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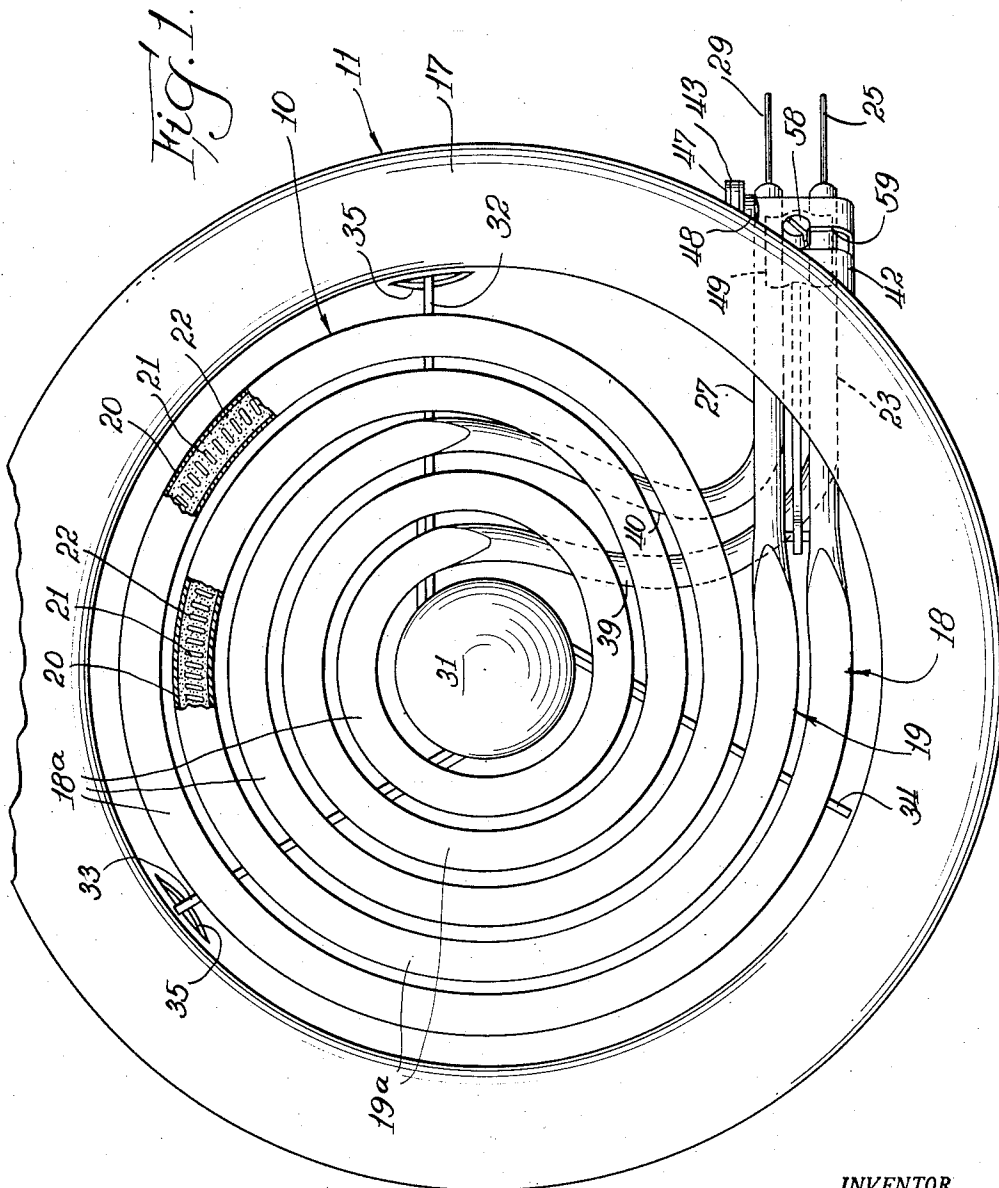
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2,831,100

HEATING UNIT END MOUNTING

Filed Nov. 1, 1954

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

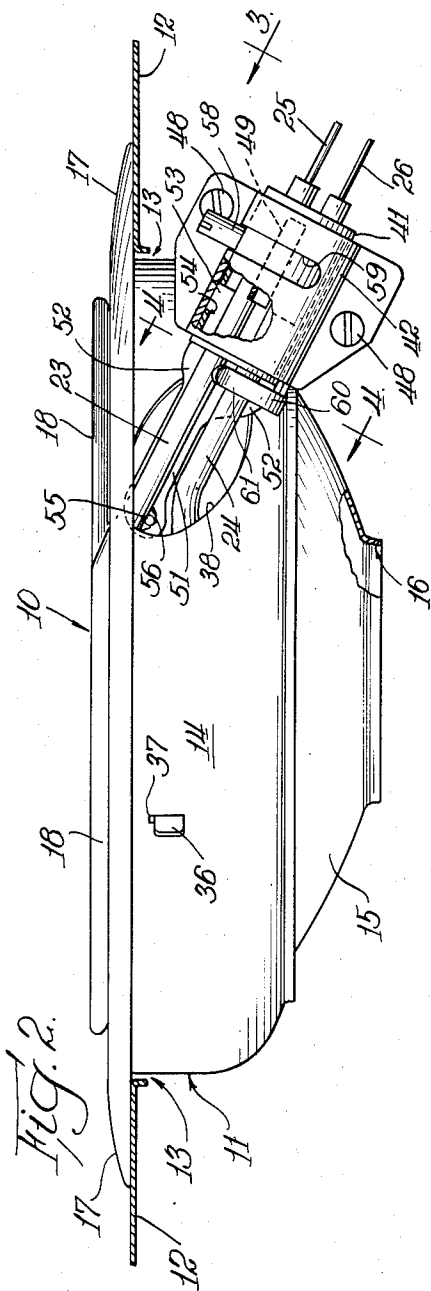
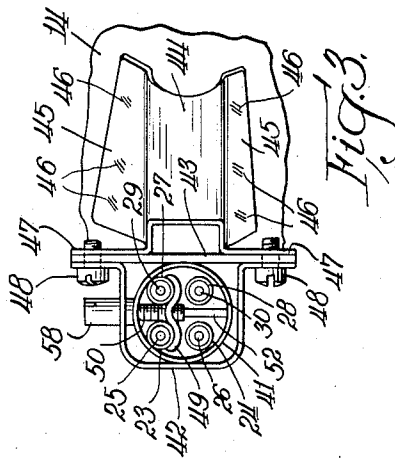
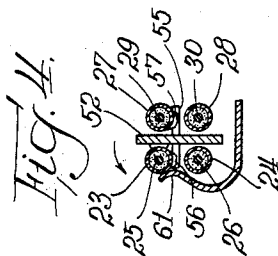
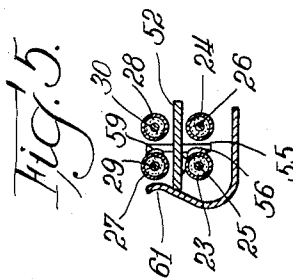


*Fig. 3.*



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2,831,100

## HEATING UNIT END MOUNTING

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9 Claims. (Cl. 219—37)

This invention relates to electrical heating units where- in the heating resistor extends lengthwise within and is electrically insulated from a tubular sheath which is bent in the form of a flat winding, as for example in a flat spiral form such as commonly used for surface heating units of electric ranges, the invention having reference more particularly to the mounting of the ends of such heating unit.

Such heating units, and especially range surface heating units, are usually pivotally mounted to swing upwardly from the normal position of use in order to afford access to the underside of the heating unit and to parts underneath the heating unit, and it is customary to make such pivotal connection to the sheath at or in the vicinity of the place where the resistor terminals project therefrom so that the conductors, which are connected to the terminals to supply current to the resistor, do not interfere with and are not appreciably affected by the pivotal movement of the heating unit.

Such heating units, however, are subjected to a wide range of temperature change which causes lengthwise expansion and contraction of the sheath, and as differential expansion and contraction occurs at the inner and outer sides respectively of the convolutions or bends of the winding, the latter tends to expand and contract in the plane in which it is bent and accordingly it is important that the ends of the sheath be free to move relatively so as to avoid distorting strains which would otherwise be imposed on the unit.

To permit such freedom of the sheath ends to move relatively the heating unit of Tuttle Patent 2,508,582 has the flat winding thereof resting loosely on a supporting spider and the resistor or resistors are arranged in the sheath so that the terminals are at one end of the sheath, and the heating unit is pivotally mounted at that end of the sheath, the other end thereof being remote from and unattached to the pivotal mounting and thus freely movable in the expansion and contraction of the heating unit.

The pivotal mounting of that Tuttle patent also has the advantage that the end portion of the sheath extends axially of and constitutes a part of the pivoting structure or hinge and the terminals extend from the pivoted sheath end in an axial direction and sufficiently close to the axis of pivotal movement so that in the pivotal movement of the heater the conductors connected to the terminals are merely subjected to a slight twist and no bending of the conductors occurs which might eventually cause breakage thereof.

In some cases, however, and especially in heating units having a sheath of small diameter, it is desirable or even necessary to provide terminals at each end of the sheath and in such cases it not only is necessary to locate both ends of the sheath at the place of pivotal mounting for connection of the current supply conductors to the terminals at both ends of the sheath, but it is also important to support both ends of the sheath at the place of pivotal mounting as the small diameter sheath does not have

sufficient rigidity to maintain the desired flat winding shape without such support at both ends thereof.

Unless, however, the thus supported ends are free to move relatively in a direction to accommodate the differential expansion and contraction of the inner and outer sides respectively of the convolutions or bends of the winding, objectionable distorting strains are imposed on the heating unit.

The principal objects of the present invention are to provide an improved pivotal mounting of the opposite ends of a tubular sheathed heating unit; to hold both ends of the sheath in a manner to positively maintain the winding of the heating unit in the desired flat form; to permit relative movement of the pivoted opposite ends in conformity with the expansion and contraction of the heating unit; to provide a conjoint mounting of the sheath ends which is simple and convenient; to locate the sheath ends within and axially of the hinge and with the current supply conductors connected to the terminals at a place where bending of the current supply conductors is minimized; and to provide a hinge mounting which is adapted to accommodate the sheath ends of a heating unit composed of several sheath sections, these and other objects being accomplished as pointed out more particularly hereinafter and as shown in the accompanying drawings in which:

Fig. 1 is a top view of a heating unit assembly constructed in accordance with the present invention;

Fig. 2 is a side view of the heating unit assembly of Fig. 1 with portions broken away at the hinge to show details of the construction;

Fig. 3 is a view taken on the line 3—3 of Fig. 2 looking at the terminal end of the heating unit when the latter is in the normal operating position;

Fig. 4 is a sectional view on the line 4—4 of Fig. 2; and

Fig. 5 is a view similar to Fig. 4 but showing the illustrated parts in the position they occupy when the heating unit is tilted upwardly to the upraised position.

Heating units of the type to which this invention relates are used extensively in electric ranges, especially as surface heating units thereof, and it is customary to incorporate the heating unit in an assembly which includes a mounting ring by which the heating unit is supported in or at an opening in the range top.

Such assembly is shown in the accompanying drawings in which the reference numeral 10 indicates the heating unit as a whole and 11 the mounting ring, a portion of the range top being also shown at 12 which has an opening 13 therethrough in which the assembly is mounted.

The mounting ring 11 has a skirt portion 14 which extends downwardly through the range top opening 13 and is provided at the bottom with a drip pan 15 which slopes inwardly to a central opening 16, and said ring 11 is provided at the top with an annular flange or rim 17 which extends around the upper end of the skirt portion 14 and rests on the portion of the range top 12 around the opening 13 to support the assembly.

The drip pan 15, which serves also as a heat reflector for the heating unit thereabove, may be made as an integral part of the ring 11 or as a separate part and removable from the ring as is well known in the art, the latter form being shown in the drawing, and the center opening 16 thereof serves not only for drainage but also for ventilation of the interior of the ring.

Heating units of electric ranges are sometimes made of a single sheathed section or heating element, for example, as shown in Tuttle Patent 2,368,051, which is bent into the desired flat winding form, whereas others are made of several sheathed sections or heating elements, for example, as shown in Tuttle Patent 2,467,348, each having bent

portions or coils arranged conjointly to form the flat winding.

The latter form of heating unit is shown herein having two sheathed sections or heating elements which are indicated as a whole respectively at 18 and 19 and each is formed with coils, which are indicated respectively at 18<sup>a</sup> and 19<sup>a</sup>, and are intercalated with the coils of the other sheathed section or heating element so that conjointly they constitute the flat winding of the heating unit.

Each of said heating elements 18 and 19 comprises a tubular sheath 20 having a heating resistance 21 extending lengthwise therein and embedded in compacted electrical insulating material 22 in a manner well known in the art, and each resistance 21 is provided at each end with a terminal which extends outwardly through and is insulated from the respective end portion of the sheath 20 thereof and projects sufficiently therebeyond for attachment thereto of conductors through which current is supplied to that resistor.

The aforesaid end portions of the sheath 20 of the heating element 18 are indicated respectively at 23 and 24 and the terminals therein are indicated respectively at 25 and 26 and the end portions of the sheath 20 of the heating element 19 are indicated respectively at 27 and 28 and the terminals therein are indicated respectively at 29 and 30.

The winding, composed of the intercalated coils 18<sup>a</sup> and 19<sup>a</sup>, is located within the mounting ring 11 at the top thereof so that it projects sufficiently above the mounting ring as shown in Fig. 2 to support a pan or utensil thereon, and is supported on, but unattached to, a spider 31 which is removably mounted within the ring 11.

This spider 31 comprises three arms 32, 33 and 34 the inner ends of which are securely connected to one another underneath an attached center disk to which the spider indicating reference numeral is applied and the outer ends of the arms 32 and 33 rest on shoulders 35 which are pressed inwardly from the skirt portion 14 of the mounting ring 11. The other spider arm 34 has a reduced tongue extension 36 (see Fig. 2) at the other end which is engaged in and projects through an opening 37 in the skirt portion 14 to support the outer end of said arm 34, the arrangement being such that when the tongue extension 36 is engaged in the opening 37 the outer ends of the arms 32 and 33, by reason of their confinement within the skirt portion 14, are positioned by the tongue 36 engagement with the opening 37 to be supported on and retained against displacement from the shoulders 35.

The flat winding of the present heating unit, comprising the intercalated coils 18<sup>a</sup> and 19<sup>a</sup>, is hinged to swing upwardly from its normal position on the spider 31 to a substantially upright position at one side of the mounting ring 11 and in substantially the same manner as the heating unit swings upwardly in Tuttle Patent 2,506,554, it being an important feature of the present invention, however, that the sheath section or sections of the heating unit have terminals at both ends thereof and both ends of said section or sections are held, at the place of pivoting, in a manner to retain the coils of the winding quite firmly in the form of a flat winding and these sheathed ends extend conjointly in the same direction at the place of hinging and along the pivotal axis of the hinge.

It is also an important feature that although the opposite end portions of the sheath or sheaths are held at the hinge location in a manner to provide sufficiently substantial support thereof to maintain the heating unit coils with certainty in the flat winding form, the opposite end portions of the sheath or sheaths are relatively movable in a direction to compensate for and permit freedom of expansion and contraction of the coils of the winding that occurs in the changes of temperature to which the coils are subjected.

This is accomplished in the illustrated structure by lo-

cating all of the end portions 23, 24, 27 and 28 at the periphery of the windings 18<sup>a</sup>, 19<sup>a</sup>, and at the same peripheral place, and extending these ends conjointly and in the same direction tangentially from the winding and downwardly through an opening 38 in the skirt portion 14 to a place outside said skirt portion and below the level of the mounting ring flange 17 and the range top 12 and pivotally mounting these ends at the latter place in a manner which permits at least one end of each heating element 18 and 19, although hingedly mounted, to move in a direction to compensate for the expansion and contraction of the coils 18<sup>a</sup> and 19<sup>a</sup>.

The ends 23 and 24 are merely continued tangentially in parallel relation from the respective coils 18<sup>a</sup> and 19<sup>a</sup>, as shown in Fig. 1, and both at a corresponding downward slope through the opening 38, the slope of both being the same as the slope of the end 23 in Fig. 2, whereas the other ends 24 and 28 are brought over underneath the coils 18<sup>a</sup> and 19<sup>a</sup>, as indicated respectively at 39 and 40, to the place at the periphery of the winding where the ends 23 and 27 extend tangentially and slope downwardly therefrom, and said ends 24 and 28 extend likewise tangentially and downward underneath the ends 23 and 27 in parallel relation therewith and through the opening 38.

These end portions 23, 24, 27 and 28, beyond the opening 38, extend through and are mounted in a tubular sleeve 41 which is journaled to rotate in a bearing which is mounted on the skirt portion 14 at the exterior thereof.

The said bearing is composed of two parts one of which, indicated at 42, is of substantially the same length as the sleeve 41, as shown in Fig. 2, and of rectangular shape in cross section but open at one side, as shown in Fig. 3. The other part of the said bearing, as shown at 43, is a plate which closes the open side of the bearing part 42 and these bearing parts 42 and 43 are conjointly secured to a bracket 44 which in turn is secured to the outer side of the skirt portion 14 so as to hold the bearing 42, 43 at an inclination corresponding to the slope of the ends 23, 24, 27 and 28 and in the line of tangency of the said ends with respect to the winding 18<sup>a</sup>, 19<sup>a</sup>.

The bracket 44 is provided with flanges 45 which conform to and are preferably spot welded as at 46 to the skirt portion and said bracket has other flanges 47 to which the bearing parts 42 and 43 are secured by screws 48, as shown in Figs. 2 and 3.

The width of the bearing opening between the plate and the opposite side of the bearing part 42 is such as to confine the sleeve 41 quite closely therebetween, as shown in Fig. 3, but in the vertical direction the sleeve 41 is loosely confined in the bearing opening, as also shown in Fig. 3, to permit sufficient tilting of the heating unit ends 23, 24, 27 and 28 in the direction of their length to insure that the coils 18<sup>a</sup> and 19<sup>a</sup> lie flat on the supporting spider 31 when the heating unit is in the normal position of operation.

The sleeve 41, which is journaled in the bearing 42, 43 as aforesaid, is of such internal diameter that the heating unit ends 23, 24, 27 and 28 loosely occupy the interior thereof, the upper ends 23 and 27, however, being clamped securely to the top of the sleeve by a clamping member 49 which underlies said ends 23 and 27, and has threaded engagement with a screw 50 which extends downwardly through the top of the sleeve 41 and between the ends 23 and 27 and serves in conjunction with the clamping member 49 to hold the ends 23 and 27 firmly in a fixed position in the sleeve 41.

The said ends 24 and 28 are, however, loosely contained in the bottom of the sleeve 41 and not only are free to move longitudinally therein but have sufficient latitude of sidewise movement in any direction so that there is no cramping or binding thereof in the sleeve 41 which might interfere with the freedom of longitudinal movement.

Thus, although the respective ends 23 and 27 of the heating elements 18 and 19 are fixed in the pivoted sleeve

41 and the respective ends 24 and 28 are confined and held sufficiently by said sleeve 41 to contribute substantial support of the heating unit, the said ends 24 and 28 are sufficiently free so that they are movable relatively with respect to the fixed ends 23 and 27 and in a manner to respond to expansion and contraction of the heating unit under the changes of temperature to which it is subjected.

The principal expansion and contraction of the heating unit is in the plane of the coils 18<sup>a</sup> and 19<sup>a</sup> and, although the ends 24 and 28 and the sleeve 41 are inclined with respect to that plane, the freedom of movement of the ends 24 and 28 in the sleeve 41 is such that their permissible movement is not solely in the direction of their length but sufficiently sidewise so that at their acute angularity to the plane of the coils 18 and 19, their movement is substantially in accord with the expansion and contraction of the heating unit.

The heating unit ends 23 and 27 are further secured to the sleeve 41 and held in line therewith by an arm 51 which is secured at its lower end to the sleeve and projects from the upper end thereof between the ends 23 and 27 and at its upper end is secured thereto.

The clamping member 49 extends only part way of the length of the sleeve 41, as shown in Fig. 2, and the arm 51, which is of plate stock disposed in a vertical plane, has its lower end enlarged as indicated at 52 and extending diametrically across the upper end of the sleeve 41 beyond the clamping member 49 with the heating unit ends 23 and 24 at one side of said portion 52 and the heating unit ends 27 and 28 at the other side thereof. This portion 52 is secured in the sleeve 41 by a lug 53 at the top thereof which is engaged in an opening 54 in the wall of the sleeve.

The arm 51 is continued a considerable distance beyond the upper end of the sleeve 41 between the heating unit ends 23 and 27 and at the upper end has a pin 55 extending therethrough which is welded as at 56 and 57 respectively to the underside of the heating unit ends 23 and 27.

To prevent endwise movement of the sleeve 41 in the bearing 42, 43 the screw 50 by which the heating unit ends 23 and 27 are clamped in the sleeve, is provided with an elongated head 58 which projects through a transverse slot 59 of the bearing part 42, this slot 59 being so located and of such length to permit the necessary rotation of the sleeve 41 in the bearing 42, 43 for swinging the heating unit 10 from the normal horizontal position on the spider 31 to an upright substantially vertical position at the side of the mounting ring 11.

Preferably a latch is provided to safely retain the heating unit in the upraised position, and for this purpose the bearing part 42 is formed at its upper end with a spring tongue 60 which extends part way around the group of heating unit ends 23, 24, 27 and 28 immediately beyond the upper end of the sleeve 41 and has a bent tang portion 61 at the free end thereof arranged to engage over one lateral edge of the enlargement 52 of the arm 51, as shown in Fig. 5, when the heating unit 10 is in the upright position and by such engagement to hold the heating unit against accidental displacement from said upraised position thereof.

For operation of the heating unit 10, current supply conductors are connected to the outer exposed ends of the terminals 25, 26, 29 and 30 which are located in close proximity to the axis of pivotal movement of the sleeve 41 in the bearing 42, 43 and by reason thereof there is only a slight twist of said current supply conductors when the heating unit is swung to and from the upraised position and bending of the conductors is avoided which might eventually cause breakage thereof.

While I have shown and described my invention in a preferred form as applied to a surface heating unit with two tubular sheathed heating elements, it is to be understood that it is applicable to heating units other than those for range surface heating and to heating units com-

prising more or less than two tubular sheathed elements and that various other changes and modifications may be made without departing from the principles of the invention, the scope of which is to be determined by the appended claims.

What is claimed is:

1. An electric heating unit comprising at least one elongated tubular sheath containing a heating resistance which is electrically insulated from the sheath and has terminals at the opposite ends of the sheath, said tubular sheath being in the form of a flat winding which is free to expand and contract in the plane of flatness thereof upon changes of temperature of the heating unit, and said sheath having the opposite end portions thereof extending correspondingly in side by side relation in a substantially tangential direction from approximately the same place at the periphery of the winding and conjointly pivoted to a support on an axis which extends in the direction of the length of said opposite end portions the direction in which the said sheath ends extend and the axis on which they are conjointly pivoted being sufficiently near to horizontal to cause the winding to swing upwardly from a horizontal plane position to a position in an upwardly extending plane.

2. An electric heating unit comprising at least one elongated tubular sheath containing a heating resistance which is electrically insulated from the sheath and has terminals at the opposite ends of the sheath, the said tubular sheath being bent in the form of a flat winding which is free to and expands and contracts in the plane of flatness thereof upon changes of temperature of the heating unit and causes movement of said opposite ends relatively to one another in a direction of approximate parallelism with said plane, said sheath having opposite end portions thereof extending correspondingly in side by side relation in a substantially tangential direction from approximately the same place at the periphery of the winding and at a moderate slope obliquely downward from the aforesaid plane in a direction corresponding generally to the direction of said relative movement of said opposite ends and conjointly pivoted to a support on a pivotal axis which extends in the direction of the length of said opposite end portions permitting the winding to swing upwardly from a horizontal plane to an upwardly extending plane.

3. An electric heating unit comprising at least one elongated tubular sheath containing a heating resistance which is electrically insulated from the sheath and has terminals at the opposite ends of the sheath, the said tubular sheath being bent in the form of a flat winding which is free to and expands and contracts in the plane of flatness thereof upon changes of temperature of the heating unit and causes movement of said opposite ends relatively to one another in a direction of approximate parallelism with said plane, said sheath having the opposite end portions thereof extending correspondingly in side by side relation in a substantially tangential direction from approximately the same place at the periphery of the winding and at a moderate slope obliquely downward from the aforesaid plane in a direction corresponding generally to the direction of said relative movement of said opposite ends and conjointly pivoted to a support on a pivotal axis which extends in the direction of the length of said opposite end portions, said end portions which are inclined downwardly as aforesaid being pivoted at one side of the plane of the winding on an axis which is sufficiently near to horizontal to permit the winding to swing upwardly from a horizontal plane to an upwardly extending plane.

4. An electric heating unit comprising at least one elongated tubular sheath containing a heating resistance which is electrically insulated from the sheath and has terminals at the opposite ends of the sheath, the said tubular sheath being bent in the form of a flat winding which is free to and expands and contracts in the plane

of flatness thereof upon changes of temperature of the heating unit and causes movement of said opposite ends relatively to one another in a direction of approximate parallelism with said plane, said sheath having the opposite end portions thereof extending substantially tangentially in side by side relation in the same direction from approximately the same place at the periphery of the winding in a direction corresponding generally to the direction of said relative movement of said opposite ends and conjointly pivoted to a support on a pivotal axis which extends in the direction of the length of said opposite end portions, one of said end portions being fixedly secured relatively to said pivotal axis and the other of said end portions being free to move relatively to said pivotal axis in substantially the direction in which the sheath ends are caused to move relatively to one another by the aforesaid expansion and contraction of the flat winding.

5. An electric heating unit comprising at least one elongated tubular sheath containing a heating resistance which is electrically insulated from the sheath and has terminals at the opposite ends of the sheath, said tubular sheath being in the form of a flat winding which is free to expand and contract in the plane of the flatness thereof upon changes of temperature of the heating unit, said sheath having the opposite end portions thereof extending correspondingly in side by side relation in a substantially tangential direction from approximately the same place at the periphery of the winding and at a moderate slope obliquely downward from the aforesaid plane and said opposite end portions being contained in and conjointly pivoted in a bearing and extending in the direction of the length of the pivotal axis thereof which is sufficiently near to horizontal to permit the winding to swing upwardly from a horizontal plane to an upwardly extending plane.

6. An electric heating unit comprising at least one elongated tubular sheath containing a heating resistance which is electrically insulated from the sheath and has terminals at the opposite ends of the sheath, said tubular sheath being in the form of a flat winding which is free to expand and contract in the plane of the flatness thereof upon changes of temperature of the heating unit, said sheath having the opposite end portions thereof extending substantially tangentially in side by side relation in the same direction from approximately the same place at the periphery of the winding, said opposite end portions being within and extending lengthwise of a sleeve which is turnable in a bearing and one of said opposite end portions being fixed in said sleeve and the other end portion free to move therein.

7. An electric heating unit comprising a plurality of elongated tubular sheaths each having coils thereof of flat spiral shape intercalated with coils of another of said sheaths and conjointly constituting a flat winding, each sheath containing a heating resistance which is electrically insulated from the respective sheath and has terminals at the respective opposite ends of the sheath, all of said sheaths having the opposite end portions thereof extending substantially tangentially in the same direction from approximately the same place at the periphery of the winding and all of said end portions being in side

by side relation to one another and contained in a sleeve which is turnable in a bearing, one of the opposite end portions of each sheath being fixed in the sleeve and the other opposite end portion of each sheath being free to move in the sleeve.

8. An electric heating unit comprising a plurality of elongated tubular sheaths each having coils thereof of flat spiral shape intercalated with coils of another of said sheaths and conjointly constituting a flat winding, each sheath containing a heating resistance which is electrically insulated from the respective sheath and has terminals at the respective opposite ends of the sheath, a mounting for said heating unit having an opening at the top thereof in which said winding is located and having a skirt portion extending downwardly around said winding, and a spider within said mounting on which said winding rests and to and from which the winding is freely movable, all said sheaths having the opposite end portions thereof extending substantially tangentially in the same direction from approximately the same place at the periphery of the winding through said skirt portion and therebeyond all of said end portions being in side by side relation to one another and contained in a sleeve which is turnable in a bearing which is mounted on the exterior of said skirt portion, one of said opposite end portions of each sheath being fixed in the sleeve and the other opposite end portion of each sheath being free to move in the sleeve.

9. An electric heating unit comprising at least one elongated tubular sheath containing a heating resistance which is electrically insulated from the sheath and has terminals at the opposite ends of the sheath, the said sheath being bent in the form of a flat spiral having a plurality of coils in the same plane and including a large outer coil and a small inner coil within the confines and approximately central of the outer coil, the outer coil having one end portion of the sheath continuing in a tangential direction therefrom and rectilinear and the inner coil having a longer end portion at the other end of the sheath extending downwardly from the inner coil at one side thereof and outwardly at a lateral curvature reverse to that of said side of the inner coil and terminating in a rectilinear portion which is paired with and extends in the same direction as and in substantially parallel side by side relation to and is engaged with the other rectilinear portion in a bearing to turn conjointly therein with said other rectilinear portion, the said paired rectilinear sheath end portions being sufficiently near to horizontal to provide a hinge connection on a pivotal axis which is sufficiently near to horizontal to permit the winding to swing upwardly from a horizontal plane to an upwardly extending plane.

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