May 28, 1929. J. A. WILLIAMS ET AL 1,715,109

ELECTRIC HEATER

Filed July 22, 1927

Fig 1

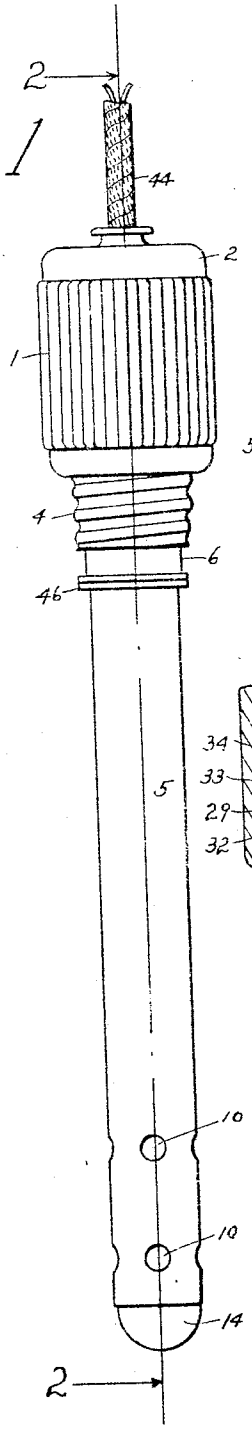


Fig 5

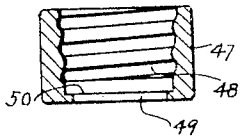
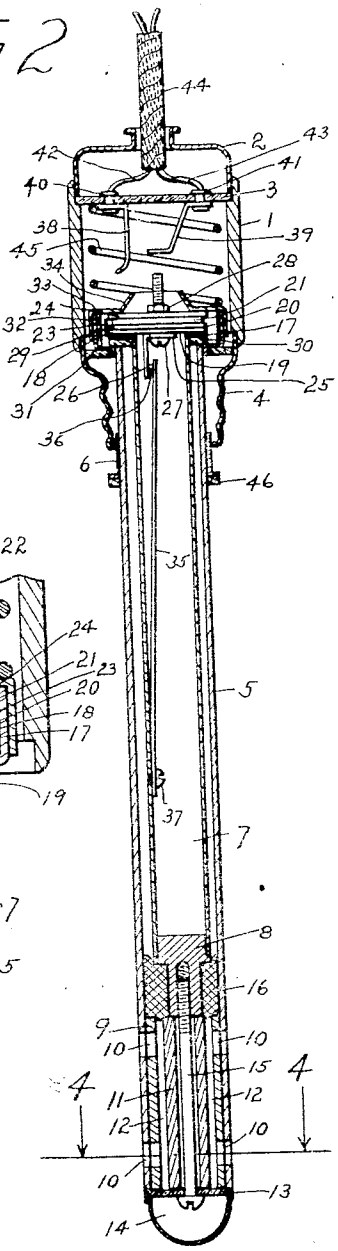


Fig 2



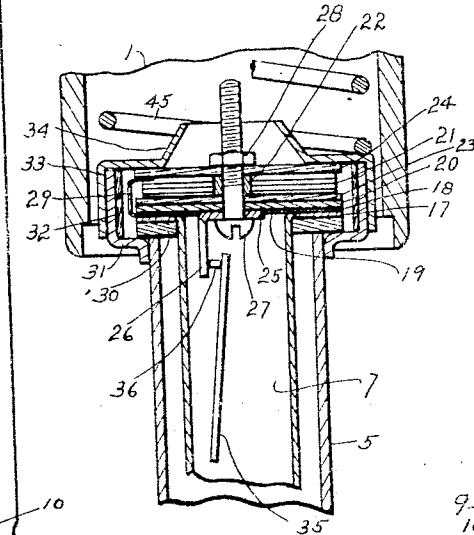
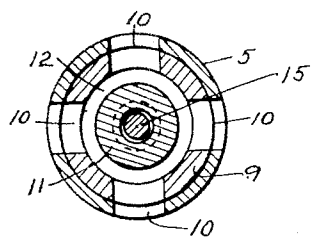


Fig 3

Fig 4



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UNITED STATES PATENT OFFICE.

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ELECTRIC HEATER.

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Our invention relates to electric heaters of the class in which part of the heater is immersed in water or other liquid for the purpose of imparting heat to same. It has for its main object to provide a heater which utilizes part of the liquid in which it is immersed as a part of its electric circuit and in which the making and breaking of the circuit is automatically governed by the decrease and increase of the temperature of the liquid so that the liquid may be kept at an even, predetermined temperature.

A further object is to provide a heater very economical in its consumption of current and safe from imparting shocks or burns to the person using it. A still further object is to provide a heater of simple, strong construction having no coils or other parts likely to burn out or get out of order, easy to manipulate, and inexpensive to manufacture.

These and other objects and advantages will be clearly understood from the following description and from the accompanying drawing of a preferred embodiment, but it will be readily noted that various modifications may be made without departing from the scope of the invention.

In the drawing,

Fig. 1 is a side elevation of the preferred embodiment of our invention,

Fig. 2 is a cross-sectional, side elevation taken on line 2—2, Fig. 1,

Fig. 3 is a fragmentary, cross-sectional view showing certain parts of the heater on a greatly enlarged scale,

Fig. 4 is a cross-sectional, top view taken on line 4—4, Fig. 2, and also drawn to an enlarged scale, and

Fig. 5 is a cross-sectional, side elevation of an auxiliary part.

Referring now to Figs. 1 and 2, the heater consists of a tubular handle member 1, counterbored at its upper end to receive a cap 2 and an insulating washer 3, and counterbored at its lower end to receive a screw-threaded shell 4. A comparatively long tube 5 extends downwardly from the handle member and is provided with a flanged sleeve 6 which is securely attached to the tube but slidably mounted in the shell 4. A smaller tube 7 is placed substantially concentrically inside of the larger tube 5. This tube, which in this preferred embodiment is shorter than the outer tube, terminates at its lower end in a shouldered and internally threaded plug 8.

A tubular, carbon electrode 9 fits snugly inside the lower end of the outer tube and is provided with a plurality of holes 10 which align with similar holes drilled in the tube. Another tubular, carbon electrode 11 of a smaller diameter is placed concentrically inside the outer carbon electrode so as to form an annular space 12 between them. This construction is plainly shown on the enlarged view Fig. 4.

The extreme lower end of the outer tube is counterbored to receive an insulating washer 13 and a semi-spherical cap 14. A screw 15, passing through the washer 13 and screwed into the plug 8, clamps both the electrodes against a resilient, insulating gasket 16. However, the construction is such that when the washer 13 is seated in the counterbore in the outer tube the inner electrode buts against the end of the plug 8 and makes electric contact therewith. It is evident that when the heater is immersed in liquid, part of this liquid will enter the annular space 12 but is prevented from flowing up between the tubes by the gasket 16.

Referring now more particularly to the enlarged view Fig. 3, a metal washer 17 is riveted on the upper end of the inner tube 7, on top of this metal washer an insulating washer 18, having a large center opening 19, is placed and on top of this washer is placed another metal washer 20. A condenser 21, constructed of alternating layers of copper foil and mica and having an insulating center bushing 22, is separated from the metal washer 20 by another insulating washer 23, while an insulating washer 24 is placed on top of the condenser. A bracket 25, having a downwardly extending contact arm 26, is placed under the metal washer 20. All these parts are held together by a screw 27 and nut 28, as plainly shown. The top copper foil of the condenser 21 is electrically connected by a metal strip 29 to the metal washer 20 on which the bracket 26 is clamped.

The upper end of the outer tube 5, which buts against an insulating washer 30 placed under the metal washer 17, is provided with an upwardly extending, circular shell 31 which forms a chamber for all the parts se-

cured on the upper end of the inner tube. An insulating liner 32 is placed inside of this shell and a cover 33, having an upwardly extending, conical projection 34, fits over the shell. The screw 27 projects through the opening in the conical projection. It will be seen that when the screw 15 is tightened, not only are the electrodes 9 and 11 secured in their respective places, but the outer tube is secured as well.

A strip of flat, thermostatic metal 35, having a contact point 36 riveted near its upper end, is fastened inside the inner tube by means of the screw 37. The contact point 36 normally contacts with the contact arm 26. Two contact springs 38 and 39 are secured to the insulating washer 3 by the eyelets 40 and 41 and the ends of the electric wires 42 and 43, contained in the cord 44, are soldered in these eyelets.

It will be noted that the handle member 1 and the parts secured thereon are free to slide on the outer tube but that this movement is limited by the washer 30 and the flange on the sleeve 6. A compression spring 45 normally holds the handle member in its upper position. A rubber gasket 46 is placed on the outer tube below the sleeve 6.

The operation of the heater will now be explained. The preferred embodiment is constructed for use with a hot water bag or any other appliance into which the cap 4 may be screwed. When the handle member is screwed into such an appliance, the spring 45 is compressed and the heater moved slightly upward until the gasket 46 is properly seated and forming a water-tight joint. The contact spring 39 is now engaged on the end of the screw 27 and the contact spring 38 against the conical side of the projection 34. A current may now flow through the wire 42, contact spring 38, cover 33, shell 31, outer tube 5, electrode 9, through the water or liquid contained in the annular space 12, electrode 11, plug 8, inner tube 7, thermostatic metal strip 35, contact point 36, contact arm 26, screw 27, contact spring 39 and back through the wire 43.

As the temperature of the liquid increases the thermostatic metal strip curves until it breaks the contact between the contact point 36 and the contact arm 26, thus shutting off the current until the temperature decreases. So effective have we found this construction, that in actual practice we have maintained water at a comparatively high temperature, over an extended period of time, with less than one degree (Fahrenheit) variation in its temperature and with an actual use of current of less than three minutes per hour. By varying the length or gauge of the thermostatic metal it is possible to raise the temperature of the liquid to any reasonable point and to maintain the temperature at that point.

As no current can flow through the heater until the spring 45 is compressed and as it is at times desirable to use the heater as a plain immersion heater, the part shown in Fig. 5 is provided. This part consists of a body member 47 having an internal thread which fits the thread on the cap 4, an opening 49 through which the outer tube passes, and a seat 50 against which the gasket 46 is seated.

While on direct current it is preferable to use carbon electrodes and a condenser to absorb the arc which might otherwise form when the contact point 36 is removed from the contact arm 26, on alternating current the condenser may be omitted and metal electrodes substituted; in fact, by lengthening the inner tube the two tubes may be used without any inserted electrodes.

While we have described and illustrated a heater such as is used with a hot water bag and on direct current, we do not wish to limit our invention to any particular use, but desire to employ it within the full scope of the appended claims.

What we claim as our invention and desire to secure by Letters Patent is:

1. In an electric heater of the class described, a handle member, an outer tube extending from said handle member, a smaller tube located concentrically within said outer tube, a non-metallic electrode inserted in the lower end of said outer tube, another smaller non-metallic electrode attached to the inner tube, said electrodes electrically insulated from each other and provided with means for connecting them to an electric current, and a thermal switch located inside the heater for making and breaking said current.

2. In an electric heater of the class described, a handle member, an outer tube extending from said handle member, a smaller tube located within said outer tube, a non-metallic electrode inserted in the lower end of said outer tube, another smaller non-metallic electrode attached to the inner tube, said electrodes electrically connected to said tubes but electrically insulated from each other, means for connecting said tubes to an electric current, and a thermal switch located inside the inner tube for making and breaking said current.

3. In an electric heater of the class described, a handle member, an outer tube extending from said handle member, a smaller tube located inside said outer tube and spaced therefrom, a non-metallic electrode inserted in the outer tube, another smaller non-metallic electrode attached to the inner tube, said electrodes electrically connected to the respective tubes but electrically insulated from each other, means for connecting said tubes to an electric current, a thermal switch located inside the inner tube, and a condenser so connected as to absorb the arc from said thermal switch.

4. In an electric heater of the class de-

scribed, a handle member having a screw-threaded portion, an outer tube having a slidable movement in said handle member, a smaller tube located inside said outer tube and spaced therefrom, a non-metallic electrode inserted in the outer tube, another smaller non-metallic electrode attached to the inner tube, said electrodes electrically connected to the respective tubes but electrically insulated from each other, means for connecting said tubes to an electric current, a thermal switch located in the inner tube, and an additional switch contained in the handle member and operated by the sliding movement of the outer tube.

5. In an electric heater of the class described, a handle member, an outer tube extending from said handle member and closed at its lower end, a smaller tube located concentrically within said outer tube, a non-metallic electrode inserted in the lower end of said outer tube, a plurality of perforations formed in said electrode and aligned with perforations drilled in the outer tube, another smaller non-metallic electrode attached to the inner tube, said electrodes electrically insulated from each other and having means for connecting them to an electric current, means for preventing the liquid which enters through the perforations when the heater is immersed from flowing between the tubes, and a thermal switch located inside the inner tube.

6. In an electric heater of the class described, a handle member, a tube extending from said handle member and provided with perforations at its free end, a tubular electrode inserted in the end of said tube, perforations formed in said electrode aligning with the perforations in the tube, a smaller electrode inserted concentrically in said tubular electrode and insulated therefrom, a thermal switch located inside the tube, said smaller electrode electrically connected to said switch, means for preventing liquid from entering the tube above the said electrodes, and means for connecting said tube and said switch to an electric current.

7. In an electric heater of the class described, a tube, an outer tubular electrode having a plurality of perforations, an inner tubular electrode, a shouldered bushing having a threaded hole, a resilient insulating packing placed on said bushing, an insulating washer, said electrodes placed inside of said tube their ends abutting against said packing and said washer, and a screw for securing all of said parts in their correct positions within said tube.

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