By: Haseltine, Lake & Co.
AGENTS

June 23, 1953 H. H. GOLDSTAUB 2,643,324

ELECTRIC HEATING DEVICE

Filed Sept. 19, 1951 5 Sheets-Sheet 4

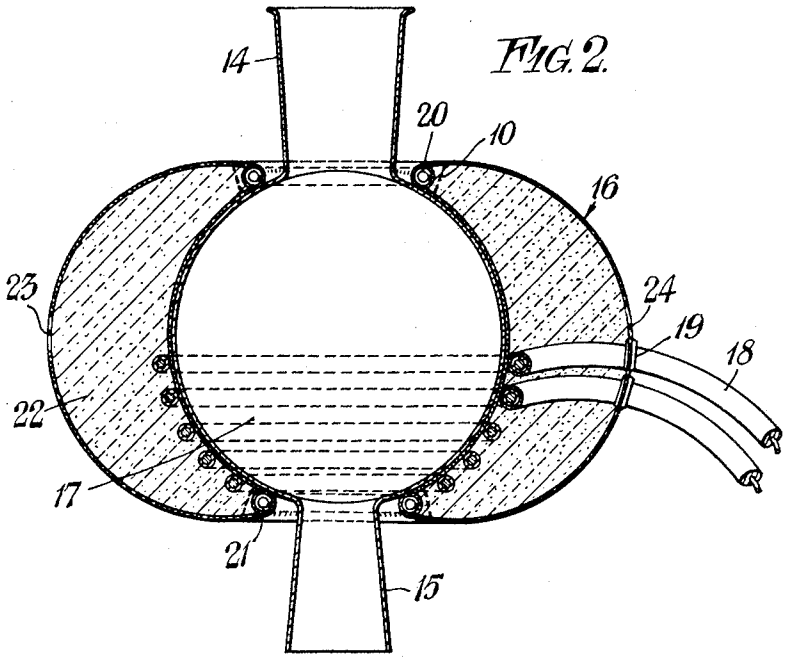


FIG. 2.

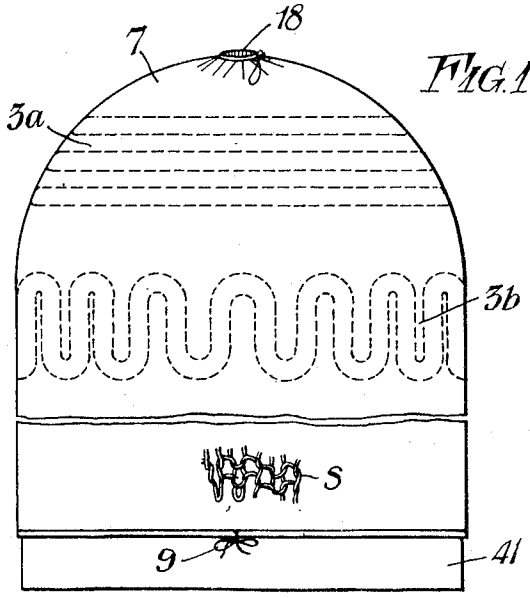


FIG. 1D.

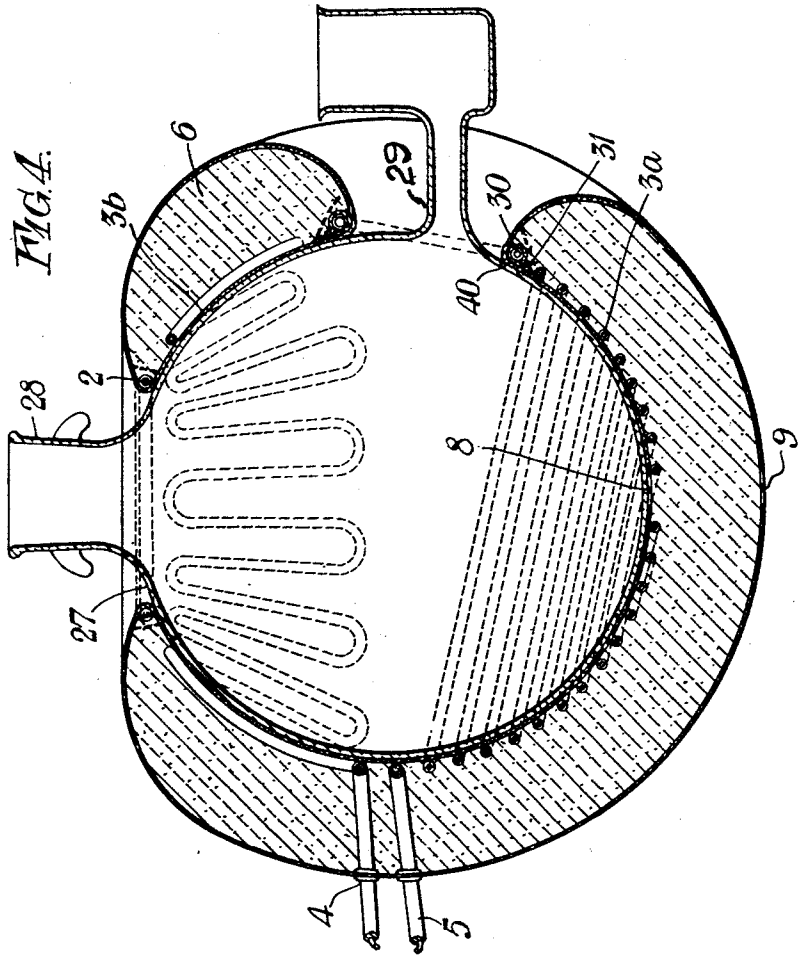
INVENTOR
HEINZ HERBERT GOLDSTAUB
By: Nauclins, Lake & Co.
AGENTS

June 23, 1953 H. H. GOLDSTAUB 2,643,324

ELECTRIC HEATING DEVICE

Filed Sept. 19, 1951 5 Sheets-Sheet 5

FIG. 4.



INVENTOR
HEINZ HERBERT GOLDSTAUB
By:
Wasserman, Lake & Co.
AGENTS

Patented June 23, 1953 2,643,324

UNITED STATES PATENT OFFICE

2,643,324

ELECTRIC HEATING DEVICE

Heinz Herbert Goldstaub, Snaresbrook, England

Application September 19, 1951, Serial No. 247,219

4 Claims. (Cl. 219—43)

1

This invention relates to electric heating devices, more especially devices for the electrical heating of containers, including mercury vapour pumps, which containers may be of glass quartz, silica, metal, earthenware or the like.

It has for its object to provide an improved heater of this type, particularly one which will suit flasks or the like of various sizes and forms for a given size of heater, one which will conveniently deal with flasks or the like of what are known as "side entry" or "multi entry" types, that is to say, with an opening at the side with or without an opening at the top or a number of openings, not necessarily of the same size, be easy of application to the flask and hold on the flask without extraneous means.

Heating devices have previously been known made of woven glass fabric in association with metallic heating wires, but these could not as a single unit be applied to heat the external surface of flasks of non-uniform diameter, beyond their maximum diameter.

In designing a heater in which heat loss over substantially the whole of the external surface of a vessel is prevented there are two possibilities or groups, namely, one in which heating is only effected up to the maximum diameter from the bottom and the other in which heating is applied substantially all over the vessel. Previously it was only possible to apply heat substantially all over the vessel by dividing the heating mantle into two parts at the maximum diameter. In accordance with the present invention by providing an extensible or elastic type of heater over the upper and lower parts, a unit can be provided for heating over substantially the whole external surface of the vessel.

In brief the invention consists in an electrical heating device for a vessel, comprising a flexible mantle made of knitted heat resisting and electrically insulating fibres, marginal portions in said mantle defining an opening, elastic means surrounding said opening, and an electrical heating coil associated with said mantle, said opening being smaller than a part of the vessel with which the mantle is to be in contact, whereby the elastic means may be stretched to pass over said part and can grip said vessel.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made to the accompanying drawings in which:

Figure 1A is a vertical section illustrating a first embodiment,

Figure 1B is a horizontal section corresponding to Figure 1A,

2

Figure 1C is an enlarged detail of part of the embodiment illustrated in Figures 1A and 1B,

Figure 1D is a view of the embodiment illustrated in Figure 1A at an intermediate stage of manufacture,

Figure 1E is a view, similar to Figure 1A, illustrating a modified first embodiment,

Figure 2 is a view, similar to Figure 1A, illustrating a second embodiment,

Figure 3 is a view, similar to Figure 1A, illustrating a third embodiment,

Figure 4 is a view, similar to Figure 1A, illustrating a fourth embodiment, and

Figure 5 is a view, similar to Figure 1A, illustrating a fifth embodiment.

Referring now to the drawings, the round bottom flask 1 (see Figure 1A) has a single neck, and is covered by a flexible heating mantle which contains a heating coil 3*a* and 3*b* of electric resistance wire, the part 3*a* being spirally wound, whilst the part 3*b* is wound in zig-zag form. The part 3*a* covers the lower half of the flask up to its maximum diameter, whilst the part 3*b* covers the upper half of the flask. It will be apparent that the zig-zag form of part 3*b* has greater extensibility than the spirally-wound part 3*a*.

The heating mantle may be produced from an open-ended tube 7 (see Figure 1D) of knitted glass fabric, the tube having draw cords 8 and 9 at its ends. The knitted structure S of the fabric is apparent from the enlarged detail in Figure 1D. The draw cord 8 is pulled tight and knotted and the tube 7 is placed over a former 41 to produce the shape shown in Figure 1D. The heating coil 3*a*, 3*b* is then sewn to the fabric of the tube 7 and the free end of the tube 7 folded over so that a recess for a coil spring 2 is provided. The fabric is sewn together by a line of stitches 10 (see Figure 1A) behind the coil spring 2 to provide an annular space in which the coil spring 2 may move. The leads 5 of the coil 3*a*, 3*b* are passed through the outer fold of the tube 7 through eyelets 4 sewn to the glass fabric. The space between the two folds of the tube 7 is filled with glass wool insulation 6 and the free ends of the tube 7 are drawn together by means of the draw cord 9 the ends of the draw cords being pushed inside the thus-formed mantle to produce a neat appearance. In the modification shown in Figure 1E, the heating coil 11 is spirally wound in the lower part of the heating mantle and consists of three separately wound parts, each having a lead 12 on the negative side, there being a common lead 13 on the positive side. Apart from this, the other details are the same as the embodiment described with

reference to Figures 1A to 1D and are similarly designated.

A second embodiment of the invention is illustrated in Figure 2. The spherical flask has a single neck 14 with a drain-off 15 and is surrounded by a heating mantle 16 of knitted glass fabric. The heating coil 17 is spirally wound in the lower half of the mantle 16 and has leads 18 passing through eyelets 19 in the outer wall of the mantle 16. Coil springs 20 and 21 are disposed within the mantle 16 about the upper and lower openings respectively, so that the springs grip the neck 14 and the drain-off 15. The inner and outer walls of the mantle 16 are sewn together behind the springs 20 and 21 to form annular spaces in which the springs may move. Glass wool 22 is disposed between the inner and outer walls of the mantle 16. The draw cords 23 and 24 are situated on opposite sides of the mantle at the middle point of its length.

In the embodiment of Figure 3, a double neck spherical flask 25 is shown. The heating coil 26 is spirally wound in the lower half of the heating mantle, but, in other respects, the mantle corresponds to that shown in Figures 1A to 1D and similar parts are similarly designated. It will be observed that the coil spring 2 grips the flask around the distant sides of both necks.

An all glass continuous water still flask 27 is shown in Figure 4. The spherical flask 27 has a neck 28 and a side entry 29. The heating mantle is somewhat similar to that shown in Figures 1A to 1D and similar parts are similarly designated. However, in addition to the coil spring 2 around the neck 28 there is a coil spring 30 around the side entry 29. The method of construction of the heating mantle is also similar to that shown in Figures 1A to 1D. However, the open-ended tube of knitted glass fabric is made with spaced first and second slits along its length which slits lie opposite each other, in the inner and outer folds, when the tube is folded over to provide a recess for the spring 2. Prior to the folding the spring 30 is placed about the first slit in the inner fold, on the side of the fabric to which the heating coil is sewn. The edges of the fabric, surrounding the first slit are then curled over the spring and secured to the fabric as at 31, so as to provide an annular space in which the spring 30 may move. The edges of the second slit in the outer fold are then secured to their corresponding parts on the first slit as at 40.

Figure 5 illustrates the application of a heating mantle, to a conical flask 32. The heating mantle is of similar construction to that shown in Figures 1A to 1D and is similarly designated. However, the disposition and shape of the spiral part 3*a* and zig-zag part 3*b* of the heating coil are not the same because of the differently shaped flask. Thus, it will be observed that the spiral part 3*a* of the heating coil lies along the bottom of the flask.

In the manufacture of the knitted glass fabric tube, draw cords are either introduced in the knitting or the fabric is seamed at the ends to provide a channel for the draw cords, according to the type of knitting machine used. Thus in Figure 1C the draw cord 23 lies in a channel formed in the fabric 39. Openings for any side entries are provided by leaving out the linking of the selvedges at certain points. However, the side openings can be provided by altering the operation of the needles in the needle bed on a flat bed machine. In this way it is possible to provide openings at more than one point on the periphery. An alternative method is to provide a number of flat bed pieces and link these together in a suitable manner, leaving holes for ultimate elastic neck openings where required.

The various heating coils may have different parts connected in series or in parallel. Thus a spiral part may be connected in parallel with a zig-zag part of a coil, or a spiral part may contain a number of portions in parallel.

In the use of the heating mantle, the elastic opening (or openings) is (or are) stretched so that it will pass over the flask concerned and the heating mantle is placed around the flask. The neck or other narrow portion of the flask is then gripped by the elastic opening, because of the spring therein, and the heating mantle is in close contact with a large area of the flask.

Knitted fabric is essential to the construction of heating mantles, as the fabric must be flexible and elastic. The heating mantles can be easily applied to chemical apparatus already set up in position. As has been shown, they can be readily applied to flasks which have top openings, bottom openings and side openings, and in effect they grip the flask by their own construction. The capacity for slipping on the mantle from the bottom of the flask is a substantial advantage.

It will of course be understood that insulating material other than glass fabric or glass wool may be employed such as asbestos or quartz.

I claim:

1. An electrical heating device for a vessel having a relatively small discharge neck extending from an enlarged body portion; said heating device comprising a unitary flexible mantle made of knitted heat resisting and electrically insulating fibres and formed to define an enclosed space for accommodating the enlarged body portion of the vessel and extending to a relatively small portion of the latter, marginal portions of said mantle defining an opening through which the relatively small portion of the vessel may extend, and electrical heating means carried by said mantle and disposed for good heat exchanging relationship with the body portion of a vessel in the mantle, said opening being normally smaller than the enlarged body portion of the vessel to be received in the mantle whereby the opening may be stretched to pass over the enlarged body portion and can grip the relatively small portion of the vessel.

2. An electrical heating device for a vessel having a relatively small discharge neck extending from an enlarged body portion; said heating device comprising a unitary flexible mantle made of knitted heat resisting and electrically insulating fibres and formed to define an enclosed space for accommodating the enlarged body portion of the vessel and extending to a relatively small portion of the latter, marginal portions of said mantle defining an opening through which the relatively small portion of the vessel may extend, said flexible mantle including inner and outer walls and flexible insulating material between the latter, elastic means surrounding said opening for yieldably contracting the latter, and an electrical heating coil attached to the surface of said inner wall facing toward said outer wall and disposed for good heat exchanging relationship with the body portion of a vessel in the mantle, said opening being normally smaller than the enlarged body portion of the vessel to be received in the mantle whereby the opening

may be stretched to pass over the enlarged body portion and can grip the relatively small portion of the vessel.

3. An electrical heating device according to claim 2; wherein said heating coil includes a spirally wound part in the portion of said mantle diametrically opposed to said opening and a part wound in zig-zag form and extending around the portion of the mantle between said opening and said portion diametrically opposed to the opening so that the last mentioned part of said heating coil can expand and contract with the mantle to accommodate vessels of different configurations in the mantle.

4. An electrical heating device according to claim 2; wherein said elastic means includes a circular coil spring attached to said marginal portions of the mantle defining said opening.

HEINZ HERBERT GOLDSTAUB.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
978,892	Janssen	Dec. 20, 1910
1,455,237	Hadley	May 15, 1923
2,231,506	Morey	Feb. 11, 1941
2,482,665	Geyer	Sept. 20, 1949
2,500,241	Brown	Mar. 14, 1950
2,527,864	Weidenschilling	Oct. 31, 1950
2,572,695	Briscoe et al.	Oct. 23, 1951