May 2, 1950 W. R. TUTTLE 2,506,554

HINGED HEATING UNIT

Filed Dec. 6, 1944 2 Sheets-Sheet 1

Fig. 1.

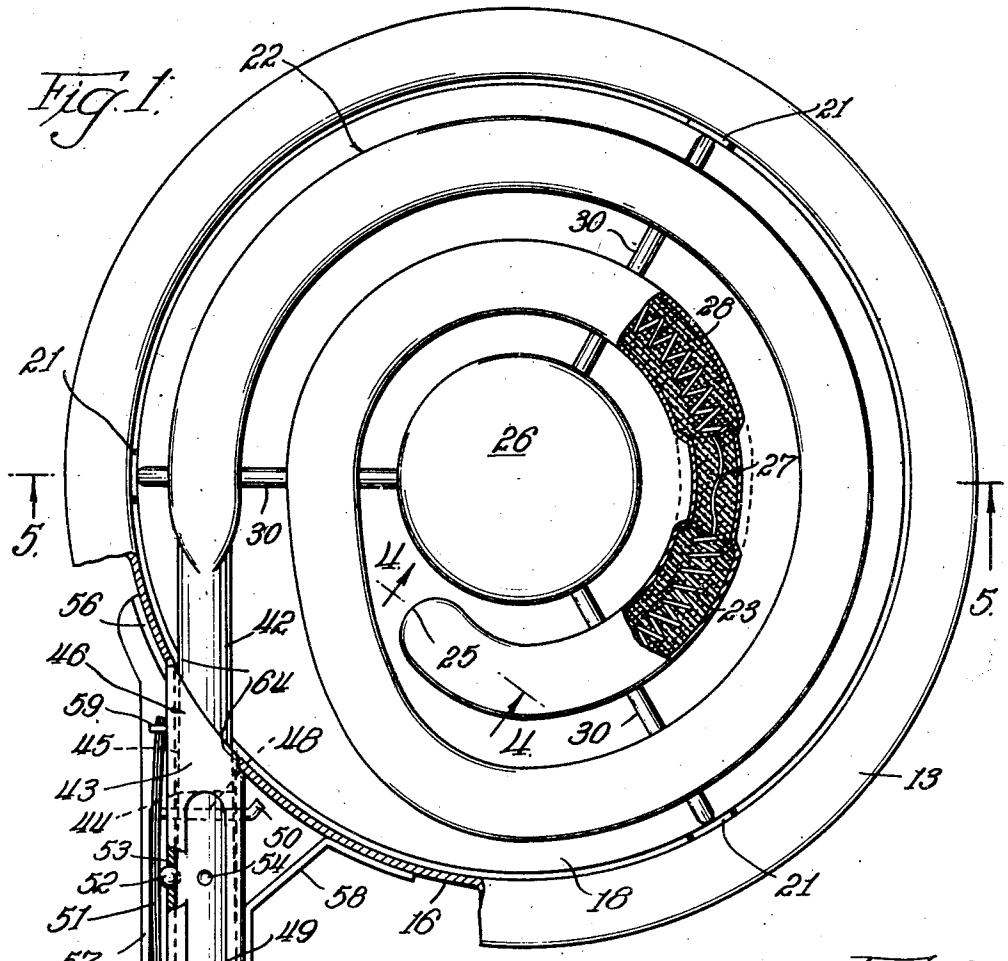


Fig. 2.

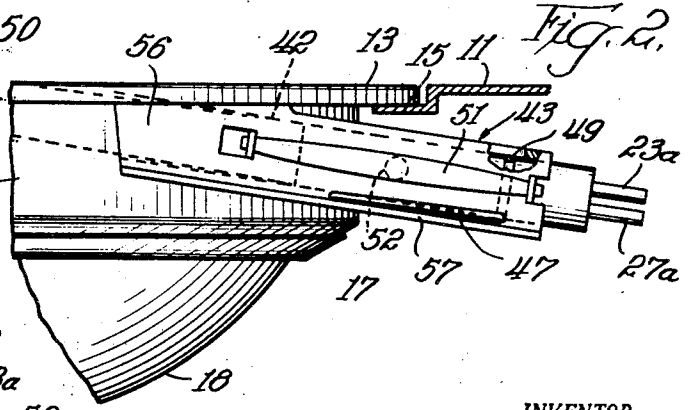
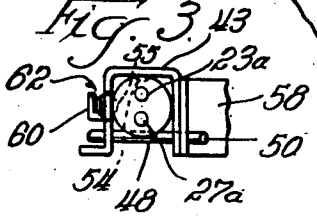


Fig. 3



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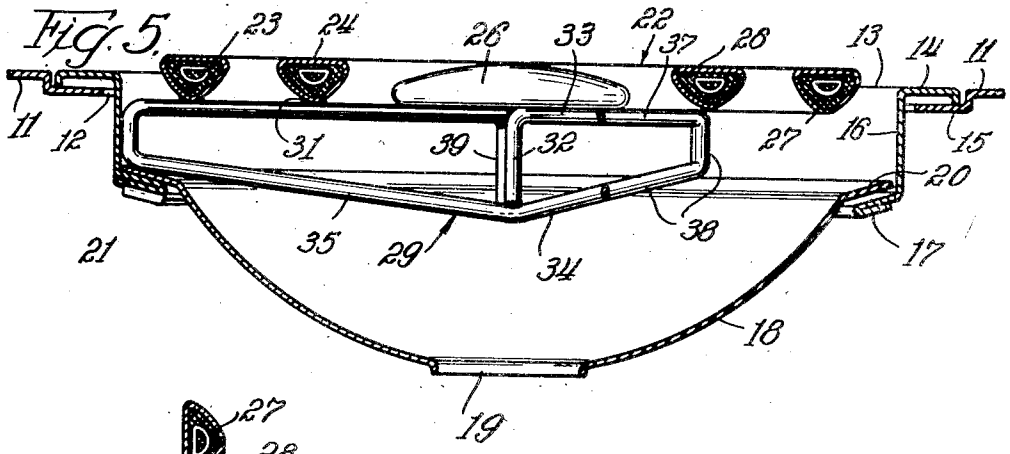
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HINGED HEATING UNIT

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Fig. 5.



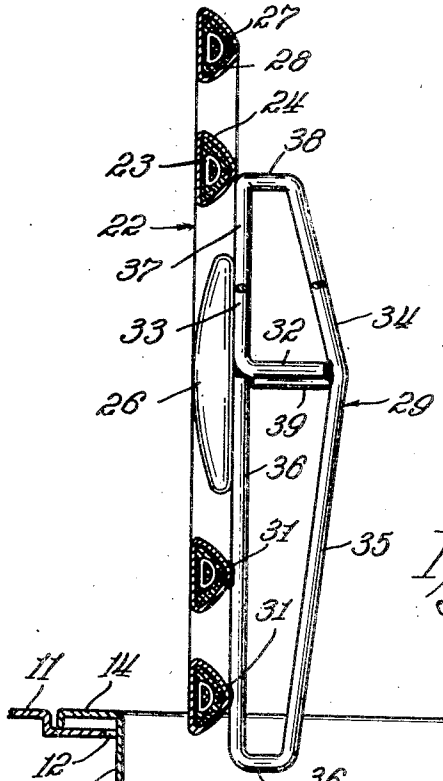
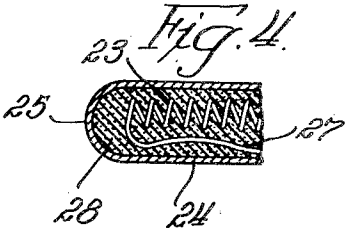
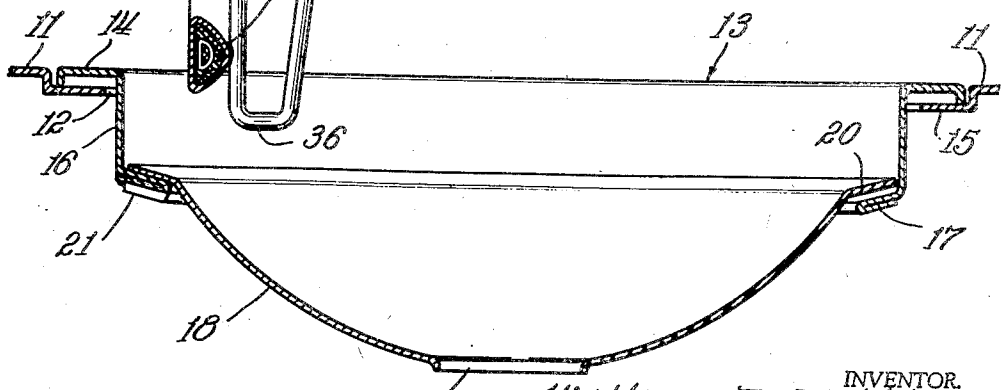


Fig. 6.

Fig. 4.





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HINGED HEATING UNIT

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Application December 6, 1944, Serial No. 566,856

8 Claims. (Cl. 219—37)

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My invention relates to electric heating units of the sheathed resistor type and has reference more particularly to a construction thereof that is particularly adaptable to pivotal mounting.

This application is a continuation in part of my co-pending application Serial No. 566,855 (Patent No. 2,456,343) which discloses a coiled tubular sheath closed at one end and containing a resistor which has all of its terminals projecting from the other end of the sheath, and is also a continuation in part of my co-pending application Serial No. 430,684 (Patent No. 2,368,051) which discloses the opposite ends of the tubular sheath of a coiled electric heater aligned and journaled in aligned bearings.

For many years it has been the prevailing practice, particularly in surface type heaters for electric ranges and similar purposes, to utilize a helical resistance which is enclosed in a tubular metal sheath and insulated therefrom by an insulating powder, such as magnesium oxide, which fills the tube and is compacted in and around the resistance so as to hold it centrally in the tube. Such sheathed resistors may be bent in the various shapes that may be required for the particular heating purpose and may also be flattened if desired to increase surface contact thereof with a utensil or other article to which heat is to be communicated from the heater.

When such heaters are used as surface units for electric ranges and other similar purposes, it has been customary to bend them in serpentine, spiral, or other appropriate form to provide the required heating area with suitable concentration and distribution of heat in that area, and moreover such units are usually located over a pan like member which not only serves as a reflector to direct the radiated heat from the unit to the pan or utensil that is placed thereon but also serves to collect any drippings or overflow from the pan or utensil.

In such cases it is frequently necessary to clean the unit on the underside and also to clean the reflector pan thereunder and accordingly it is the practice, when these heating units are employed for range surface units and similar purposes, to arrange the heating unit for removal or sufficient lifting from the pan like reflector to afford access to the reflector pan and to the underside of the unit for cleaning.

Hinging of the unit at one side of the reflector pan so that it can be tipped up therefrom for cleaning is the most desirable arrangement to permit separation of the unit from the pan for cleaning the underside of the unit and the reflector pan, but such hinging has heretofore been difficult and uneconomical because of the peculiar nature of these heaters and the electrical connections which must be capable of shifting as

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the unit is tipped up and at the same time maintained intact at all times.

In the prevailing types of surface heating units, it has been the practice to enclose each resistor in a sheath with the terminals of the resistor projecting from the opposite ends of the sheath and with such sheathed resistances, when bent in this conventional serpentine or spiral form it is necessary to extend both ends thereof to the place of hinging so that electrical connections may be made with the end terminals of the resistance at a place where such connections are least disturbed in the tipping up operations for cleaning. At least one end of the resistance usually terminates centrally of the heating area where it is not only difficult to extend same satisfactorily to the place of hinging but it involves awkward and undesirable bending of the sheathed heater to locate both terminals at the place of hinging.

Moreover, it is desirable in these surface heaters of electric ranges to provide a number of different intensities of heat and for this purpose it is customary to employ several separate resistances, each independently sheathed, and connected through suitable switch as indicated in Tuttle Patent 2,317,967 to be selectively energized separately and conjointly to afford a number of different heating stages, in which cases it is even more awkward and difficult to locate the terminals of the several sheathed resistances at the place of hinging.

Furthermore even with a single sheathed heater having a terminal at each end as they are commonly made, it is quite difficult to provide a satisfactory hinge connection thereof for lifting from the reflector pan and the difficulties thereof are greatly increased when several such sheathed resistances are employed because of the additional terminals that must be extended to the hinging location and each provided at that location with an electrical connection therewith that permits and is unaffected by repeated tipping up of the unit that is necessary for cleaning.

Various forms of hinging connections have been employed for this purpose, usually with some cumbersome form of fitting or housing into which all of the terminal ends of the sheathed resistors are secured and oftentimes with some awkward form of hinging which does not lend itself to easy manipulation of the heating unit to the tipped up cleaning position and return thereof to the normal position of use.

The principal objects of my invention are to provide an improved form of sheathed resistor which may be hinged in a simple and satisfactory manner so that it may be readily swung to and from its normal position; to permit several resistors to be employed, if desired, in the heater with the same simplicity and convenience of

hinging as, with a heater having a single resistance; to permit a better distribution and more efficient utilization of the heat output of electrical heaters; to effect economies that will materially reduce the cost of electrical heaters; to arrange the terminals so that electrical connections with a hinged heater are conveniently made and in such manner that they are not impaired by repeated swinging of the heater to and from its normal position; to provide an improved composite assembly of heater, reflector pan and mounting ring; and in general to simplify, facilitate manufacture, minimize cost, increase the efficiency and utility of sheathed resistor heaters and assemblies thereof and permit hinging of the heater in a more satisfactory and convenient manner than heretofore, these and other objects being accomplished as pointed out hereinafter and as shown in the accompanying drawings in which

Fig. 1 is a top view of a heating unit made in accordance with this invention, assembled for mounting in a range top, parts of the heating unit and mounting ring being broken away to disclose details of construction;

Fig. 2 is a side view of the hinge mounting of the unit of Fig. 1 and shows a fragmentary portion of the range top in which the assembled unit is mounted;

Fig. 3 is an end view of the hinge mounting of the unit of Fig. 1;

Fig. 4 is a sectional view of the inner end of the sheathed heater taken on the line 4—4 of Fig. 1;

Fig. 5 is a sectional view of the unit assembly taken on the line 5—5 of Fig. 1 and showing adjoining portions of the range top in which the unit assembly is mounted, one of the arms of the wire spider which supports the heating unit having the outer end portion thereof broken away to disclose the other spider arm therebehind; and

Fig. 6 is a view similar to Fig. 5 but showing the heating unit in the tipped up position.

In said drawings, which illustrate an embodiment of the invention suitable for use as a surface unit of an electric range or the like, the reference numeral 11 indicates a range top in which the unit is mounted and which has the usual opening 12 therethrough within which the heating unit assembly is located.

A ring 13, similar to the rings usually provided for mounting electrical heating units in range tops, fits in the opening 12 and supports the unit, said ring constituting a part of the unit assembly and having an outturned annular flange 14 around the top which rests on the margin of the range top opening, said margin being preferably depressed as indicated at 15 to provide an annular seat for the flange 14 so that the top of the ring 13 is flush or substantially flush with the range top 11.

This ring 13 has a depending skirt portion 16 formed therearound at its lower end with an inwardly extending flange 17, preferably folded as shown, upon which a reflector and drain pan 18 is removably supported, said drain pan 18, which may have a central drain opening 19, being provided with an outturned marginal flange 20 which extends over the supporting flange 17.

Space for air circulation is provided around the pan 18 and to this end the diameter of the pan is sufficiently less than the internal diameter of the skirt 16 to leave a substantial ventilation space between the skirt 16 and the pan margin 20, and the folded flange 17 is also bumped up at intervals therearound to provide spaced elevations 21 upon which the marginal flange 20 of the pan rests so that between the elevations 21 the pan flange 20 is spaced sufficiently above the skirt flange 17 to afford substantial ventilation space therebetween.

The flange 17 and bumps 21 preferably slope downwardly from the skirt as shown and the pan margin 20 is correspondingly sloped, which correspondingly sloped arrangement not only serves to facilitate centralized positioning of the pan 18 within the skirt 16 but also provides upward direction of air flow between the overlapping pan margin and skirt flange. The central drain opening 19, which also contributes to ventilation, is preferably sufficiently large so that the finger may be engaged therein for convenience in removing the drain pan which merely rests upon the bumps or elevations 21 and is liftable readily therefrom.

The heating unit 22 is of conventional metal tubular sheathed type wherein a helical resistance wire is embedded in compacted insulation within a length of seamless or butt welded tubing but differs from such conventional metal tubular sheathed heating units in the respect that all of the terminals for the contained resistance are at one end of the metal tube and the other end thereof is closed as for example by contracting and welding together that end of the metal tube or by welding a closure cap thereon as explained in my aforesaid application Serial No. 566,855.

In my aforesaid application Serial No. 566,855 of even date herewith metal tubular sheathed heating units are disclosed having more than one helical resistance embedded in compacted insulation within a single tubular metal sheath which is closed at one end and has all of the terminals at the other end and any of such plural resistance heating units with all of the terminals at one end may be employed in connection with the present invention although for illustrative purposes herein I have merely shown a single helical resistance with a return wire leading therefrom at the inner closed end of the tubular sheath to the other end of the tubular sheath where two terminals project for connection with the source of current by which the resistor is energized.

In the illustrated heating unit 22, which is bent in the form of a flat spiral to provide a suitable heating surface for cooking and similar purposes as required in surface type units of electric ranges, the helical resistance is indicated at 23 and extends from end to end of the metal tubular sheath 24 which is closed at the inner end as indicated at 25 and at the outer end of said sheath said resistance 23 is provided with a terminal 23a of low resistance which is electrically connected with the resistance 23 within the sheath near the outer end thereof and projects therefrom for connection with a suitable source of electric current.

A return wire 27 leads from the inner end of the helical resistance 23 back through the tubular sheath 24 to the outer end thereof where it is also provided with a terminal 27a of low resistance which is likewise electrically connected within the sheath near the outer end thereof with the return wire 27 and projects from the outer end of the tubular sheath 24.

This return wire 27 may be a separate conductor joined to the helical resistance 23 at the inner closed end of the tubular sheath 24 but I

prefer to employ as the return wire an additional integral portion of the wire of which the resistance 23 is formed, and running back within the tube 24 under the resistance 23 to the outer end of the sheath, it being understood, of course, that the resistance 23 and return wire 27 are embedded in compacted insulation 28 in separated relation from one another and from the sheath 24 so that they are electrically insulated from one another and from the sheath 24 throughout their length.

In practice, I have found that a particular satisfactory return wire may be provided by forming a helix of the resistance wire of a greater length than required for the resistance 23 and then stretching out a number of surplus coils of the helix at one end almost straight and bending this almost straight length back as shown in Fig. 4 in parallel spaced relation to the helix 23 to serve as the return wire but leaving enough twist therein for lengthwise extensibility to insure some extra length for expansion and contraction and any longitudinal strains that may be exposed on the return wire in the manufacture or use of the unit.

The helix 23 is of ordinary cylindrical form when assembled in the tube 24 and the connected ends of the helix and of the return length 27 are held in the proper location at one end of the tube 24 while the insulation 28 is supplied and compacted in the tube as will be understood by reference to my aforesaid application Serial No. 566,855 of even date herewith, the insulation being sufficiently compacted so that the assembled structure may thereafter be bent into the spiral form disclosed herein and also flattened without disturbing the relative location of the resistance 23 and return wire 27 in the tube. Ordinarily, in units such as disclosed herein, the flattening occurs after the bending into the spiral form, in which operation the helix 23 is deformed transversely into a shape that conforms substantially to the flattened shape of the sheath or tube 24 as shown herein.

For holding this spiral sheathed unit rigidly in flat spiral form a spider 29 is employed formed of a stiff heavy wire which is bent into the requisite form with three radial arms 30 the upper lengths 33, 36 and 37 of which are welded to the spiral unit as indicated at 31.

This spider 29 is preferably formed of a single length of wire with a down turned end 32 at the center of the spider and the wire leading from the top of said down turned end 32 radially outward at 33 then downwardly and back to the center as at 34, then radially outward as at 35, then upward and back to the center as at 36, then radially outward as at 37, and then downwardly and back to the center as at 38 where it terminates in an upturned end 39, said downturned end 32 and upturned end 39 being rigidly secured to one another by welding or in other convenient manner to form a composite hub from which the three wire arms radiate, and the intersections of the top wires 33, 36, 37 and bottom wires 34, 35 and 38 being secured together and to the upper and lower ends of the composite hub 32, 39 by welding so as to afford ample rigidity.

A dish or shell 26 is usually provided at the center of these units which may serve as a name plate and this is attached to the arms of the spider in any convenient manner.

This spider 29 is particularly advantageous as it not only is easily produced but it affords an especially strong reinforcement and support for the spiral unit and moreover it provides a ventilated support all parts of which are rounded

and has no sharp edges that might scratch or injure the hands in cleaning the unit.

The outer ends of the spider arms 30 rest loosely on the flange 20 of the pan 18, preferably at the places where the flange 20 rests on the bumps 21 and thus the heating unit 22 and its spider are supported by the mounting ring 13 and preferably at a suitable elevation so that the flat top of the heating unit is only slightly above the top of the ring flange 14 which as previously indicated is substantially at the same level as the range top 11.

The pan 18 as previously indicated serves as a drain pan and also as a reflector to direct the heat upwardly to the utensil on the unit 22, and as the pan 18 as well as the underside of the unit require cleaning occasionally, it is necessary to arrange the heating unit so that it can be elevated to permit access to the underside thereof and to the pan 18, and this lifting must be accomplished while maintaining intact the electrical connections with the unit through which current is supplied thereto.

For this purpose the outer end portion 42 of the unit 22 is arranged to extend tangentially from the outer convolution of the unit as shown in Fig. 1 and is inclined downwardly from the plane of the unit as shown in Fig. 2, this downward inclination being sufficient so that this end portion 42, at the place where it extends outwardly from the ring 13 is well below the flange 14 to afford ample space therebetween to accommodate the margin of the top 11 as will be understood from Fig. 2, and this tangential downwardly inclined end portion 42 is engaged in a correspondingly inclined housing 43 on the ring 13 in which said portion 42 is free to turn and thus provide a hinge connection of the unit with the ring 13 which allows the unit to rest normally on the pan rim 20 as shown in Fig. 5 and to swing upwardly to the position shown in Fig. 6. In this latter position the underside of the unit is freely accessible for cleaning as is also the pan 18, and it will also be understood that in this position of the unit the pan 18 is freely removable so that it may be cleaned more readily and also to give access to the space under the range top.

The housing 43 is preferably of sheet metal shaped in elongated open bottom box form as shown in Fig. 3 and of an interior size so that the unit end portion 42, which is round, is closely confined but free to turn therein. Preferably bearing engagement with the housing 43 is limited to a selected length at the outer end of the tangential portion 42 and to this end, in the swaging operation of making the unit, a substantial portion at the end, as for example up to the point 44 in Fig. 1, is left of a larger diameter than the remainder of the unit and with a gradual taper 45 therefrom down to the size to which the remainder of the unit is swaged. For example with a unit that is swaged to a diameter of three-eighths of an inch, the portion at the terminal end up to the point 44 may be left one-half inch in diameter with a gradual taper 45 therefrom down to the point 46 beyond which the sheathed unit is reduced to the three-eighths inch diameter, it being understood that it is the three-eighths inch diameter portion that is coiled in the serpentine form to produce the utensil supporting surface and that this serpentine coiled portion is subsequently flattened, but that the flattening extends only to the point where the tangential portion 42 is deflected downwardly as is clearly shown in Fig. 1, the tangential portion 42 remaining round.

For holding the end portion 42 in the open bottom housing 43, a wire fastener 47 of wide staple-like form has the legs 48 thereof inserted through the side walls of the housing near the bottom thereof so that the legs engage the end portion 42 at the bottom and hold said end portion 42 against the top wall of the housing, said end portion 42 being formed with a circumferential groove 49 in which one of the legs 48 of the wire fastener engages to hold the end portion against axial movement in the housing. The wire fastener is held in place by bending the outer extremities of legs 48 as indicated at 50.

For holding the heating unit in the tipped up position of Fig. 6 a leaf spring 51 is secured at its opposite ends to the outer wall of the housing 43 and at its middle bears with substantial tension against a ball 52 which projects through an opening 53 in the side wall of the housing to engage the enlarged end portion of the unit 22. This enlarged portion of the unit has two depressions 54 and 55 circumferentially spaced approximately 90 degrees apart, which are engageable by the spring pressed ball 52 and suitably arranged so that when the unit is in the tipped up position of Fig. 6 the ball is spring pressed into the depression 54 so that it holds the unit in the tipped up position whereas when the unit is in the normal position of Fig. 1 the ball 52 is spring pressed in the depression 55 to hold the unit positively in that position.

The pivot housing 43 may be attached to the ring 13 in any convenient manner that will insure ample rigidity, the housing in the present case having the outer wall provided with an extension 56 thereof shaped to conform to the contour of the skirt 16 of the ring and secured thereto by welding or in any other convenient manner, said outer wall and extension being also preferably provided with a continuous outturned flange 57 along the bottom thereof for reinforcing.

At the opposite side of the housing the housing wall is terminated at the skirt 16 and a brace 58 is attached at one end to said housing wall and at the other end to the skirt 16 as shown to hold the housing in rigid relation to the ring 13.

The wall of the housing 43 at the side thereof where the spring 51 is located is preferably formed with outturned ears 59 and 60 to receive and hold the ends of the spring 51, the ear 59 preferably having a closed slot into which the end of the spring 51 is insertible endwise whereas the other ear 60 has a slot 62 which is open at the top so that the corresponding end of the spring is insertible laterally into the slot 62.

The ball opening 53 in the housing wall is of suitable shape and size so that the ball 52 may not be pressed entirely therethrough by the spring 51, and by reason thereof the ball is retained in said opening when the heating unit end is removed from the housing 43.

It is to be understood of course that the skirt 16 of the ring 13 has an opening therethrough at the inner end of the housing 43 to loosely accommodate the tangential end 42 of the unit, said opening being indicated at 64 in Fig. 1, and it will also be understood that when mounted in a range, conductors are connected to the exposed terminals 23*a* and 27*a* of the unit at the outer extremity of the tangential end 42 which projects slightly beyond the outer end of the housing 43 as shown in Figs. 1 and 2.

Heating units, like that shown herein, but having two or more helical resistances therein and all the terminals at one end of the enclosing sheath may be employed if desired instead of the illustrated heating unit with its single resistance 23 and single return wire 27, as for example two resistances of different wattage capacities may be employed, both connected to a single return wire or each having its own return wire and each resistance and each return wire having a terminal, all of which are located at the same end of the sheath and usable with switches such as disclosed in the aforesaid Tuttle Patent 2,317,967 to provide a number of different stages of heat, or as a further example, three resistances each of a different wattage capacity may be employed, without any return wires, and all connected together at the closed end of the enclosing sheath and provided with exposed terminals at the other end of the sheath, it being understood that the heating unit 22 hereof, which is usable with an ordinary switch for single heat purposes or with a switch such as shown in Potter Patent No. 2,294,573 for infinite variation of heat intensity, is merely illustrative of the convenience and economy of metal tubular sheathed heating units with all the terminals at one end of the sheath and the simple mounting for which such units are adaptable.

Flexible conductors are connected with the terminals of the unit to supply current thereto, as for example to the terminals 23*a* and 27*a* of the illustrated embodiment, and as the terminals are close to the pivotal axis of the unit there is no appreciable bending of the conductors which is likely to break the insulation or wires in repeated tipping up of the unit but merely a slight twisting thereof which has no appreciable breakdown effect on the conductors such as is commonly experienced with other hinge arrangements of heating units.

From the foregoing, it will be understood that I have provided a heating unit and mounting thereof which is simple, substantial and with important advantages over heating units and assemblies heretofore available. The heating unit is of neat, compact and substantial appearance because of the single coil construction without the one or more ends leading back underneath to the place of hinging which were required in previous surface heating units and because of the wire spider which lends attractiveness and obvious stability to the unit, and there are no abrupt or unnecessary bends which are usually difficult to make and are usually the places where the unit is most likely to break down.

Moreover the hinging of the unit is simple and substantial and more readily accomplished than in previous surface heating units, and also permits conductors to be connected with the unit at a place and in a manner that assures so little bending thereof that they are immune to the wear and tear therein occasioned with previous hinging arrangements.

Furthermore with this heating unit there is substantial economy in manufacture due not only to the employment of a single sheath for all resistances instead of separate sheaths therefor when several resistances are employed, but there is also a saving in tubing, insulation and conductors that has been required heretofore to extend both ends of the sheathed resistances to the place of hinging for connection of the current supply conductors therewith.

While I have shown and described my invention in a preferred form, I am aware that various changes and modifications may be made therein without departing from the principles of the invention, the scope of which is to be determined by the appended claims.

What I claim is:

1. A pivotally mounted electric heater of the class described comprising a metal tube coiled in the form of a flat spiral and having the inner end closed and having an outer end portion extending substantially tangentially from the outer coil of the spiral, and a bearing in which said substantially tangential outer end portion of the tube is journaled, said tube having therein an electrically energizable helical resistance and a return conductor both of which extend lengthwise of the tube and are electrically insulated throughout their length from one another and from the tube and are electrically connected to one another at the inner closed end of the tube and each having a terminal at the outer end of the said substantially tangential outer end portion of the tube.

2. In a heater of the class described the combination of a mounting ring having a substantially tangential bearing, a heater coil in the ring comprising a metal tube coiled in the form of a flat spiral and having an outer end portion extending substantially tangentially from the outer coil of the spiral and journaled in said bearing, said tube having therein an electrically energizable resistance which extends lengthwise of the tube and is electrically insulated therefrom, and a pair of terminals at the outer end of the substantially tangential outer end portion of the tube and electrically connected respectively with the opposite ends of said resistance.

3. An electrical heater comprising a length of metal tubing which is open at one end and closed at the other end and coiled in flat spiral form with a straight portion at the open end thereof extending tangentially from the outer coil of the flat spiral, and a supporting frame for said flat spiral having a bearing in which said tangential portion of the tubing is engaged for hinging the flat spiral to the supporting frame, said tubing having a plurality of electrical conductors, at least one of which is a helical resistance, extending lengthwise thereof in side by side relation and insulated from one another and from the tubing and said conductors having terminals projecting from the outer end of the aforesaid tangential portion and said conductors being connected together at the other closed end of the tubing.

4. In an electrical heater of the class described the combination of a mounting ring having a bearing extending substantially tangentially therefrom, a coiled heater supported in the opening of said ring and having an end portion projecting outwardly through said bearing and provided with separate electrical terminals projecting from the outer end thereof, said coiled heater comprising a metal tube with at least two conductors, one of which is a helical resistance, extending through said tube from the aforesaid terminals to the other end of the tube, the latter end of the tube being permanently closed and the conductors being connected together therein at said closed end of the tube.

5. A pivotally mounted electric heater comprising a bearing and a flat winding of metal tubing one end of said tubing being open and engaged in the bearing and the other end of said tubing being closed and free, said tubing having therein an electrically energizable resistance which extends lengthwise of the tubing and is electrically insulated therefrom and provided with leads through which the energizing current is supplied thereto from the exterior of the tubing, all of which said leads project outwardly through said open end of the tubing.

6. A pivotally mounted electric heater comprising a bearing and a flat winding of metal tubing, one end of said tubing being open and the other end of said tubing being closed, the end portion of the tubing at the open end thereof being located at the margin of the flat winding and engaged in the bearing to provide the pivotal mounting of the heater and the tubing at the closed end thereof being free, said tubing having therein an electrically energizable resistance which extends lengthwise of the tubing and is electrically insulated therefrom and provided with leads through which the energizing current is supplied thereto from the exterior of the tubing, all of which said leads project outwardly through said open end of the tubing.

7. A pivotally mounted electric heater comprising a bearing and a flat winding of metal tubing, one end of said tubing being open and the other end of said tubing being closed, the end portion of the tubing at the open end thereof being extended substantially tangentially from the margin of the flat winding and engaged in the bearing to provide the pivotal mounting of the heater and the tubing at the closed end thereof being free, said tubing having therein an electrically energizable resistance which extends lengthwise of the tubing and is electrically insulated therefrom and provided with leads through which the energizing current is supplied thereto from the exterior of the tubing, all of which said leads project outwardly through said open end of the tubing.

8. A pivotally mounted electric heater comprising a bearing and a flat winding of metal tubing, one end of said tubing being open and the other end of said tubing being closed, the end portion of the tubing at the open end thereof being extended through the bearing as the journal member thereof to provide the pivotal mounting of the heater and the tubing at the closed end being free, said tubing having therein an electrically energizable resistance which extends lengthwise of the tubing and is electrically insulated therefrom and provided with leads through which the energizing current is supplied thereto from the exterior of the tubing, all of which said leads extend from the open end of the tubing through that portion of the tubing which is engaged in the bearing.

WILLIAM R. TUTTLE.

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