Nov. 24, 1936. M. W. HANKS ET AL 2,061,837

LIQUID CONDUCTOR HEATER

Filed Sept. 10, 1931 2 Sheets-Sheet 1

Fig. 1.

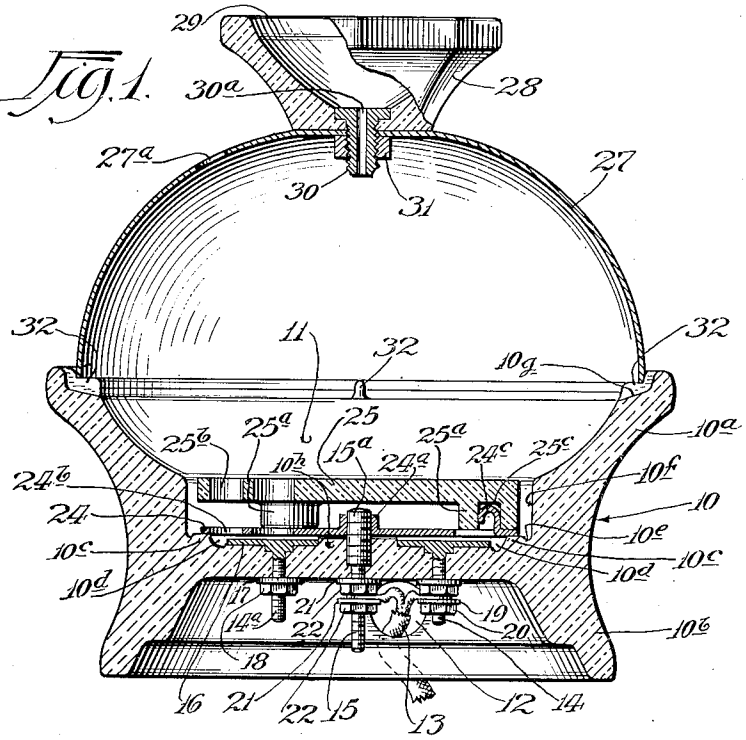
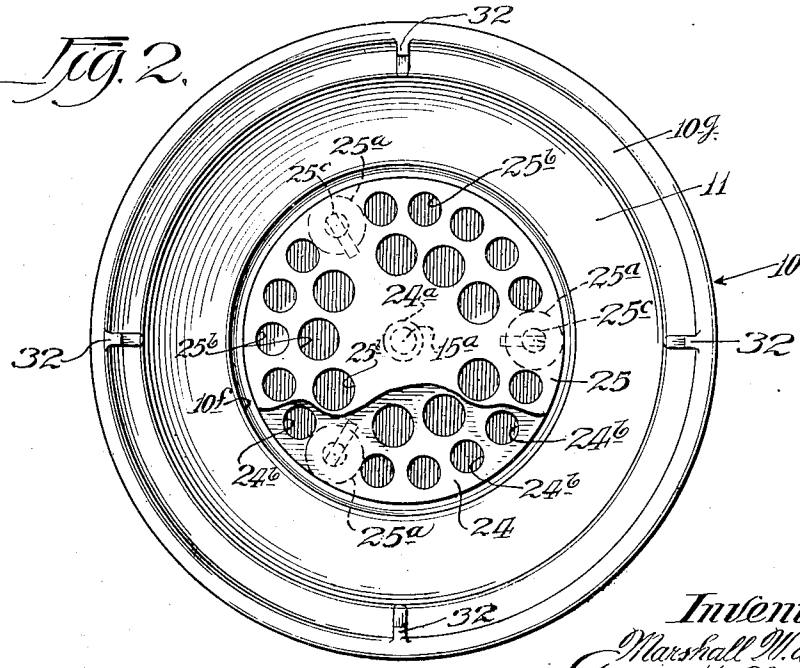


Fig. 2.



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Fig. 3.

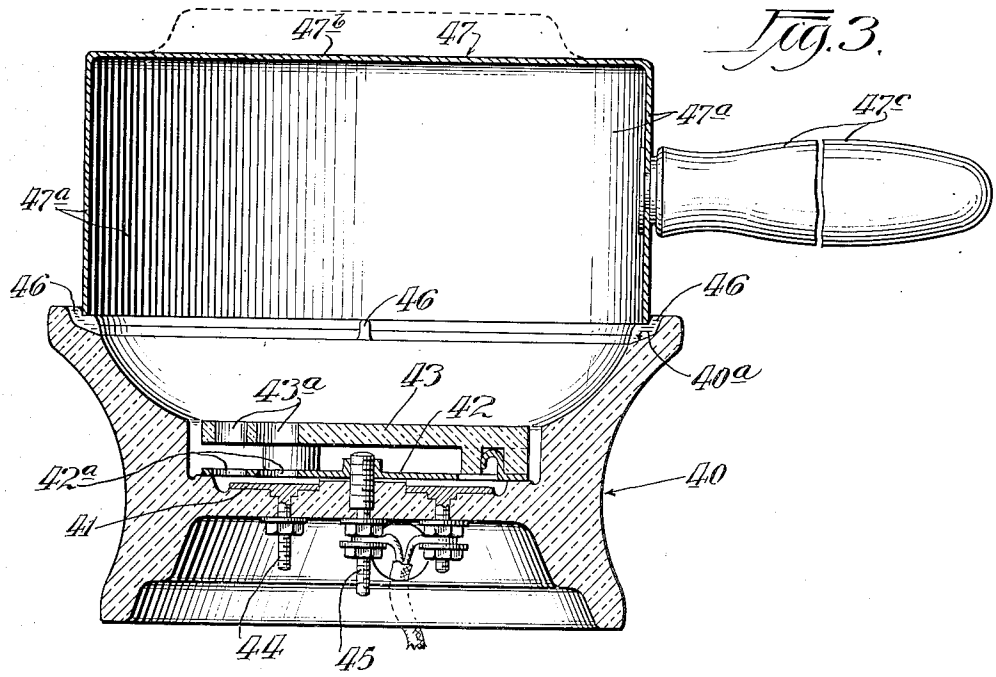
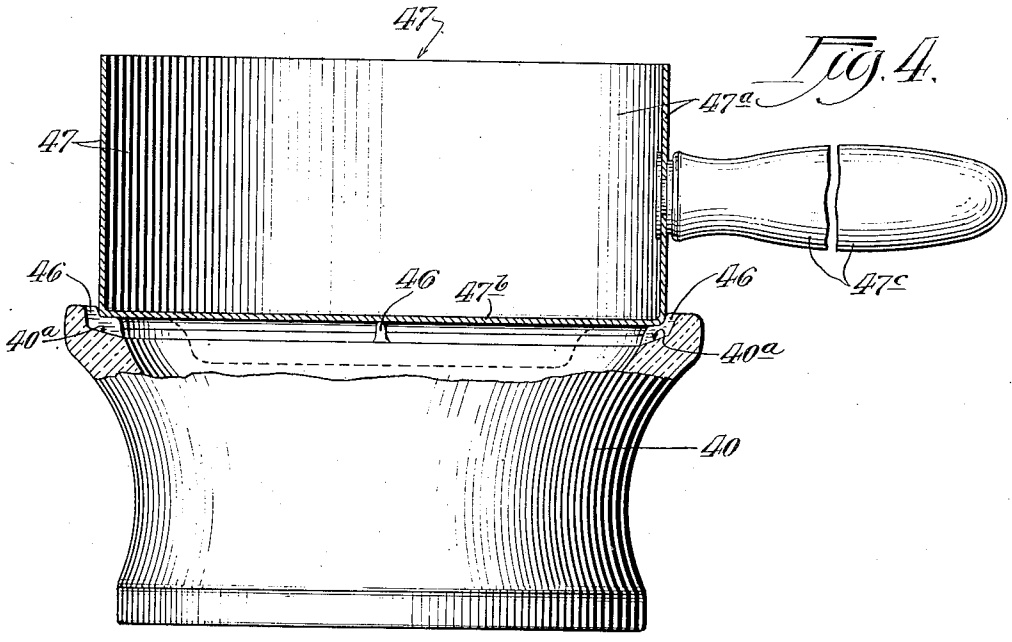


Fig. 4.



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UNITED STATES PATENT OFFICE

2,061,837

LIQUID CONDUCTOR HEATER

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Application September 10, 1931, Serial No. 562,020

11 Claims. (Cl. 219—40)

This invention relates to improvements in liquid conductor heaters of the type described in the prior United States patents of Marshall W. Hanks, No. 1,175,442, dated March 14, 1916, and No. 1,683,070, dated September 4, 1928, and in the patent to Messrs. Hanks and Mason No. 1,683,071, dated September 4, 1928. These patents relate to liquid conductor heaters and the method of operating the same according to which a measured quantity of water is evaporated to substantial dryness by the passage of current between two electrodes which are immersed in the water so that the apparatus has a definite time period of operation depending upon the quantity of water evaporated. In liquid conductor heaters of this type it is desirable to provide within the water containing vessel some means of support for the articles to be heated or cooked, for example, a tray to support eggs, as shown in certain of said prior patents, and it is also desirable to insure against the injury or fright of the user of the apparatus by providing means adapted to prevent electric shock if the hands of the user come in contact with the exposed portions of the apparatus. The principal object of the present invention is to provide means for preventing contact of the hands of the user with the electrodes which are connected by the water within the vessel and this means may also preferably serve as a support for the objects to be heated or cooked. A further object of the invention is to provide a liquid conductor heater having an insulating vessel for containing the electrodes and the liquid by which they are connected in combination with a metallic cover arranged to engage parts of the vessel which are constructed to prevent any substantial leakage of current to the metallic cover, whereby an electric shock caused by touching the cover is prevented. Still another object is to provide a liquid conductor heater having spaced electrodes mounted within a vessel and having one of these electrodes provided with an insulating cover which prevents contact of the fingers of the user with one or both of these electrodes. A further object of the invention is to provide a liquid conductor heater having spaced metallic electrodes one of which is provided with an insulating plate detachably secured thereto. Another object of the invention is to provide a liquid conductor heater having a cover which may be inverted to serve as a sauce pan in which case the products which are to be heated are not contained directly within the chamber of the vessel in which the electrodes are located. Other objects relate to various features of construction and arrangement which will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings, in which one embodiment is illustrated. In the drawings,

Fig. 1 shows a vertical central section through a liquid conductor heater embodying the features of the present invention;

Fig. 2 is a top plan view of the liquid conductor heater shown in Fig. 1, with the cover removed and having certain parts broken away;

Fig. 3 is a vertical section through a modified form of the invention showing the use of an inverted sauce pan as a cover for the heating vessel; and

Fig. 4 is a side elevation of the device illustrated in Fig. 3, showing the cover in upright position to serve as a sauce pan.

As shown in the accompanying drawings, the improved liquid conductor heater of the present invention comprises a vessel 10, formed of porcelain or other insulating material, which is flared upwardly and outwardly as shown at 10a around the heating chamber 11 while the lower part is provided with a downwardly and outwardly flared flange 10b which is adapted to rest upon a table or other support. The flange 10b is provided with an aperture 12 to which the electrical conductors 13 lead from a source of current supply. These conductors are adapted to be connected to the terminal posts 14 and 15 which lead upwardly through the lower wall of the vessel 10 and are connected to the spaced electrodes above referred to. The lower electrode 16 is in the form of a flat circular metal plate resting directly upon the lower wall of the vessel and having welded or otherwise secured thereto the terminal post 14 and a similar post 14a. These posts extend downwardly through apertures in the lower wall of the vessel and are engaged at their lower ends by washers 17 and nuts 18. The post 14 is provided with an additional washer 19 and a nut 20 so that one of the wires 13 may be clamped between the washer 19 and the upper nut 18. The other terminal post 15 is provided at its upper end with an enlarged threaded portion 15a which is embedded in the lower wall of the vessel at its central point and which projects upwardly above this wall. The lower reduced part of the terminal post 15 projects beneath the lower wall of the vessel and is engaged by two washers 21 and two nuts 22, be-

tween which the other supply conductor 13 is clamped.

The upper electrode 24 is provided with a central hub 24a which threadedly engages with or permanently attaches to the upwardly projecting portion 15a of the central terminal post which extends upwardly through a central projection 10h of the lower wall of the vessel. This projection 10h extends through a central aperture formed in the lower electrode 16. When the upper electrode 24 is screwed downwardly on the portion 15a of the central terminal post, its lower surface engages the annular projection 10c which is spaced outwardly from the outer edge of the lower electrode and thus has a definite spaced relation with respect to the upper surface of the lower electrode 16. The lower wall of the vessel is preferably provided with an annular groove 10d which extends downwardly slightly below the lower level of the electrode 16 and is bounded on its outer side by the annular upwardly extending shoulder 10c. Around the outer edge of this shoulder 10c there is provided an annular groove 10e from which the inner surface of the vessel extends cylindrically upward as shown at 10f and then flares upwardly and outwardly. The upper electrode 24 is preferably provided with a plurality of apertures 24b for the purpose of providing a ready escape for bubbles and a ready return of liquid to the region between the electrodes, thereby obtaining a steady running current, and also for the purpose of bringing about an abrupt shut-off of the apparatus at the conclusion of the heating operation, as described and claimed in said Hanks and Mason Patent No. 1,683,071. For the purpose of preventing contact of the fingers of the user with the upper electrode and to provide a support for the objects to be heated or cooked, the upper electrode 24 is provided with an insulating plate 25, formed of porcelain or other electrical insulating material, which is of substantially the same diameter as the electrode 24 and which has its body portion spaced upwardly therefrom with the top surface at the level of the upper end of the cylindrical surface 10f of the vessel. The insulating plate 25 is also provided with a series of apertures 25b which are preferably of the same number and have the same distribution as the aperture 24b in the electrode 24 so that these two sets of apertures register with each other when the insulating plate is applied to the electrode. For the purpose of connecting the plate and the electrode, the plate is provided on its lower side with a plurality of downwardly extending cylindrical lugs 25a, each of which is provided centrally with an upwardly extending cylindrical recess 25c. The lugs 25a are adapted to rest directly upon the upper surface of the upper electrode 24 and the recesses 25c are adapted to be engaged by hook-shaped tongues 24c which are formed on the electrode 24. These tongues are preferably formed by bending upwardly parts of the plate 24 and then reversely bending these parts to form hook-shaped tongues having some resiliency so that they may be wedged into the recesses 25c and by frictional engagement with the walls of the recesses hold the two plates in a firm but detachable connection with each other. The insulating plate 25, when thus secured in place upon the upper electrode 24, effectually prevents accidental contact of the fingers of the user with the electrodes and at the same time provides a support upon which objects to be cooked or heated may be placed. This insulating cover 25 may be otherwise applied to the electrode, but is preferably secured as above described.

The vessel 10 is provided with a dome-shaped metallic cover 27 which is adapted to be supported at its lower edge upon the upper portion of the vessel 10. This cover 27 is preferably provided on its outer side with nickel or chromium plating to increase its ornamental appearance and at its upper central part it is provided with an outwardly flared receptacle 28, formed of insulating material, which serves not only as a handle for the cover but also as a receptacle from which a measured quantity of liquid to be vaporized is supplied gradually to the interior of the vessel 10. The chamber 29 of this receptacle communicates with a restricted opening 30a which is formed in a central threaded fitting 30 extending downwardly through an aperture in the central upper part of the cover 27 and engaged at its lower end by a nut 31 by which the combined handle and receptacle 28 is secured on the cover. Instead of resting the lower edge of this cover directly on the annular shoulder 10c which is formed around the upper and inner portion of the vessel 10, this shoulder is provided at widely spaced intervals with integral radially extending lugs 32 which are of angle shape so that they engage the lower edge and outer annular edge of the cover for holding it in a predetermined position on the base. These lugs thus space the lower edge of the cover from all of the adjacent annular parts of the vessel 10 so that the cover has only a limited contact with the vessel in which the electrodes and the vaporizable liquid are contained. These lugs effectually prevent any substantial leakage of current from passing upwardly from the electrodes along the damp walls of the vessel 10 to the metallic cover 27 so that the danger of shock by such leakage of current is overcome. The cover 27, although preferably formed of metal, may be formed of other materials, and may be provided with a vent hole 27a to permit the escape of vapor.

In the operation of the apparatus, a measured quantity of liquid is supplied through the restricted opening 30a from the receptacle 28 and this liquid falls downwardly and finds its way around the plate 25 and through the apertures 25b to the upper electrode 24 so that it is then permitted to pass downwardly through the apertures 24b to establish a connection between the two electrodes and thereby complete the circuit, assuming that the conductors 13 are connected to a source of current supply. When the two electrodes are connected by the liquid, the current begins to flow with the result that the liquid is gradually vaporized and the vapor rises upwardly through the apertures 24b and through and around the insulating plate 25 to contact with and effect the heating or cooking of the objects which are supported under the cover 27. The upper level of the liquid within the vessel 10 will depend upon the quantity thereof which is supplied and this level will ordinarily be below the upper surface of the insulating plate 25 at starting although the bubble structure formed by the passage of the current may subsequently rise above that level. The vaporization of the liquid continues until it is evaporated to substantial dryness, when the flow of current ceases. At this stage, there is no possibility of the con-

tact of the finger of the user with the electrodes and there is little possibility of leakage current passing upwardly along the wall of the vessel 10 because such currents passing from the lower electrode 16 are intercepted by the outer edges of the upper electrode 24 which is preferably connected to the grounded side of the electric circuit.

In Figs. 3 and 4 there is illustrated a modified form of the invention in which the vessel 40 is similar to the vessel 10, previously described, and is provided with similar equipment including a lower electrode 41, an upper electrode 42, an insulating cover plate 43 for the upper electrode, and terminal posts 44 and 45 which are connected to the lower and upper electrodes, respectively. The upper electrode is provided with apertures 42a and the insulating plate 43 is provided with apertures 43a, thus permitting the ready escape of bubbles and vapor as well as permitting the ready downward flow of liquid supplied to the vessel or returned by condensation as vapor originally produced in the vessel. The vessel 40 is provided adjacent its upper part with an annular shoulder 40a upon which are formed a plurality of radially extending shoulders 46 which are similar to those previously described and which are adapted to support the cover 47. This cover is in the form of an inverted pan having a cylindrical wall 47a and a circular top wall 47b which may be flat, as shown, or outwardly depressed to form a crown as shown by dotted lines. At one side, a handle 47c is attached to the cylindrical wall 47a to extend laterally therefrom. The pan or cover 47 is preferably formed of metal which may be provided either on the inside or the outside thereof, or on both sides, or on one or both surfaces of the wall 47b, with an insulating coating adapted to minimize the leakage current which may pass upwardly to the cover through the bubble structure which is formed above the electrodes by the passage of current through the liquid. By thus coating the pan or cover, in addition to supporting it upon the lugs 46, it is possible to substantially eliminate danger of shock by reason of contact of the fingers of the user with the metallic cover. When the operator wishes to use the cover 47 as a sauce pan, it may be inverted, as shown in Fig. 4, in which case the edges of the bottom wall 47b rest upon the ledges 46 so that there is only a limited contact of the metallic pan with the wall of the vessel 40. The objects to be heated and cooked may then be placed in the pan and will be heated by the action of the steam or vapor upon the under side of the vessel 47b.

Although two forms of the invention have been shown and described by way of illustration, it will be understood that it may be constructed in various other forms within the scope of the appended claims.

We claim:

1. The combination in a liquid conductor heater, of a vessel adapted to contain a measured quantity of liquid to be vaporized, a pair of superimposed spaced electrodes between which current passes through said liquid, means for independently supporting each of said electrodes and an insulating plate mounted on and supported entirely by the upper one of said electrodes.

2. The combination in a liquid conductor heater, of a vessel adapted to contain a measured quantity of liquid to be vaporized, a pair of superimposed spaced electrodes between which current passes through said liquid, and an insulating plate mounted on and supported entirely by the upper one of said electrodes, said upper electrode and said plate being provided with a plurality of apertures therethrough.

3. The combination in a liquid conductor heater, of a vessel adapted to contain a measured quantity of liquid to be vaporized to substantial dryness, an electrode mounted in the lower part of said vessel, said vessel having an annular shoulder around the outer edge of said electrode, an upper electrode spaced from said first-named electrode and having its outer edge engaging said shoulder, and an insulating plate mounted upon said upper electrode.

4. The combination in a liquid conductor heater, of a vessel adapted to contain a liquid to be vaporized, a pair of spaced electrodes mounted in the lower part of said vessel, an insulating plate having lugs engaging one of said electrodes and spacing said plate therefrom, and means for securing said lugs to said electrode engaged thereby.

5. The combination in a liquid conductor heater, of a vessel adapted to contain a liquid to be vaporized, a pair of spaced electrodes mounted in the lower part of said vessel, an insulating plate having lugs engaging one of said electrodes and spacing said plate therefrom, said lugs having recesses formed therein, and tongues formed on said last-named electrode for detachable engagement with said recesses.

6. The combination in a liquid conductor heater, of a vessel adapted to contain a quantity of liquid to be vaporized to substantial dryness, a pair of electrodes located one above the other in the lower part of said vessel, an insulating plate mounted above the upper one of said electrodes and having insulating lugs spacing said plate from said upper electrode, said lugs being provided with upwardly extending recesses, and reversely bent tongues formed on said upper electrode and engaging said recesses.

7. The combination in a liquid conductor heater, of a vessel adapted to contain a liquid to be vaporized, a pair of spaced electrodes located in the lower part of said vessel to be connected by said liquid, a metallic cover for said vessel, and relatively small insulating members carried by said vessel and engaging said cover at widely spaced intervals for supporting said cover on said vessel.

8. The combination in a liquid conductor heater, of a vessel adapted to contain a liquid to be vaporized, a pair of spaced electrodes located in the lower part of said vessel to be connected by said liquid, a metallic cover for said vessel, said vessel having an annular shoulder around the upper part thereof, and a plurality of widely spaced insulating lugs of angular formation formed on said shoulder and engaging the lower edge of said metallic cover for supporting said cover out of contact with said shoulder.

9. The combination in a liquid conductor heater, of a vessel adapted to contain a liquid to be vaporized, spaced electrodes mounted in said vessel to be connected by said liquid, and insulating means mounted on and in spaced relation to one of the electrodes for supporting objects to be heated.

10. The combination in a liquid conductor heater, of a vessel adapted to contain a liquid to be vaporized, a pair of superimposed, spaced electrodes between which current passes through said liquid, and an insulating plate supported on

and in spaced relation to the upper electrode for supporting objects to be heated.

11. The combination in a liquid conductor heater, of a vessel adapted to contain a quantity of liquid to be vaporized, a pair of spaced electrodes mounted in said vessel to be connected by said liquid, said electrodes being so mounted and positioned in said vessel that there is a free and unobstructed flow of said liquid to the space between said electrodes, and insulating means mounted over and in spaced relation to said electrodes for supporting objects to be heated and preventing contact of the fingers of the user with said electrodes.

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