April 23, 1957 J. McORLLY 2,790,062

ELECTRIC HEATERS

Filed July 16, 1954 5 Sheets-Sheet 1

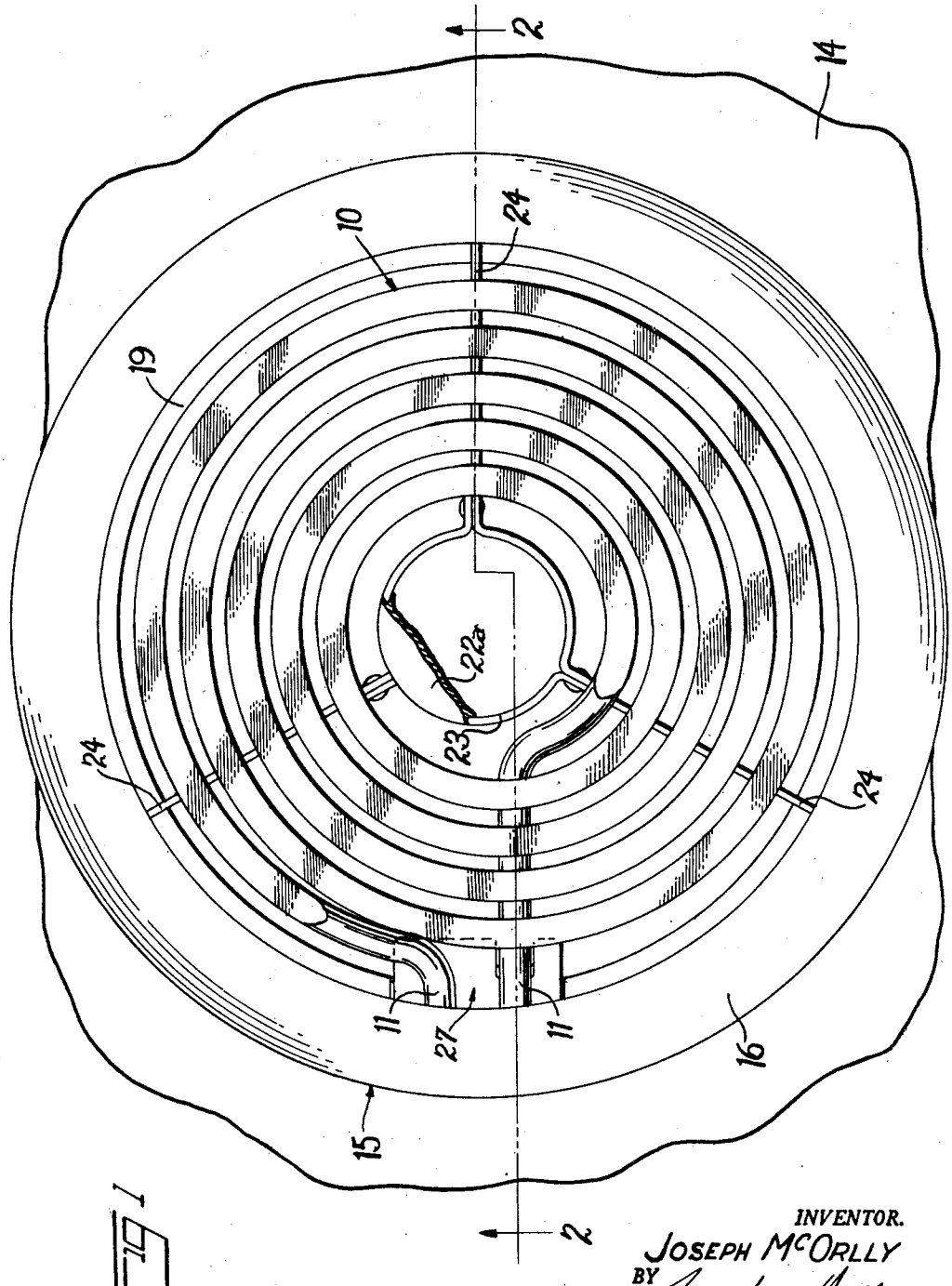

Fig 1

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ELECTRIC HEATERS

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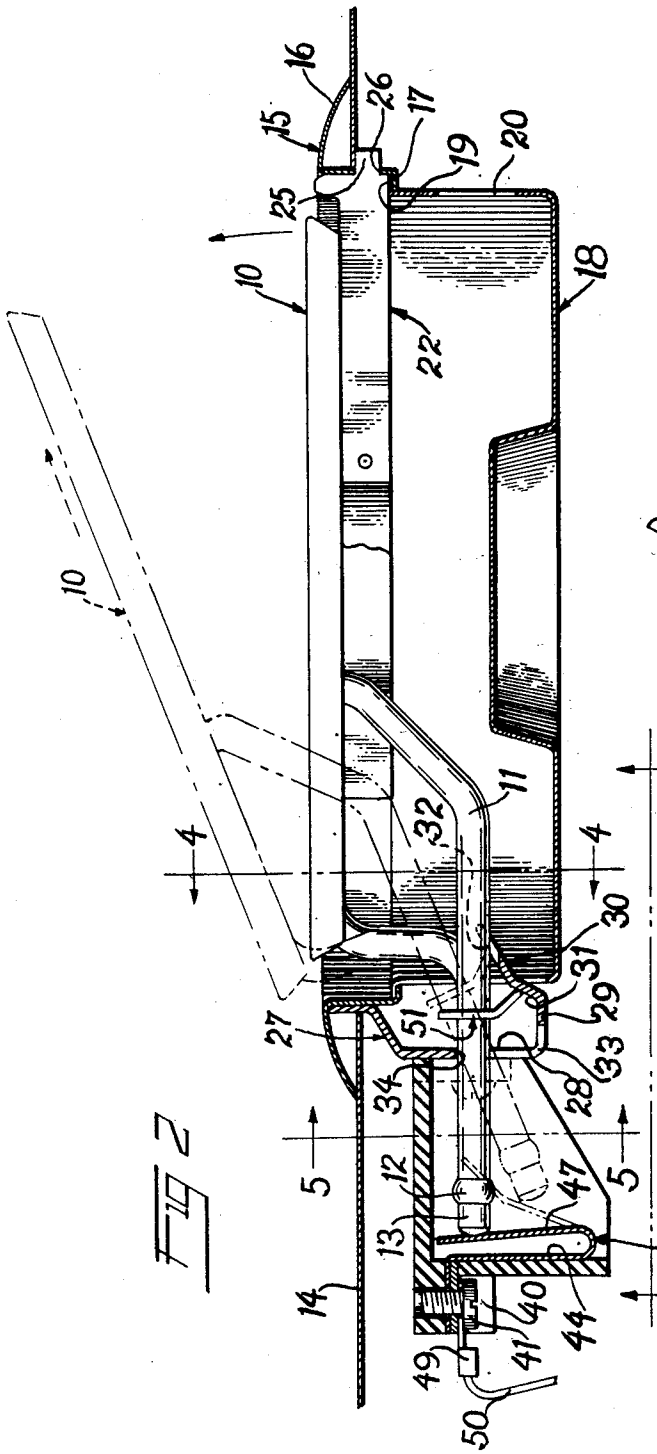

FIG 2

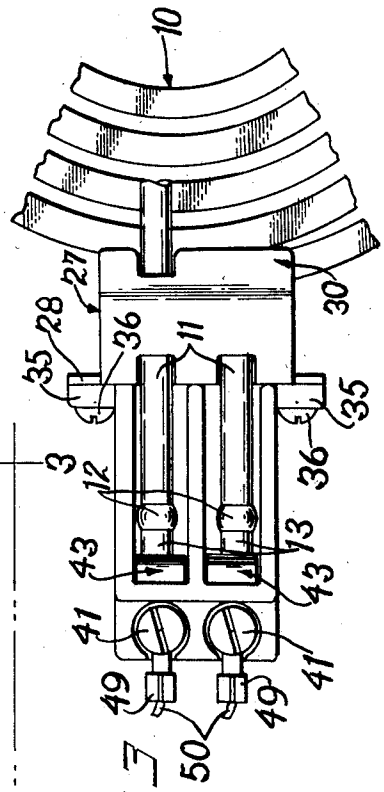

FIG 3

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ELECTRIC HEATERS

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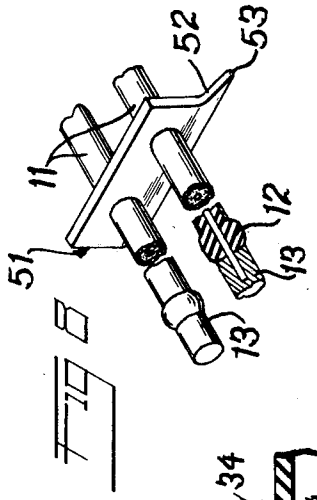

FIG 8

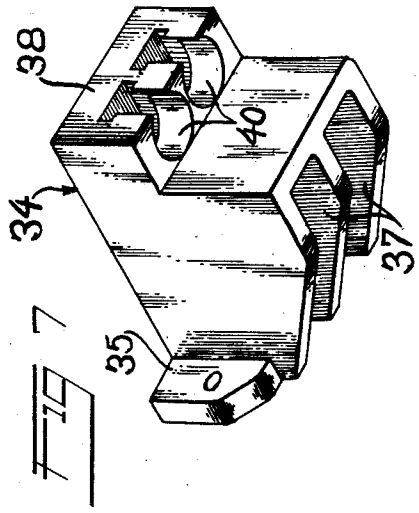

FIG 7

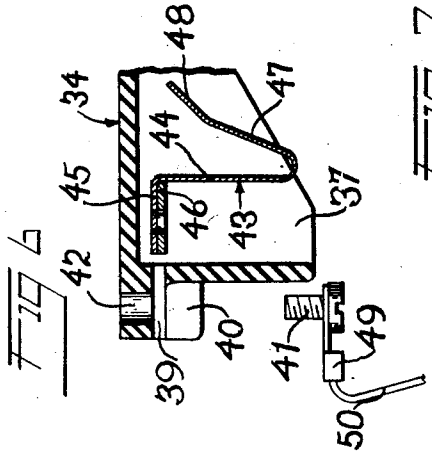

FIG 6

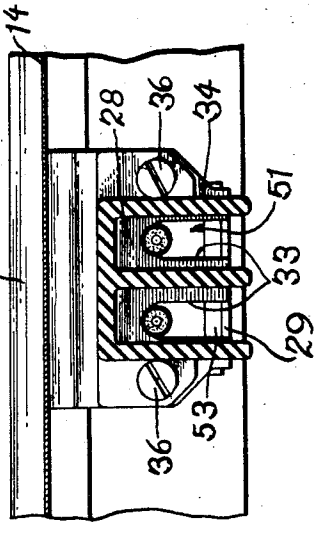

FIG 5

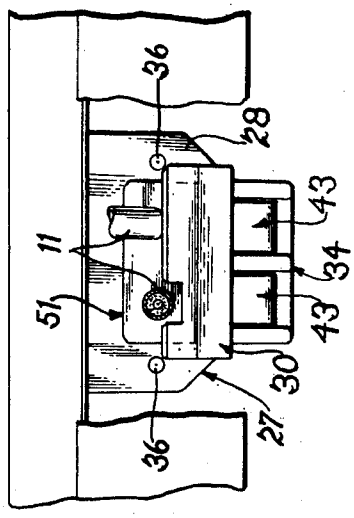

FIG 4

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ELECTRIC HEATERS

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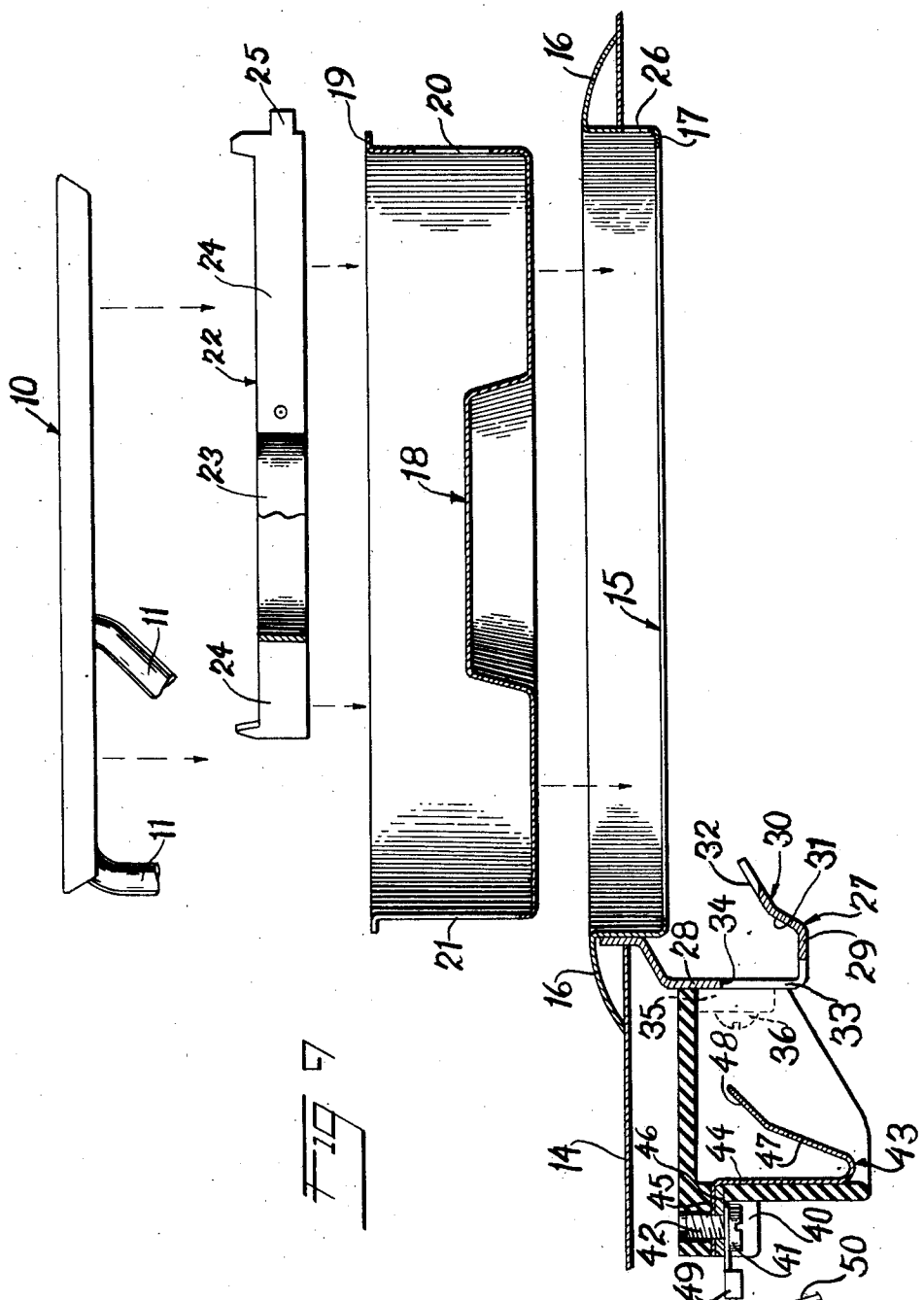

FIG. 7

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ELECTRIC HEATERS

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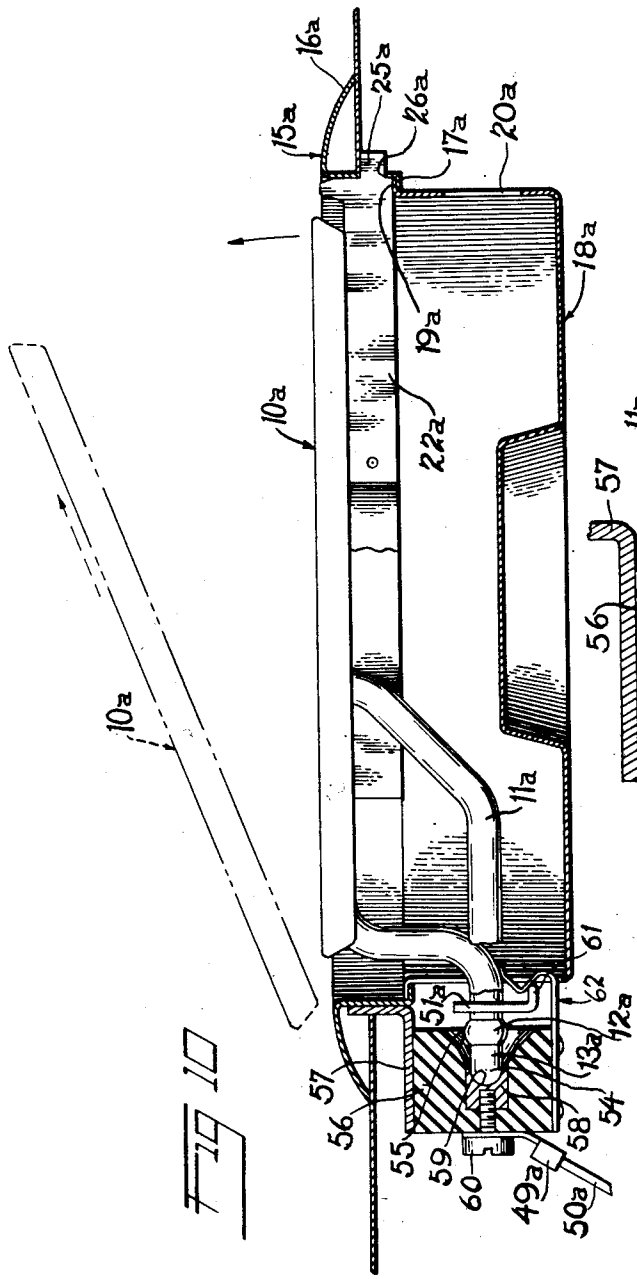

FIG 10

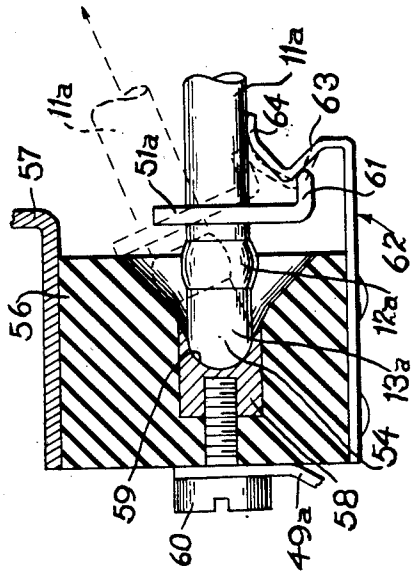

FIG 11

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United States Patent Office 2,790,062 Patented Apr. 23, 1957

2,790,062

ELECTRIC HEATERS

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Application July 16, 1954, Serial No. 443,749

10 Claims. (Cl. 219—37)

The present invention relates to electric heaters, more particularly to electric heaters adapted for use with ranges and the like, and the principal object of my invention is to provide new and improved electric heaters of the character described.

For many years, manufacturers have been attempting to devise range-type electric heaters which may be shifted from their normal position to permit cleaning of the heating element and of the reflector which normally underlies the element. Most present day range-type heaters have elements which may be pivoted to one side from their normal heating positions to permit cleaning. However, access to many parts of the heater is still difficult and sometimes dangerous because of the power leads which remain attached to the heating element. Furthermore, constant shifting of the element imposes stresses on the attached power leads and this eventually results in breakage of the leads or, even more dangerous, results in a breakdown of the insulation protecting the leads.

In order to simplify cleaning, prevent the aforementioned lead damage and simplify replacement of inoperative heating elements, it has been proposed to provide elements which can be plugged into position in a manner similar to that employed in plugging an appliance into an electric outlet. However, none of these prior-art removable element heaters has achieved wide commercial success since most have been expensive to manufacture; many constituted a shock hazard (particularly when cleaning); and, many of the constructions were difficult to operate and often failed to hold the element securely in its operative position.

My invention provides a range-type electric heater which effectively solves the problems inherent in prior-art constructions and these and other advantages will become apparent from a study of the following description and from the drawings appended hereto.

In the drawings accompanying this specification and forming a part of this application there is shown, for purpose of illustration, embodiments which my invention may assume, and in these drawings:

Figure 1 is a top plan view of my invention,

Figure 2 is a sectional view generally corresponding to the line 2—2 of Figure 1 but with certain parts shown in one position in full lines and in another position by dot-dash lines,

Figure 3 is a fragmentary view generally corresponding to the line 3—3 of Figure 2 but with certain parts removed in the interest of clarity.

Figure 4 is a fragmentary sectional view generally corresponding to the line 4—4 of Figure 2,

Figure 5 is a fragmentary sectional view generally corresponding to the line 5—5 of Figure 2,

Figure 6 is a fragmentary sectional view of a portion of the construction shown in Figure 2, certain parts being entirelf removed in the interest of clarity and other parts being displaced from their normal positions to illustrate assembly procedure,

Figure 7 is a slightly enlarged perspective view of a detail,

Figure 8 is a slightly enlarged, fragmentary perspective view of a detail, a portion thereof being broken away to illustrate interior construction,

Figure 9 is a fragmentary view similar to Figure 2 but showing certain of the parts separated to illustrate assembly procedure,

Figure 10 is a view similar to Figure 2 but illustrating another embodiment of my invention, and

Figure 11 is an enlarged view of a portion of the embodiment illustrated in Figure 10, certain parts being shown in one position in full lines and in another position in dot-dash lines.

As best seen in Figures 1 and 2, the present invention comprises a heating element **10** herein disclosed to be of the sheathed embedded type. Briefly, such an element comprises a metallic sheath filled with a compacted heat-conductive, electric-insulating material in which is embedded an electric resistance member, or resistor. The resistor usually terminates short of each end of the sheath and each end is electrically connected to a respective terminal pin, each of which extends beyond a respective open end of the sheath to provide for electrical connection to the resistor.

In the present embodiment, the intermediate portion of the sheathed element (that portion which contains the resistor conductor) is convoluted to provide a flat, generally circular heat-generating portion while the ends of the element containing the terminal pins are bent to provide generally parallel, spaced-apart terminal leg portions **11** (Figure 2) which are spaced below (in the position of parts shown) the heat-generating portion and which terminate some distance beyond the edge of the heat-generating portion for a purpose to be disclosed.

As illustrated in Figure 8, the refractory material terminates short of each extreme end of the sheath to provide a pocket. In the present embodiment, a rubber-like plug **12** of heat resistant material is preferably positioned within each pocket and is of a length to extend beyond the sheath end. A sleeve **13** having an aperture of a size to closely receive a terminal pin is positioned over each terminal pin and each is secured to its respective pin by crimping or other suitable means in a manner to hold the plugs **12** under axial compression.

Heating element **10** is adapted to be removably supported by a range **14** in the following manner: A ring-like member **15** having an outwardly turned flange **16** and an axially spaced, inwardly turned flange **17** is adapted to be positioned within an aperture formed in the top of the range **14** so that the flange **16** overlies the range surface defining the aperture and rests upon the range top to support member **15** in the position shown (see Figures 2 and 9). Any suitable means may be employed to hold member **15** in position; for example, spring clips (not shown) may be carried by member **15** and may be engageable with the undersurface of the range top to securely hold it in position.

A shallow tray **18** is adapted to be carried by the member **15** in position to underlie the heating element when it is in its normal position shown in full lines in Figure 2. Tray **18** serves to reflect the heat radiated by the heating element and to catch any drippings which might result from cooking operations. The tray **18** is formed with an outwardly turned flange **19** which is adapted to overlie flange **17** of member **15** so as to support the tray in position. The tray is apertured at **20** to provide a finger hole which assists in removing the tray for cleaning purposes and the tray is also slotted at **21** (see Figure 9 especially) for a purpose to be shown.

A spider **22** is adapted to rest upon the upper surface of the flange **19** of the tray **18** when the tray is positioned

as shown in Figure 2 and the spider presently comprises a structurally integral member having a ring-like center portion 23 and three equally spaced, radially extending legs 24. One of the legs 24 has a locating tongue 25 extending therefrom, the tongue being receivable within an aperture 26 formed in the ring-like member 15.

A medallion disc 22*a* is adapted to overlie the portion 23 of the spider. This disc usually carries suitable indicia which identifies the range manufacturer or the heating unit manufacturer and it may have a flange portion, as shown, which frictionally engages with the portion 23 of the spider to maintain the disc in assembled relation therewith.

As best seen in Figure 9 and in the relation of parts shown, a bracket 27 depends from the member 15 and is secured thereto by welding or other suitable means. Bracket 27 is herein shown to comprise a generally vertical portion 28, a generally horizontal portion 29, and an angularly disposed portion 30 which provides upwardly directed cam surfaces 31 and 32. A pair of slots 33 are formed in the portion 28 of the bracket 27, these slots being spaced to correspond to the spacing between the terminal leg portions 11 and extending into the portion 29 of the bracket for reasons later to become clear. The upper end portion of each slot 33 is preferably formed complementary to the cross-sectional shape of the terminal leg portions 11 and the portion of bracket 27 which defines the upper end portion of each slot 33 forms an abutment 34 for a purpose later to be pointed out.

Secured to the vertical portion 28 of the bracket 27 and extending outwardly of the periphery of member 15 is a terminal block 34 (perhaps best shown in Figure 7) formed of any suitable dielectric material. Block 34 has a pair of integrally formed ears 35 which are apertured to pass screws 36 which are adapted to be threaded into bracket 27 in order to hold the block in position. The block 34 is formed to provide a pair of spaced-apart generally vertically disposed slots 37 for receiving the spaced-apart terminal leg portions 11 of the heating element 10 and the block has an overhanging ledge portion 38 for a purpose to be shown.

Horizontal slots 39 (see especially Figures 6 and 7) extend through portion 38 of block 34 and each communicates with a respective one of the slots 37. The underside of portion 38 is formed with generally circular recesses 40 to receive the heads of screws 41, each recess extending to, but not beyond, its respective slot 39. Portion 38 of block 34 is also apertured at 42, each aperture 42 being concentric with a respective recess 40 and being of a size to freely pass the shank of a respective screw 41.

A spring contact member 43 is adapted to be positioned within each of the slots 37 of the block 34 and each contact member comprises a generally hair-pin shaped spring having one leg 44 bent to provide a laterally extending portion 45. Portion 45 has a small plate 46 welded or otherwise secured thereto and portion 45 and plate 46 are provided with aligned threaded apertures into which a respective screw 41 may be threaded. Each contact member 43, as before pointed out, has a leg 44 and each also has a leg 47 whose free end is bent outwardly at 48 as shown and for a purpose to appear.

As most clearly seen in Figure 8 wherein the parts are shown disassembled, each contact member 43 will be assembled with block 34 by sliding leg portion 45 of the contact member (together with the attached plate 46) into a respective slot 39 until leg 44 of the contact member lies along the adjacent internal wall of the block (see Figure 9). A respective screw 41 will then be passed through an apertured terminal clip 49 which is secured to a power lead 50 and the screw is threaded into the apertures provided in leg portion 45 and plate 46. With the foregoing parts assembled as shown in Figure 9, each spring contact member will be tightly secured to its respective power lead and will be held in position within the block 34 since recesses 40 and apertures 42 will engage a respective screw 41 and prevent withdrawal of the contact member from the position shown. However, since apertures 42 and recesses 40 are somewhat larger in size than the adjacent portions of the screws 41, each contact member will be permitted a certain amount of float, or movement, for purpose of alignment so that good electrical contact between the members and the sleeves 13 of the heating element is assured at all times.

Referring particularly to Figure 8, but as also shown in Figure 2, it will be seen that a plate 51, transversely apertured to pass the spaced-apart terminal legs 11 of the element 10, is secured to the legs 11 by welding or other suitable means and has a lower portion 52 bent as shown to provide an abutment 53 which is slideable along the cam surfaces 31, 32 of the bracket 27.

With the various parts assembled for normal operation as shown in full lines in Figure 2 and when the user desires to disassemble the unit for cleaning or other purposes, it is only necessary to raise the right side of the heating element to pivot the element about the fulcrum provided by the abutments 34 defining the upper limits of the slots 33 in the bracket 27. As the element pivots about the abutments 34, spring contact members 43 will urge the element to the right, the lower edge 53 of plate 51 carried by the element sliding first along cam surface 31 and then along cam surface 32.

With the element in the dot dash line position shown in Figure 2, it may be grasped by the user and moved in the direction of the arrow to remove it from the range for cleaning or replacement. The spider 22 may next be raised from its position wherein it is supported by the flange 19 of the tray 18, it being understood that it will be necessary to slightly tilt the left-hand end (Figure 2) of the spider to withdraw the tongue 25 from the slot 26 in the ring-like member 15. After removing the spider 22, the tray 18 may next be removed by employing the finger hole 20 to raise the tray from its supported position.

With the parts separated as illustrated in Figure 9, each of the removed parts may easily be cleaned. Moreover, the ring-like member 15 may also be easily cleaned without the slightest danger since the contact members 43 are spaced sufficiently far from the portions of the member 15 which require cleaning and are sufficiently well protected by the dielectric block 34 that the possibility of accidental contact with the contact members is obviated.

It will be noted that in the event a spring contact member 43 becomes damaged or broken, it may be easily replaced by removing the proper screw 41, replacing the old contact member with a new one in the manner heretofore described in conjunction with Figure 6, and replacing the screw 41.

Reversing the previously outlined steps will effect proper assembly of the heater. First the tray 22 will be positioned so that it is supported by the flange 17 of the member 15 (note that the slot 21 in the tray 18 provides clearance for the bracket 27 and for the terminal leg portions 11 of the heating element). The spider 22 will next be positioned upon the flange 19 of the tray 18 with the tongue 25 positioned in the slot 26 in member 15.

The heating element 10 will next be tilted approximately as shown by the dot-dash lines in Figure 2 and moved in a direction opposite to that indicated by the arrow until the terminal leg portions 11 enter the slots 33 in the bracket 27 and contact the spring members 43 and the abutment 53 of the plate 51 engages with the cam surface 32.

With the heating element 10 in the dot dash line position, the user need only press down on the heating element to seat it in position. As the element is pressed down, it will pivot about the fulcrum provided by the abutments 34 of the bracket 27 and the abutment 53 of the plate 51 will slide along the cam surface 32 thus forcing the element to the left and compressing the spring contacts 43.

As the element approaches its seated, full line position, abutment **53** of plate **51** will slide from engagement with cam surface **32** to engagement with cam surface **31**. It is an important feature of the present invention that cam surface **31** is so positioned that the stress imposed on the spring contact members **43** by pressing down on the heating element will be slightly diminished as the element reaches its seated position resting upon the spider **22**. Accordingly, the final movement of the heating element to its seated position on the spider **22** will be assisted by the resiliency of the spring contact members **43**. This insures positive seating of the element regardless of expansion and contraction and prevents unintentional displacement thereof from its assembled position, since the resultant action of the spring contacts **43** and the cam surface **31** is such that the element is resiliently held in position against the spider.

From the foregoing it will be understood that the element will be automatically removed from the electrical power circuit when it is shifted from its full line seated position and automatically replaced in the circuit when it is repositioned in such position. It will also be understood that the outwardly bent portions **48** of the legs **47** of the spring contact members **43** act to increase the force exerted by such contact members when, or just before, the element seats in position. Additionally, since the sleeves **13** of the heating element and the contact members **43** have wiping contact with each other, there will be no tendency for corrosion to create a high resistance point at this junction of the electrical circuit.

Figure 10 illustrates another embodiment of the invention which is similar to the embodiment hereinbefore described; accordingly, similar parts are identified by the same reference numerals but with the suffix "*a*" appended.

In this embodiment, it will be noted that the terminal leg portions **11***a* have been shortened and that the sleeves **13***a* have semi-spherical ends **54** each of which is adapted to be seated, as shown, in respective conical recesses **55** formed in a terminal block **56**. The terminal block **56** is adapted to be supported by the ring-like member **15***a* by means of a suitable bracket **57**.

Positioned in a suitable pocket at the apex of each conical recess **55** is a contact button **58** which has a semi-spherical concavity **59** formed complementary to the ends **54** of the sleeves **13***a*. Each contact button may be pressed into its pocket and held in position by means of a screw **60** which also connects a power lead **50***a* to the button. Obviously, each button **58** will be formed of copper or other material having high electrical conductivity while the terminal block **56** will be formed of rubber or other suitable dielectric material.

Secured across the leg portions **11***a* is a plate **51***a* which is similar to plate **51**. However, this plate is formed to provide a foot-like portion **61** which is engageable with, in the full line position shown, a spring latch **62** which is riveted or otherwise secured to the terminal block **56**.

As best seen in Figure 11, spring latch **62** has a portion **63** which provides a surface directed downwardly and to the left (in the position of parts shown) and with which foot portion **61** of plate **51***a* is engageable in the full line position. Spring latch **62** also has a portion **64** which is preferably formed integrally with portion **63** as shown and which provides a cam-like surface for a purpose to be disclosed.

Operation of the embodiment illustrated in Figures 10 and 11 is similar to the embodiment disclosed in Figures 1 through 9 in that the heating element **10***a* may be removed from its normal position by first raising the right side of the heating element in the direction of the arrow (Figure 10) to the dot-dash line position shown. The element may then be removed by shifting it in the direction of the arrow (see Figure 11) to provide access to the spider **22***a* and the tray **18***a*.

To assemble the unit for use, the foregoing operations will be reversed. Assuming that the tray **18***a* and the spider **22***a* are properly positioned and supported by the ring-like member **15***a*, the heating element **10***a* will be tilted by the user approximately as shown (see especially Figure 10) and the sleeves **13***a* at the free ends of the terminal legs **11***a* positioned in their respective recesses in the terminal block **56**. The parts will, at this time, be in the position shown by dot-dash lines in Figure 11.

The user will then press the element **10***a* downwardly toward its seated position, the element pivoting about the ball and socket joints provided by the terminal block and the sleeves on the free ends of the terminal legs.

As the element is moved toward its seated position, foot **61** of plate **51***a* will engage the cam surface of portion **64** of the spring latch **62** and deflect the latch from its unstressed, dot-dash line position and beyond the full line position. As the foot moves from portion **64** to portion **63**, the latch **62** will partially return to its dot-dash line position to the full line position shown and thus partially, although not entirely, relieve the stress built up in the latch member. It is to be understood that the final movement of the element **10***a* to its seated position on the spider **22** is assisted by the resiliency of the latch member and thus the element is firmly held in position despite the expansion and contraction which occurs during normal use.

While the present invention has been shown and described as employing a heating element having two terminals, it will be apparent that the invention is not limited to such an element but that one having a different number of terminals may be employed without departing from the spirit of the invention.

In view of the foregoing it will be apparent to those skilled in the art that I have accomplished at least the principal object of my invention and it will also be apparent to those skilled in the art that the embodiments herein described may be variously changed and modified, without departing from the spirit of the invention, and that the invention is capable of uses and has advantages not herein specifically desccribed, hence it will be appreciated that the herein disclosed embodiments are illustrative only, and that my invention is not limited thereto.

I claim:

1. An electric heater assembly, comprising support means, means carried by said support means and having a recess which provides a pocket, an electric heating element adapted to be supported in a predetermined position by said support means, said element having a terminal portion formed complementary to said pocket and being pivotable therein in a direction toward said predetermined position along an arcuate path, and means resiliently opposing movement of said heating element through the initial portion of said arcuate path and assisting movement of said heating element through the latter portion of said arcuate path.

2. An electric heater assembly, comprising support means, a terminal block carried by said support means and having a recess which provides a pocket, an electric heating element adapted to be supported in a predetermined position by said support means, said element having a terminal portion formed complementary to said pocket and being pivotable therein in a direction toward said predetermined position along an arcuate path, latch means resiliently holding said heating element in said predetermined position, said latch means opposing movement of said heating element through the initial portion of said arcuate path and assisting movement of said heating element through the latter portion of said arcuate path, and means for providing an electrical circuit to said heating element and including the terminal portion of said heating element together with an electrical contact member positioned within said pocket and adapted to be electrically connected to a source of electric current.

3. An electric heater assembly, comprising a removable electric heating element having a generally flat, heat-generating portion and having terminal end portions ex-

tending from said generating portion and terminating at a point spaced laterally of said generating portion and beyond an edge thereof, connecting means extending between and secured to said terminal end portions, means for supporting said element in a predetermined position, resilient means positioned for engagement with the free ends of said terminal end portions for yieldably opposing movement thereof and for establishing an electrical connection thereto, and means carried by said supporting means providing a cam surface engageable with connecting means for guiding said element toward and away from said predetermined position, said cam surface being so arranged that initial movement of said element toward said predetermined position stresses said resilient means and further movement of said element toward said predetermined position partially relieves the stress on said resilient means.

4. An electric heater assembly for use with a range and the like, comprising a ring-like member adapted to fit within an aperture formed in the top of a range, a removable electric heating element adapted to be supported in a predetermined position by said member, said element having a generally flat, heat-generating portion and having terminal end portions extending from said generating portion and terminating at a point spaced laterally of said generating portion and beyond an edge thereof, connecting means extending between and secured to said terminal end portions, a terminal block supported in fixed relation relative to said ring-like member and having an internal cavity for receiving the terminal end portions of said element, resilient means positioned within the cavity of said terminal block for engagement with the free ends of said terminal end portions for yieldably opposing movement thereof and for establishing an electrical connection thereto, and means secured to said ring-like member and supporting said terminal block, said means providing a cam surface engageable with said connecting means for guiding said element toward and away from said predetermined position, said cam surface being so arranged that initial movement of said element toward said predetermined position stresses said resilient means and further movement of said element toward said predetermined position partially relieves the stress on said resilient means.

5. An electric heater assembly, comprising a removable electric heating element having a heat-generating portion and having a terminal portion extending from said generating portion for conducting electric current thereto, means for supporting said element in a predetermined operative position, resilient means positioned for engagement with the end of said terminal portion for yieldably opposing movement thereof and for establishing an electrical connection thereto, and means carried by said supporting means and having an abutment engageable with said terminal portion to provide a fulcrum about which said element is rotatable, said means also having a cam surface spaced from said abutment and engageable with a portion of said element to effect sliding of said terminal portion relative to said abutment, said cam surface being so arranged that initial movement of said element about said fulcrum and toward said predetermined position shifts said terminal portion in a direction to stress said resilient means and further movement of said element about said fulcrum and toward said predetermined position permits said terminal portion to shift in the opposite direction to partially relieve the stress on said resilient means.

6. An electric heater assembly for use with a range and the like, comprising a ring-like member adapted to fit within an aperture formed in the top of a range, a removable electric heating element adapted to be supported in a predetermined position by said member, said element having a generally flat, heat-generating portion and having a terminal portion extending from said generating portion and terminating at a point spaced laterally of said generating portion and beyond an edge thereof, a terminal block supported in fixed relation relative to said ring-like member and having an internal cavity for receiving the terminal portion of said element, resilient means positioned within the cavity of said terminal block for engagement with the end of said terminal portion for yieldably opposing movement thereof and for establishing an electrical connection thereto, and means carried by said supporting means and having an abutment engageable with said terminal portion to provide a fulcrum about which said element is rotatable, said means also having a cam surface spaced from said abutment and engageable with a portion of said element to effect sliding of said terminal portion relative to said abutment, said cam surface being so arranged that initial movement of said element about said fulcrum and toward said predetermined position shifts said terminal portion in a direction to stress said resilient means and further movement of said element about said fulcrum and toward said predetermined position permits said terminal portion to shift in the opposite direction to partially relieve the stress on said resilient means.

7. A surface type, electric heater assembly for ranges, comprising a trim ring adapted to be supported by the range, means carried by said trim ring and providing an electrical contact member and a cam surface, and an electric heating element removably supported by said trim ring in predetermined position in engagement with said contact member to place said element in an electrical circuit, said element having sliding engagement with said cam surface during movement of said element toward said predetermined position to urge said element to engagement with said contact member.

8. A surface type, electric heater assembly for ranges, comprising a trim ring adapted to be supported by the range, a bracket depending from said trim ring and providing an abutment, an electric heating element removably supported by said trim ring and interengaging with said abutment to provide a pivot connection about which said element is rotatable toward and away from said predetermined position, and an upwardly facing, inclined cam surface supported by said bracket in engagement with said element to urge the latter to engagement with said abutment during movement of said element to said predetermined position.

9. A surface type, electric heater assembly for ranges, comprising means carried by the range and providing a pair of electrical contact members and a cam surface, an elongated sheathed electric heating element having a convoluted intermediate heat generating portion and terminal end portions extending in side by side relation from respective ends of said heat generating portion for conducting electric current to the latter, said element being removably supported by the range in predetermined position with the free ends of said terminal end portions in engagement with respective contact members to place the heat generating portion of said element in an electrical circuit, and connecting means extending between and secured to said terminal end portions for joining them together, a portion of said connecting means having sliding engagement with said cam surface during movement of said element toward said predetermined position to urge the free ends of said terminal end portions to engagement with said contact members.

10. A range top heating unit comprising an elongated sheathed electric heating element having an intermediate heat generating portion adapted to be supported by the range for receiving a vessel to be heated and having terminal end portions extending in side by side relation from respective ends of said heat generating portion for conducting electric current to the latter, connecting means extending between and secured to said terminal end portions at a point spaced from their free ends, and means supported by the range and providing spaced abutment means resiliently urged in a direction toward each

other and respectively engageable with the free ends of said terminal end portions and with said connecting means to releasably clamp said terminal end portions therebetween when said heat generating portion is in its vessel receiving position, movement of said element to its vessel receiving position effecting engagement of the free ends of said terminal end portions with said abutment means to place said element in an electric circuit and movement of said element from such position removing said element from such circuit.

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