April 12, 1966 G. E. AMMERMAN ETAL 3,246,123

RANGE TOP HEATER ASSEMBLY

Original Filed Dec. 24, 1959 6 Sheets-Sheet 1

Fig. 1

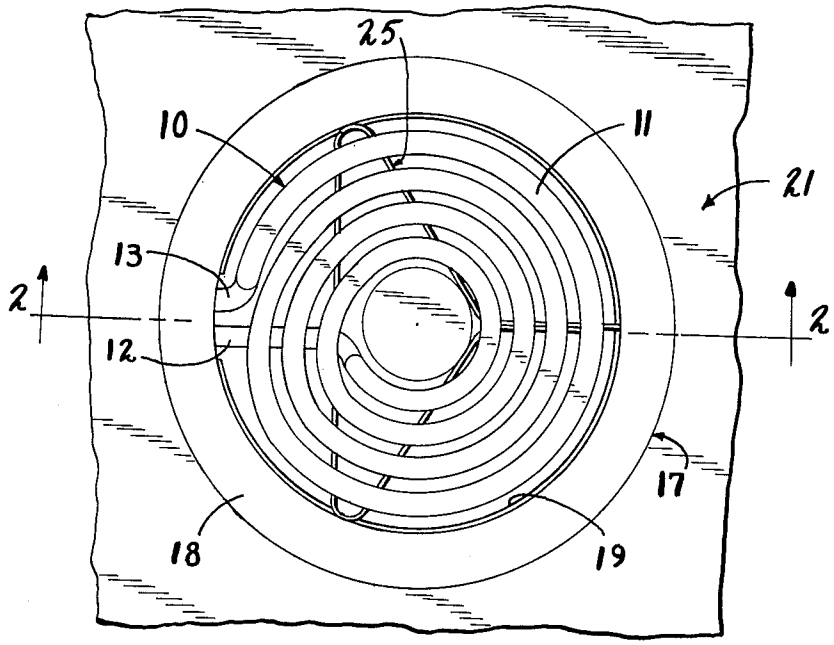
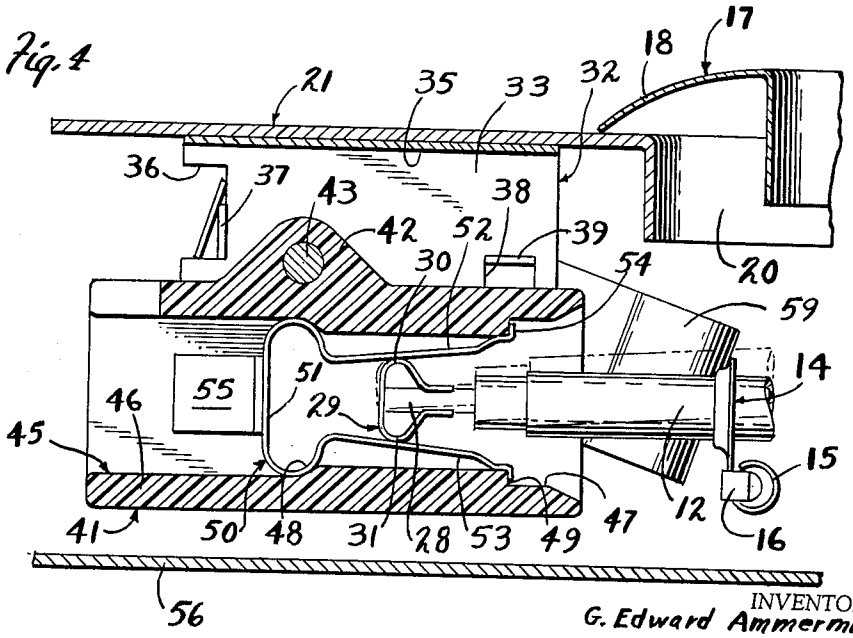


Fig. 4



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RANGE TOP HEATER ASSEMBLY

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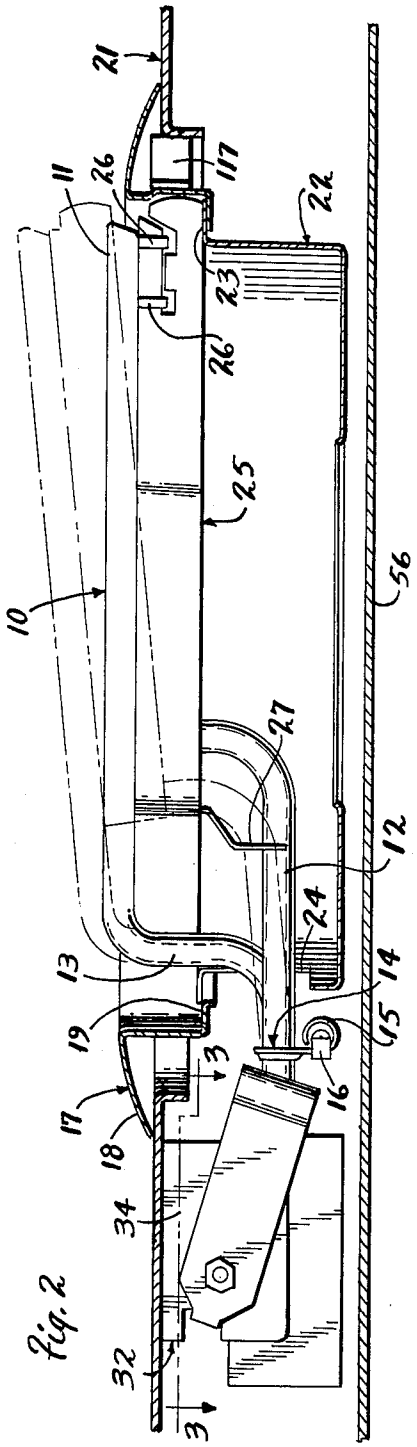


Fig. 2

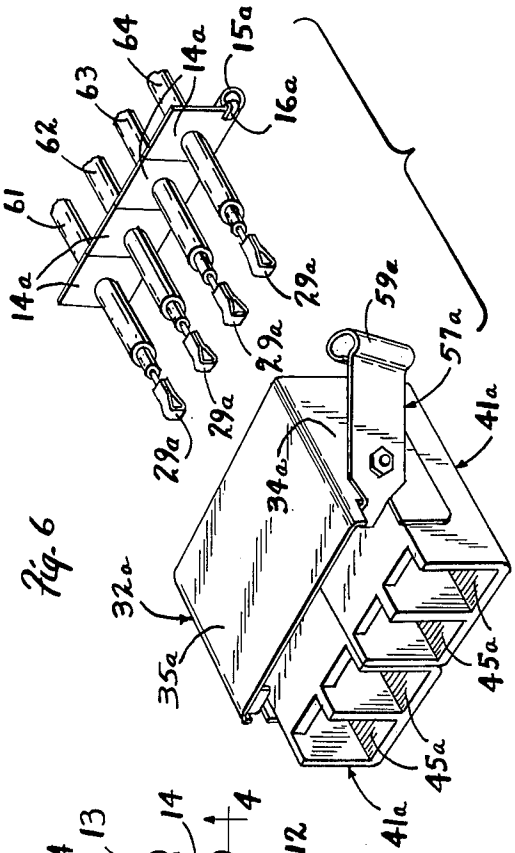


Fig. 6

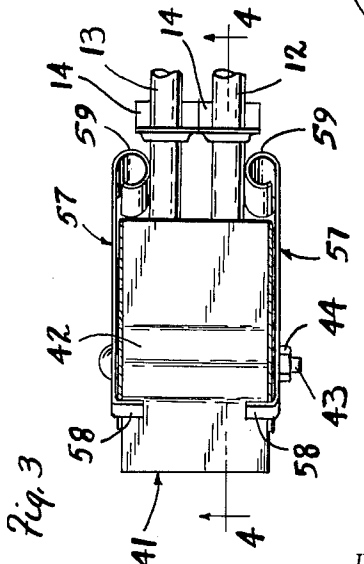


Fig. 3

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RANGE TOP HEATER ASSEMBLY

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Fig. 5

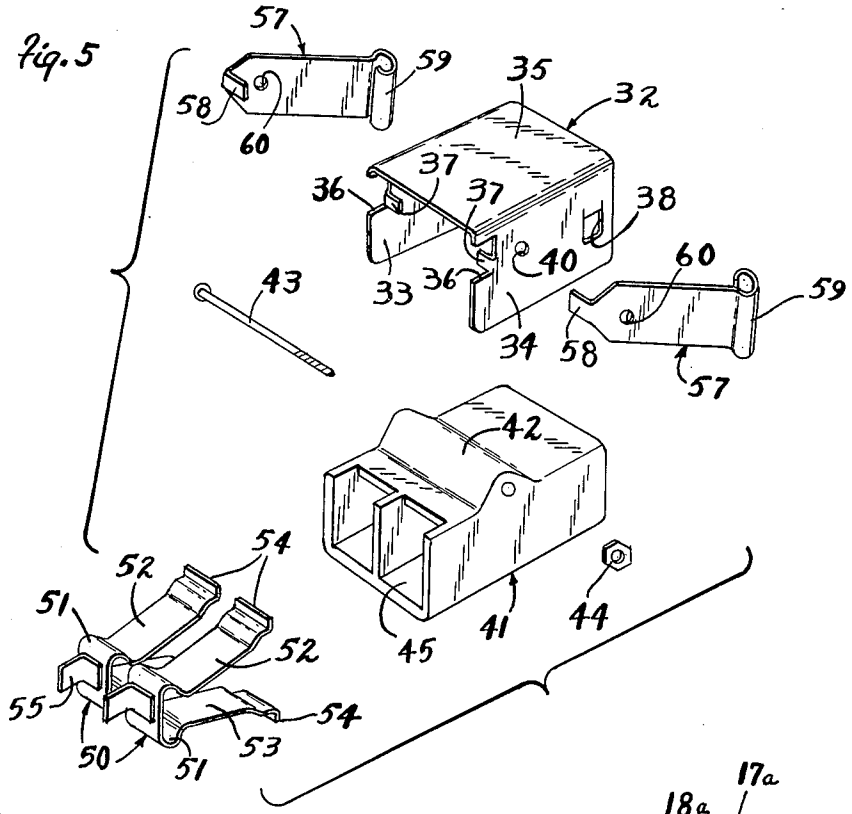
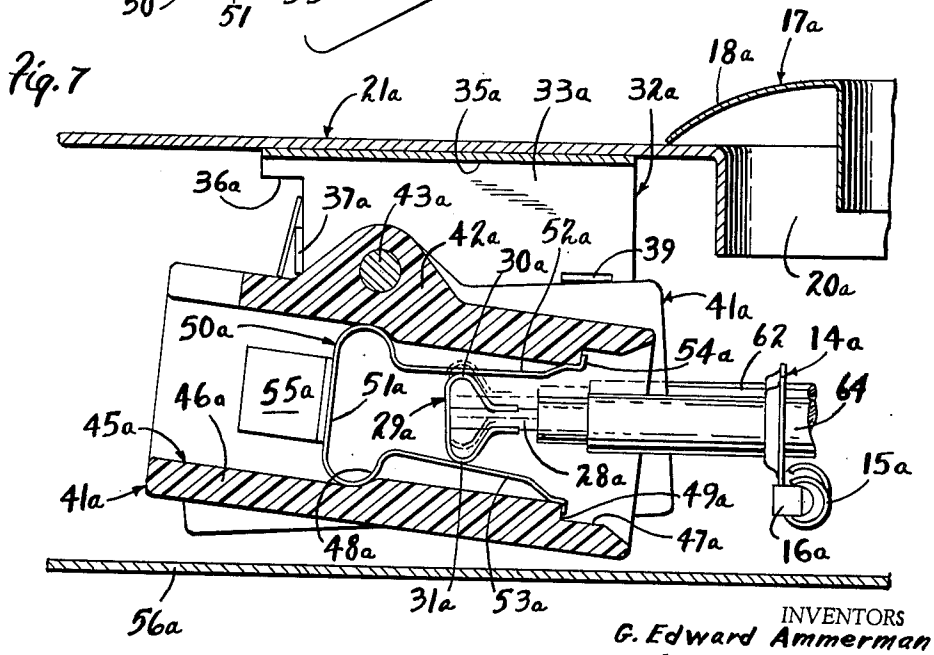


Fig. 7



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RANGE TOP HEATER ASSEMBLY

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Fig. 8

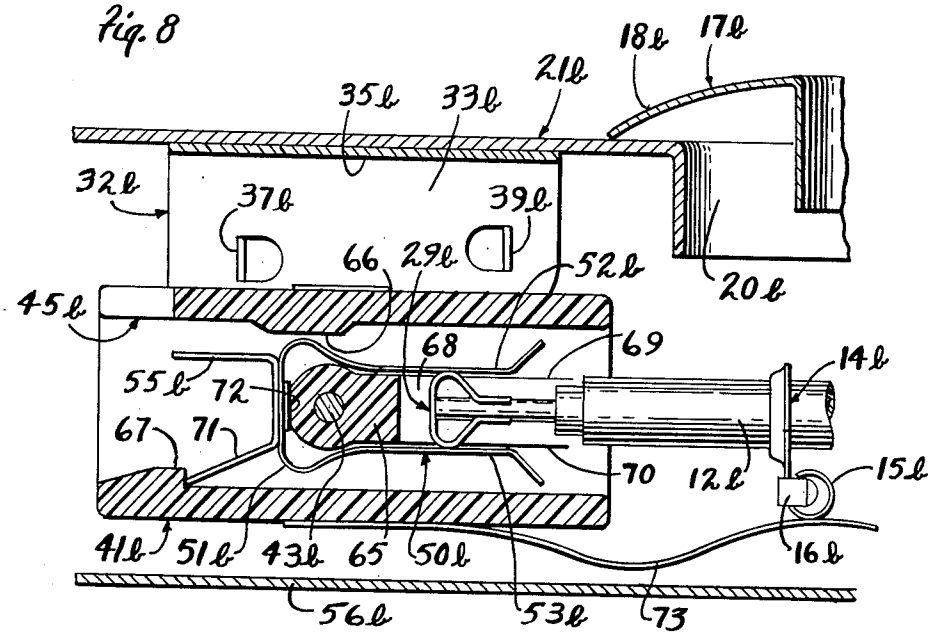
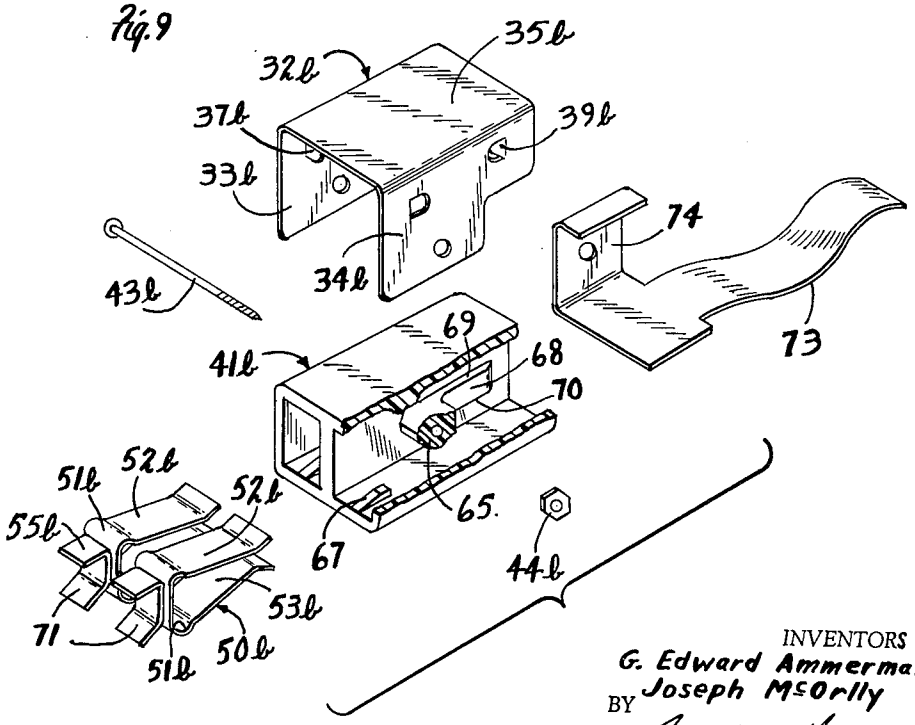


Fig. 9



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Fig. 10

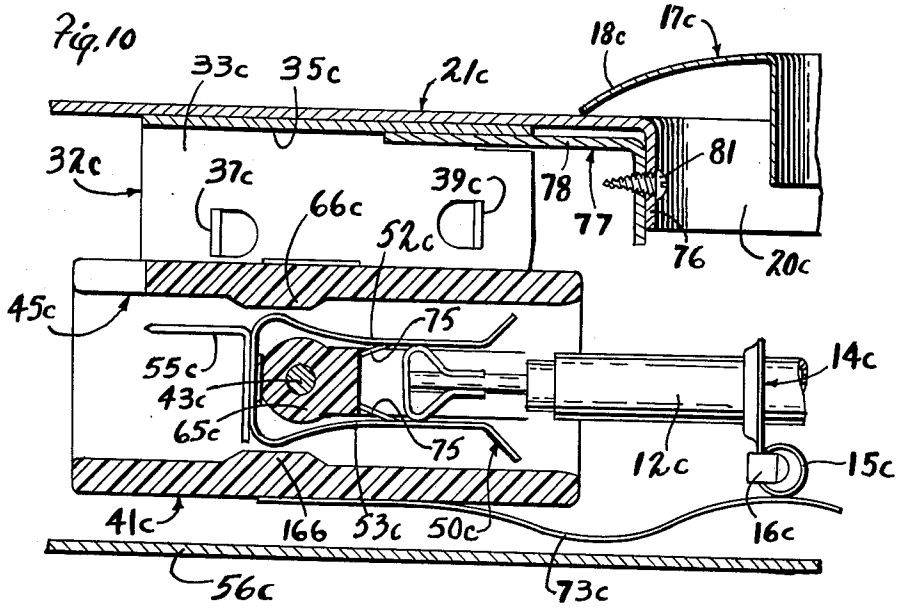


Fig. 11

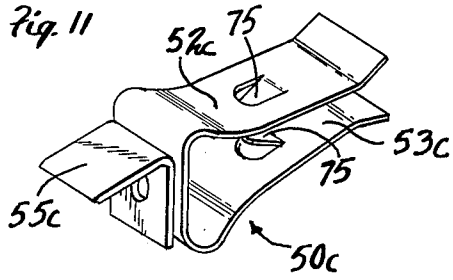
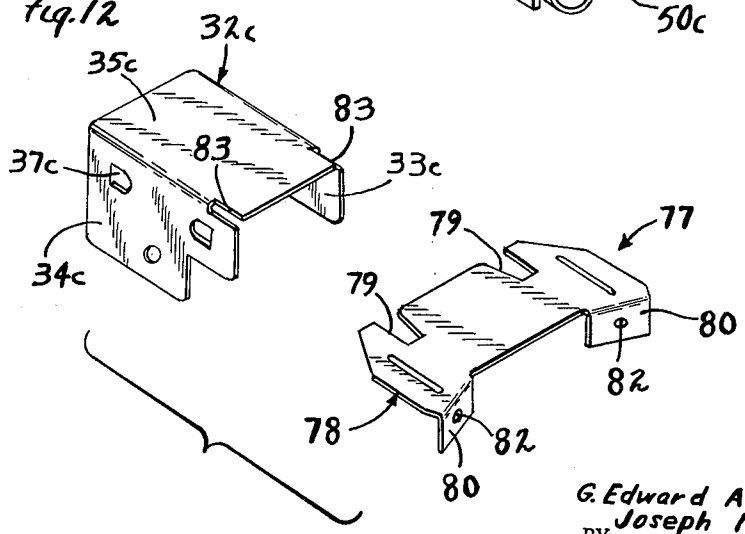


Fig. 12



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Fig. 13

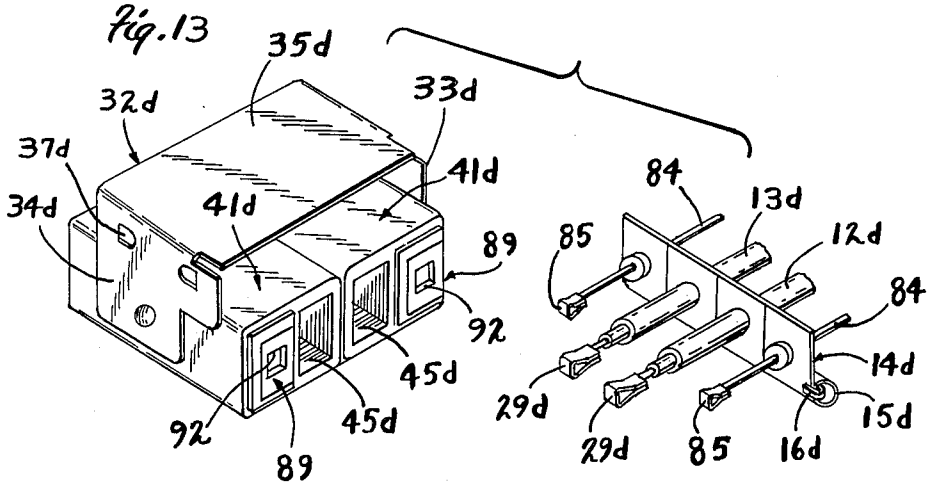
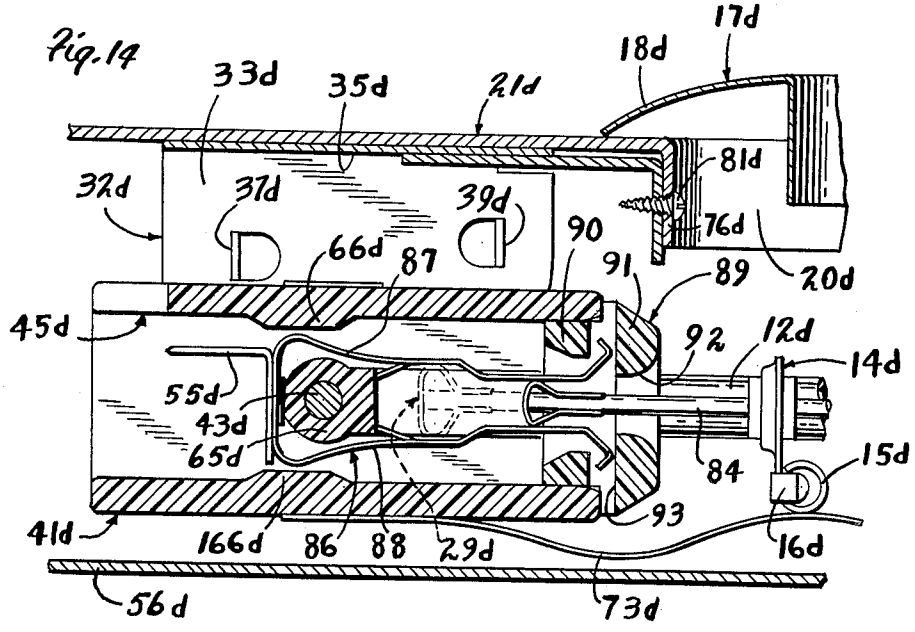


Fig. 14



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United States Patent Office 3,246,123 Patented Apr. 12, 1966

3,246,123

RANGE TOP HEATER ASSEMBLY

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Continuation of abandoned application Ser. No. 861,853, Dec. 24, 1959. This application Dec. 17, 1964, Ser. No. 421,745

20 Claims. (Cl. 219—451)

The present invention relates to electric heaters, more particularly to electric heaters of the range top, or surface type, and the principal object of the invention is to provide new and improved heaters of such character. This application is a continuation of application Serial No. 861,853, filed December 24, 1959.

Most present day range top heating element assemblies have heating elements which may be shifted from their normal position wherein they underlie and support a vessel to be heated to another position providing access to the underlying drip pan and to other parts of the assembly for cleaning purposes. Unfortunately, access to many parts of the assembly is still difficult and somewhat hazardous because of the electrical leads which remain attached to the heating element. Furthermore, constant shifting of the heating element may, in time, cause the attached leads to break or, even more serious, cause damage to the electrical insulation protecting the leads.

In order to alleviate these disadvantages, it has been proposed that the heating element be plugged into position in a manner similar to plugging an ordinary appliance into an electrical outlet. To this end, various constructions have been devised with varying degrees of success. Heretofore, one of the difficulties with even the most satisfactory of the plug-in constructions has been that considerable vertical space is required for these constructions. With the present trend to built-in ranges, there is considerable pressure to minimize the amount of vertical space required by the surface burner, or range top, portion of the unit. A reason frequently advanced for this vertical space minimization is that it permits a drawer to be mounted beneath the surface unit assembly. In any event, present market requirements dictate a relatively drastic reduction in the amount of vertical space accommodating the range top elements.

The present invention provides a simple, effective, plug-in type range top heater which fits within a vertical space much smaller than that heretofore required by similar heaters. Other advantages will readily become apparent from a study of the following description and from the appended drawings.

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

FIGURE 1 is a top plan view of a range top heater assembly constructed in accordance with the present invention,

FIGURE 2 is an enlarged sectional view generally corresponding to the line 2—2 of FIGURE 1,

FIGURE 3 is a fragmentary sectional view generally corresponding to the line 3—3 of FIGURE 2,

FIGURE 4 is an enlarged, fragmentary sectional view generally corresponding to the line 4—4 of FIGURE 3,

FIGURE 5 is a reduced size, exploded perspective view of certain of the parts seen in FIGURE 4,

FIGURE 6 is a reduced size, separated perspective view of parts similar to those seen in FIGURE 4 but of a modified construction.

FIGURE 7 is a fragmentary sectional view similar to FIGURE 4 but of the modification seen in FIGURE 6,

FIGURE 8 is a view similar to FIGURE 4 but of still another embodiment of the invention,

FIGURE 9 is a reduced size, exploded perspective view of certain of the parts seen in FIGURE 8.

FIGURE 10 is a view similar to FIGURES 4 and 8 but of yet another embodiment,

FIGURE 11 is a perspective view of a detail seen in FIGURE 10,

FIGURE 12 is a reduced size, exploded perspective view of other details seen in FIGURE 10,

FIGURE 13 is a separated perspective view of construction slightly modified from that seen in FIGURE 10, and

FIGURE 14 is a view similar to FIGURE 10 but of the embodiment seen in FIGURE 13.

With reference first to the embodiment illustrated in FIGURES 1 through 5 and as best seen in FIGURES 1 and 2, the present invention comprises a heating element **10** herein disclosed to be of the sheath embedded type. Briefly, such an element comprises a tubular metallic sheath filled with a compacted heat-conductive, electric-insulating material in which is embedded an electric resistor member. The resistor preferably terminates short of each end of the sheath and each resistor end is mechanically and electrically connected to a respective terminal pin, each of which extends beyond a respective sheath end for a purpose to appear.

In the present embodiment, the intermediate portion of the sheathed element (that portion which encloses the resistor) is formed to provide a plurality of convolutions forming a generally plane heating surface **11** which, as will later appear, is normally supported in a generally horizontal position. Respective terminal ends of the heating element **10** are bent downwardly and outwardly (in the position of parts seen in FIGURE 2) to provide generally parallel, spaced-apart terminal leg portions **12** and **13** which are spaced below the heating element surface **11** and which project generally horizontally in side-by-side relation beyond the periphery of such heating surface.

Means are provided for connecting the terminal leg portions **12** and **13** together and as herein disclosed, it is preferable to secure a flange member **14** to each terminal leg portion in spaced relation from the free end thereof, as shown and described in U.S. Patent No. 3,017,490. As disclosed in the above mentioned patent, each flange member is preferably formed of sheet metal and is apertured to pass a respective terminal leg. Each may be permanently secured to its respective leg by a suitable crimping or welding operation. Each flange member provides a tubular portion **15** whose axis extends transversely of its terminal leg and which, in the position of parts shown, underlies its respective leg. While only one flange member **14** can be seen in FIGURE 2, it is to be understood that this is because one is directly behind and aligned with the other.

The means provided for connecting the flanges **14** together may, as in the earlier filed application, comprise a spiralled metal strip **16** which passes through the aligned tubular flange portions **15** and functions as a pin. As in said patent, the ends of the strip **15** may be bent over the exterior of respective endmost tubular flange portions to retain the strip in position. Also, as disclosed in said patent, the connection between the flanges **14** is such that a limited amount of relative movement therebetween will be provided to accommodate slight manufacturing tolerances and to provide for expansion and contraction of the element during heating and cooling cycles.

The means presently employed for removably supporting the heating element **10** in position wherein its heating surface **11** may underline and support a vessel to be heat-

ed, is as follows: A ring-like member 17 having a radially outwardly turned flange portion 18 and a radially inwardly turned flange portion 19 is adapted to be positioned over an aperture 20 formed in the range top 21 so that the flange portion 18 overlies the upper surface of the range top. As seen in FIGURE 2 and for a purpose to appear, ring member 17 is provided with a sheet metal tab 117, welded or otherwise secured to the ring member, which engages the defining margin of the range top aperture 20 to prevent displacement of the ring member to the right from its centralized position in which it is seen. Although not shown, the ring member 17 may also carry the usual spring clips which resiliently retain it assembled with the range top. It should be pointed out that while ring member 17 is herein disclosed as being separate from the range top, such member may, if desired, be eliminated by forming the radially inwardly turned flange portion 19 as an integral part of the range top.

A shallow tray, or drip pan, 22 is adapted to be removably carried by the ring member 17 in position to underlie the heat-generating portion of the heating element when the latter is in its normal, full-line position seen in FIGURE 2. This tray, or pan, serves to reflect the heat radiated downwardly by the heating element and also serves to catch any drippings or overflow which may occur during cooking. Pan 22 is formed with a radially outwardly turned flange portion 23 which overlies the ring member flange 19 to thus support the pan in position. A portion of the pan is cut away at 24 to pass the terminal legs 12, 13 of the heating element.

Means 25 known in the art as a spider, underlies the heat-generation portion of the heating element and supports the latter in its normal position. This spider is preferably of the type disclosed in the above-mentioned patent. Briefly, such spider comprises a length of strip material positioned on edge and formed to a generally triangular configuration providing a plurality of legs (see FIGURE 1). One of the spider legs is slotted to pass a pair of loop members 26 depending from certain of the convolutions of the element to thus secure together the spider and one side of the element. Another portion of the spider has a forked bracket 27 which overlies the element leg 12 to retain the other side of the element and the spider together. As illustrated, spider 25 rests upon the upper surface of the flange 23 of the pan 22 when the latter is positioned on the ring member flange 19.

As previously mentioned, each terminal end of the heating element has a terminal pin protruding axially therefrom. One of such terminal pins is seen at 28 in FIGURE 4, protruding from the element terminal end 12. An identical pin, of course, protrudes from the terminal end 13. Secured by welding or the like to the free end of each terminal pin is a contact member 29 of the type disclosed in the above-mentioned patent. Briefly, each contact member 29 comprises a sheet metal loop providing vertically spaced, arcuate surfaces 30, 31, each generated about a generally horizontal axis (in the position of parts shown) which extends transversely of respective element terminal end portions 12, 13. As will later appear, contact members 29 cooperate with parts later to be described to provide a detachable electrical connection by means of which electrical energy is fed to the heating element.

A U-shaped, sheet metal bracket 32 (see FIGURE 5) is presently secured in inverted relation beneath the range top 21 adjacent the latter's aperture 20 (FIGURE 2) whereby its legs 33, 34 straddle the free ends element terminal ends 12, 13. Any suitable expedient may be employed to secure the bracket in position and at the present time it being preferable to spot weld the bight portion 35 of the bracket to the underside of the range top. For a purpose to appear, the bracket leg portions spaced furthest from the range top aperture 20 are notched at 36 and each provides an inwardly projecting, structurally integral tab 37 (FIGURE 5). The bracket leg portions adjacent the range top opening are apertured at 38 and each provides a structurally integral, inwardly projecting tab 39 (FIGURES 5 and 4). Also formed in respective bracket legs 33, 34 are respective, aligned apertures 40 (FIGURE 5).

Closely receivable between the bracket legs 33, 34 is a dielectric body, or terminal block 41. Block 41 (see especially FIGURE 5) has an apertured, upstanding boss 42 and is adapted to be pivotally secured to the bracket by means of a pin 43 which passes through the aligned apertures 40 in respective bracket legs and the boss aperture. Such pin may be removably retained assembled with the bracket by any suitable means; for example, one end of the pin may be headed and a nut 44 may be threaded on its opposite end. With the terminal block 41 thus assembled with the bracket 32 (see FIGURES 4) the block is supported by the bracket for pivotal movement about the axis of pin 43. Note, however, that pivotal movement of the block in one direction will be limited by its abutment with the bracket tabs 37 and movement in the opposite direction limited by its abutment with the bracket tabs 39.

With reference to FIGURES 4 and 5, block 41 has a pair of elongated recesses 45 extending therethrough in side-by-side relation for receiving respective element terminal legs 12, 13. Each recess 45 is herein shown with respective, vertically enlarged ends 46, 47, the former terminating on a tapered shoulder 48 and the latter terminating in a square shoulder 49.

Removably disposed in each block recess 45 (see FIGURE 4) is a spring contact 50 which, in the present embodiment, has a modified hairpin configuration. Each spring contact 50 is preferably formed of spring strip material of a width to closely fit within respective block recesses. The bight portion 51 of each spring contact 50 is of a vertical size to closely fit within a respective recess end 46 against respective shoulders 48 to limit contact movement to the right in the position of parts shown. The free ends of respective legs 52, 53 of the spring contact have a flattened portion for fitting against respective upper and lower recess surfaces and outwardly turned ends 54 which engage behind respective recess shoulders 49. Each spring contact bight portion 51 has a lug 55 welded thereto, such lug providing for the connection of an electrical lead (not shown) to the member.

To assemble a spring contact 50 with the block, it is merely inerted in its recess 45 from the left, as viewed in FIGURE 4, the element leg 12, of course, not being present at this time, until the spring contact bight portion 51 engages the shoulder 48 and the outwardly turned spring contact ends 54 spring behind the shoulders 49. Removal of a spring contact is effectuated by springing the free ends of the contact legs together so that the outwardly turned spring contact member ends 54 clear the shoulders 49. The spring contact may then be shifted to the left and out of its block recess.

Still referring to FIGURE 4, it will be seen that the legs 52, 53 of respective spring contacts 51 provide vertically disposed, converging surfaces which respectively engage the arcuate surfaces 30, 31 of the contact member 29 at the free end of a respective element terminal end portion 12, 13 when the element is positioned in its normal heating position. It is to be understood that insertion of the element terminal ends into the block recesses as illustrated in FIGURE 4 springs the contact legs 52, 53 apart somewhat so that they resiliently grip the contact member 29 and thus establish good electrical contact therebetween.

While the terminal block 41 is shown in FIGURE 4 to be aligned with the element terminal ends 12 and 13, such may not necessarily be its position with the element supported as shown on the drip pan flange 23. If, because of manufacturing tolerances or the like, the element terminal legs are somewhat higher than is herein shown, the right-hand end of the block will tilt upwardly about its

pivot 43 to equalize the stress on the respective legs of the spring contacts 50. On the other hand, if the element ends are somewhat lower, the block will tilt downwardly. Accordingly, it is not only important that the block be free to pivot about its pin 43 for the purpose aforesaid, but also that the element be free to pivot about its connection with the spring contacts 50 during insertion and removal of the element from the assembly as will next be described.

When the heater assembly is to be cleaned, it is only necessary to raise the right-end of the heating element 10, in position of parts seen in FIGURE 2, from the full-line position seen therein to the phantom-line position. This may cause upward tilting of the terminal block if the latter has sufficient freedom of movement, pivoting of the element terminal ends 12 and 13 about their connections with the spring contacts 50 if the block has insufficient freedom of movement (see the phantom-line position of the element terminal ends as shown in FIGURE 4), or a combination of such tilting and pivoting. In any event, with the element positioned as seen in phantom in FIGURE 2, the latter may be shifted to the right in the direction of the arrow to withdraw its terminal ends from respective block recesses. With the element thus separated from the assembly, it may be set aside and the drip pan 22 removed, say for cleaning or the like, from its resting place upon the annular flange 19 of the trim ring 17. If desired, the trim ring may also be removed from the range at this time to facilitate cleaning thereof and cleaning of the adjoining and underlying range portions.

To reassemble the parts and assuming the trim ring 17 and the drip pan 22 are positioned as seen in FIGURE 2, the element terminal ends will be inserted within respective terminal block recesses and moved to the left to force them into position against the resilient spring contacts 50. It is to be understood that regardless of the position of the block prior to insertion of the element terminal ends (indeed, the block will probably be tilted down because of the block portion to the right of the pivot is heavier than the portion to the left thereof) such insertion and movement to the left of the element terminal ends will tend to cause the block to so align therewith that the stress on the spring contact legs 50 will be equalized as before described. With the element inserted in the block as above described, the element being positioned as seen in phantom in FIGURE 2, it need only be pressed downwardly to the full-line normal position illustrated. Such downward movement of the element may cause tilting of the block about its pivot if the block is not against its stop, pivoting of the element about respective contact members 29 and spring contacts 50, or a combination of such tilting and pivoting.

While sufficient clearance has been shown between the terminal block 41 and a plate 56 which underlies the range top 21 to permit free tilting of the block between the stops carried by the bracket 32, where vertical space is at an even greater premium, such clearance may be reduced to the point where the terminal block has very little room for pivoting. Under such conditions, it will be evident that the ability of the element to pivot about its connection with the spring contacts 50 is of even greater importance.

Means are provided for grounding the heating element 10 to insure against a shock hazard in the event any electrical energy should leak to the element sheath. At the present time, such means are provided by a pair of members of 57 secured to the bracket 32 and engageable with respective element terminal legs 12, 13 (see especially FIGURE 3) at places spaced from their free ends. As best seen in FIGURE 5, each member 57 comprises a length of resilient spring material having one end bent at right angles to provide a tab 58, having its other end bent to provide a loop 59, and having an intermediate aperture 60. Each member 57 is adapted to overlie a respective bracket leg 33, 34 with its tab 58 seated in a respective leg notch 36 and with pin 43 passing through respective member apertures 60 to retain such members assembled with the bracket.

With reference to FIGURE 3, it is to be understood that the spacing between respective member loops 59 is such that they will be sprung apart as the element terminal ends are inserted in respective terminal block recesses to thus insure that the sheath of the heating element is electrically connected to and is thus grounded with the range top. While not shown, it may be desirable to elongate members 57 so that each engages a respective flange member 14 carried by respective element terminal ends 12, 13 rather than engaging such ends directly as herein illustrated.

In the embodiment thus far described, a single-tube heating element having but two terminal ends has been disclosed; however, the present invention is well-adapted for constructions wherein the heating element comprises a pair of tubular elements each having two terminal ends. As fragmentarily illustrated in FIGURE 6, the heating element therein shown comprises four terminal ends 61, 62, 63 and 64 in side-by-side relation. Each of these terminal ends is similar to those heretofore described in that each provides contact members 29*a* (similar to members 29) and such ends are removably connected together by means of flange member 14*a* and a strip 16*a* similar to members 14 and 16 earlier disclosed.

In this embodiment, two terminal blocks 41*a* are disposed in side-by-side relation and each is preferably identical to the block 41. Bracket 32*a*, as can be seen, is similar to 32 with the exception that the spacing between the bracket legs 34*a* is increased to accommodate two blocks instead of one. Other parts, identified by the same reference characters as before but with the suffix "*a*" added, are similar to those heretofore described.

While the use of two terminal blocks in the embodiment seen in FIGURE 6, which blocks are identical to the single block used in the embodiment seen in FIGURES 1 through 6, results in the important advantage of interchangeability of parts, yet another more important advantage is provided. It is to be understood that when the heating element is formed of two tubular elements, each having a pair of terminal ends as seen in FIGURE 6, greater difficulty exists in aligning such ends than when only two ends are employed as in the first disclosed embodiment.

Referring to FIGURE 7 wherein the two element terminal legs on the near side are shown disposed below their normal level while the two element terminal legs on the far side are shown disposed above their normal level, it will be seen that the terminal blocks 41*a* engage with respective terminal end pairs are respectively tilted down and up to equalize the stress upon the respective legs of respective spring contacts 50*a*. The ability of the terminal blocks 41*a* to thus tilt independently, when required, is of considerable advantage in prolonging contact life, insuring good electrical connections, and facilitating assembly and disassembly of the heating element with the terminal block.

It should also be pointed out that while only two terminal blocks are shown employed in the embodiment seen in FIGURES 6 and 7, four terminal blocks, one for each element terminal end, could be employed if desired to obtain the optimum in adaptability to element terminal end misalignment. Obviously, each of such terminal blocks would contain but a single, element terminal end receiving recess. That such individual terminal blocks could also be advantageously employed with the embodiment seen in FIGURES 1 through 5 will be evident.

In the embodiment seen in FIGURES 8 and 9 wherein the same reference characters employed in FIGURES 1 through 5 but with the suffix "*b*" added are employed to identify similar parts, a somewhat modified construction of the terminal block, the spring contacts and the bracket is illustrated. In this embodiment and as best seen in

FIGURE 8, each block recess 45*b* has a transversely extending boss 65 which is apertured to pass the pivot pin 43*b*. Note that in this construction, the axis of such pin lies in a horizontal plane which bisects the block. The upper wall of each recess 45*b* has a depending abutment 66 adjacent the boss 65 while the left end of the lower wall of the recess has an upwardly projecting abutment 67 providing a shoulder which faces to the right. Each recess side wall has an inwardly projecting boss 68, each providing vertically spaced upper and lower shoulders 69 and 70. The left end of each boss 68 merges into the aforesaid boss 65 while the right end of each boss 68 is tapered to fade into respective recess side walls adjacent the right end of the block.

Disposed in each block recess 45*b*, as shown, is a spring contact 50*b* which differs in several important respects from the previously described spring contact 50. Firstly, the lug 55*b* which is secured to the bight portion 51*b* of the spring contact is of generally U shape, its lower leg 71, however, being inclined downwardly to engage behind the shoulder provided by the abutment 67 to thus retain the spring contact in its recess. Abutment 66, it will be understood, limits upward movement of the spring contact to prevent unintentional disengagement of the leg 71 of the lug 55*b* from its shoulder aforesaid. While lug 55*b* could be welded to the spring contact, it is preferable to extrude, at 72, a bight portion of the lug through an aperture in the bight portion of the spring contact and to then crimp such extruded portion 72 against the spring contact to form a structurally integral assembly between the latter and the lug.

Spring contacts 50*b* differ in still another important respect from the contacts 50 previously described. The latter, it will be recalled, were so designed that the free ends of their legs were resiliently urged apart to engagement with vertically spaced defining portions of respective block recesses. In the instant construction, however, each spring contact is so designed that the free ends of its legs 52*b*, 53*b* are resiliently urged toward each other.

With reference to FIGURE 8 and assuming that the terminal ends 12*b*, 13*b* of the element are at this time not present in their respective block recesses, assembly of each spring contact 50*b* within the block recess will be as follows: A spring contact will be inserted into the left end of its recess with the free ends of its leg portions foremost and with its leg 52*b* uppermost until the free ends of its legs abut the boss 65.

Moving the spring contact still further to the right will cause its legs to be sprung apart, leg 52*b* passing over the boss 65 while leg 53*b* passes under the boss. The spring contact will be moved to the right until the extruded portion 72 of the lug 55*b* abuts the left end of boss 65 as illustrated in FIGURE 8. It is to be understood that the legs 52*b*, 53*b* will readily be sprung apart by the movement aforesaid because of the rounded configuration of the left end of boss 65 and because of the outwardly turned free ends of the spring contact legs 53*b*. Movement of the spring contact as above described will cause leg 71 of the lug 55*b* to ride over abutment 67 and finally spring behind the shoulder provided thereby when the spring contact is in its seated position shown. Removal of a spring contact from its block recess may readily be effected by disengaging leg 71 from behind the shoulder of abutment 67 and then withdrawing the contact from its recess by moving it to the left.

With the spring contact disposed as seen in FIGURE 8 but prior to insertion of the element terminal legs within the block recesses, it is to be understood that the spring contact legs 52*b*, 53*b* are resiliently engaged with, and held in spaced relation by, respective shoulders 69, 70 of respective bosses 68. When, however, an element terminal leg is inserted in the block recess, its contact member 29*b* will enter between the outwardly turned free ends of the contact member legs and force such legs still further apart, away from respective boss shoulders 69, 70, the resiliency of the spring contact now yieldably gripping the element contact member 29*b* rather than the boss shoulders 69, 70.

As viewed in FIGURE 9, rather slight constructional differences exist between the bracket 32*b* and the bracket 32. Among such differences is the elongation of the legs 33*b*, 34*b* of the bracket to accommodate the lower position of the pivot pin 43. Also, the lower, right-hand ends of the bracket legs are cut back, away from the source of heat, to reduce their operating temperature and to insure against engagement of a contact member 29*b* therewith in the event the element is improperly assembled with the block with one of the element terminal legs disposed on the outside of the block. Other slight differences exist in the formation of the tabs 37*b* and 39*b*.

One other important constructional difference exists between the construction seen in FIGURES 8 and 9 and that heretofore described, such difference being in the arrangement employed to ground the element. As illustrated, an L-shaped spring metal strip has a horizontal leg 73 adapted to underlie the block 41*b* and to project some distance beyond the right-hand end thereof for resilient engagement with the flanges 14*b* of the element terminal legs when the latter are disposed in respective block recesses. The vertical leg 74 of the strip is bent to overlie the top of the block and is apertured to pass the pivot pin 43*b*. As will be clear, the vertical leg of the strip is adapted to be interposed at assembly between the bracket leg 33*b* and the adjoining block surface. In the event a double terminal block construction, such as shown in FIGURE 6, is employed, two identical spring metal strips would preferably be used. One strip would be arranged as previously described while the other will have its horizontal leg underlying the other block and its vertical leg disposed between the two blocks.

With reference to the embodiment seen in FIGURES 10, 11 and 12, parts similar to those heretofore described are identified by the same reference characters as before but with the suffix "*c*" added. In this embodiment and bearing in mind the construction seen in FIGURE 8, the terminal block 41*c* omits the abutment 67 of the last mentioned figure and is instead provided with an abutment 166 which is preferably identical with abutment 66*c* with the exception, of course, that such abutment projects upwardly of the lower wall of the block recess 45*c* in opposed relation with abutment 66*c*. Also, in this embodiment, lug 55*c* omits the leg 71 of lug 55*b* of FIGURE 8.

The means preventing unintentional displacement of a spring contact 50*c* from its block recess comprises a pair of left-facing (in the position of parts seen) tongues 75 struck out from respective legs 52*c*, 53*c* of the spring contact. Such tongues 75 project toward each other to engage the right end of boss 65*c* when the spring contact is seated in its recess. Assembly of the spring contact 50*c* in its block recess will be from the left in the manner previously described; in this case, however, the tongues 75 snapping over the boss 65*c* to prevent unintentional disassembly. Note that the abutments 66*c*, 166 limit vertical movement of the spring contact within its block recess.

When desired, disassembly of the spring contact 50*c* from its recess may readily be effectuated by springing the legs 52*c*, 53*c* apart sufficiently to clear the boss 65*c* with the tongues 75 and then shifting the spring contact to the left and out of the block.

One other novel feature is possessed by the embodiment of the invention seen in FIGURE 10. While the bracket 32*c* may be welded to the underside of the range top as previously disclosed, it is sometimes desirable to removably secure the bracket in position. It would, of course, be possible to pass fastening screws or the like directly through the range top and the bracket; however, this is undesirable because such screws would be unsightly. Therefore, it is proposed to so fasten the bracket to the

range top that the fastening screws will be hidden by the trim ring **17***c* when it is positioned to overlie the range top aperture **20***c*. Normally, most range tops have an annular depending wall **76** defining the aperture **20***c* and it is to this wall that it is preferred to secure the bracket **32***c*.

While a special bracket could be employed when it is to be fastened to the wall **76** by means of screws rather than by welding it to the underside of the range top, it is preferable, for manufacturing economies to utilize the same bracket in both cases merely by securing to the bracket an extension member when the bracket is to be secured to the annular wall.

As viewed in FIGURE 12, a bracket extension member **77**, having a tongue portion **78** with a pair of slots **79** formed therein, is securable to the bracket **32***c*. In the position of parts illustrated, extension member **77** has a pair of spaced-apart, depending apertured ears **80** which abut radially spaced portions of the wall **76** (see FIGURE 10). Respective screws **81** pass through apertures in the wall **76** and are threaded into respective apertures **82** formed in the ears to secure the extension member to the wall.

Still referring to FIGURE 12, when a narrow bracket **32***c* (one that carries but a single terminal block **41***c*) is to be assembled with the extension member **77**, the tongue portion **78** of the latter is slid beneath the bight portion **35***c* of the bracket with the legs **33***c*, **34***c* of the latter fitting in respective slots **79** and the assembly then spot welded. Note that the bracket legs **33***c*, **34***c*, are notched at **83** to permit the bracket to be assembled quite close to the ears **80** when necessary. It is to be understood that while the range top openings **20***c* may differ in diameter somewhat between various range manufacturers, the same bracket and extension member may be employed for all since it is only necessary to appropriately vary the amount of overlap between the bracket and extension member tongue portion before welding them together. Obviously, a smaller diameter range top opening will require somewhat less overlap than will a larger range top opening. It is also to be understood that the same extension member **77** may be used with a wide bracket, similar to **32***c*, but which carries a pair of terminal blocks **41***c* in side-by-side relation. In such case, the bracket legs will straddle the entire extension member tongue portion rather than fit in respective slots **79**.

In the constructions thus far disclosed it will be recalled that a single tube element, having two terminal leg portions, or a double tube element, having four terminal leg portions, may be employed merely by using a wider terminal block mounting bracket and one or more additional terminal blocks. When a terminal block having two terminal leg receiving recesses is employed, one additional block will be required to accommodate a double tube element; however, in the event a single recess terminal block is employed, two additional blocks will be required to accommodate the double tube element. In any event, the heretofore described constructions contemplated only the usual type element assemblies having either two or four terminal legs depending upon whether the assembly was of single or double tube construction.

Many modern ranges employ a heating unit assembly wherein the heating element is thermostatically controlled in response to the temperature of the vessel being heated. In many of such assemblies, a heat-sensitive element is disposed in the center of the element convolutions for engagement with the bottom of the vessel being heated and extending from the heat-sensitive element are a pair of current conductors through which current flows in proportion to the temperature of the heat-sensitive element. Other circuit components are carried by the range to control flow of electrical energy to the heating element convolutions in accordance with the current flow through the heat-sensitive element.

For convenience in cleaning, it is highly desirable that the heat sensitive element be removable with the heating element-spider assembly and this makes it necessary to provide plug-in connections for the conductors of the heat sensitive element which are similar to those employed for making electrical connections to the terminal legs of the heating element. Since thermostatic elements usually employ a single tube heating element having but two terminal legs, it has been proposed to so locate the heat sensitive element current conductors that they will occupy the positions normally occupied by the additional terminal legs of the double tube heating element assembly. This arrangement is highly desirable since it permits interchangeability of many parts; however, certain problems are presented by the necessity of complying with the following provisions.

Firstly, it is necessary to prevent the unintentional assembly of a double tube element assembly in the place provided for the thermostatically controlled assembly. Secondly, it is necessary to insure that in the event the thermostatically controlled assembly is positioned in the place provided for a double tube element assembly, the conductors of the heat sensitive element will not be electrically connected into the power circuit for the heating element as this would immediately destroy the heat-sensitive element. The construction seen in FIGURES 13 and 14 provides a thermostatically controlled, plug-in unit assembly which meets the foregoing requirements.

As best shown in FIGURE 13, current conductors **84** extend from the heat sensitive element (not shown) in side-by-side relation with the terminal leg portions **12***d*, **13***d* of the heating element. For a detailed disclosure of the manner in which the heat sensitive element may be mounted and the manner of supporting the current conductors from the element terminal ends, reference may be had to U.S. Patent No. 3,017,491. In common with said patent, conductors **84** terminate short of the ends of the element terminal legs **12***d*, **13***d*; however, welded or otherwise secured to the ends of the current conductors **84** are contact members **85** which may be similar to the contact members **29***d* carried by the element terminal legs but which are materially smaller for a purpose to appear.

With reference to FIGURE 14, each current conductor is adapted to be disposed within its own terminal block recess **45***d*; however, it will be noted that each projects into its recess a much shorter distance than do the element terminal ends. Therefore, even if the thermostatic assembly is plugged into the wrong terminal block, the current conductors are too short (and also too narrow) to engage a spring contact member designed to cooperate with an element terminal leg.

Because of the short length of a terminal conductor **84** and the small size of its contact member **85**, the spring contact **86** disposed in each conductor member receiving block recess takes the form seen in FIGURE 14. In general, such spring contact is similar to the previously disclosed contact **50***c* seen in FIGURES 10 and 11; however, the member legs **87**, **88** are considerably elongated so as to reach a contact member **85** and such elongated leg portions are bent to provide a much closer spacing therebetween to thus resiliently grip the smaller contact member. Obviously, the block recesses which receive the element terminal legs **12***d*, **13***d* may contain spring contacts identical to that seen in FIGURE 11.

Each block recess adapted to receive a terminal conductor **84**, as herein disclosed the two outer block recesses, have their right ends partially closed by a plug member **89**. Each plug member preferably has a shank portion **90** closely fitting within a respective recess and a shoulder portion **91** for engaging the right-hand end of the block and thus locating the plug member in the block recess. Preferably, each plug member is pressed into its recess and retained in position by frictional engagement with the defining wall thereof; however, if desired, each plug member may be retained in its recess

by the outwardly turned free ends of a respective spring contact **86**.

Each plug member **89** has a central, through aperture **92** of a size to just pass the contact member **85** and the right end of such aperature may have a tapered enlargement to facilitate entry of the current conductor end. Since aperture **92** is smaller in size than a contact member **29***d* carried by the element terminal ends, it will obviously be impossible to incorrectly assemble a double tube element with the terminal block assembly seen in FIGURE 13 since the outermost terminal ends of the element assembly could not be inserted in the terminal block recesses partially closed by the plug members. Each plug member **89** is also preferably provided with a transversely extending aperture **93** to provide clearance over the outwardly turned free ends of the spring contacts **86**.

In other respects not herein specifically mentioned, it is to be understood that the construction of the embodiment seen in FIGURES 13 and 14 may be similar to that illustrated in FIGURE 10. It is also to be understood that the contacts **86** may be assembled within their terminal block recesses or removed therefrom in the same manner as the previously described spring contacts **50***c*.

In view of the foregoing, it will be apparent to those skilled in the art that we have accomplished at least the principal object of our 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 described; hence it will be appreciated that the herein disclosed embodiments are illustrative only, and that our invention is not limited thereto.

We claim:

1. A range top heating unit comprising an elongated sheathed electric heating element having an intermediate heat-generating portion providing a generally plane heating surface removably supported by the range in a generally horizontal position for underlying and supporting a vessel to be heated and having terminal end portions extending from respective ends of said intermediate portion for conducting electrical energy thereto and said terminal end portions being disposed beneath said heating surface and projecting generally horizontally in side-by-side relation beyond the periphery of said heating surface, a dielectric body carried by the range beneath the range top and spaced to one side of said element heating surface adjacent the free ends of said element terminal end portions, and means carried by said body providing a pair of opposed surfaces resiliently biased toward each other to engage a respective element terminal end portion disposed therebetween and place said element in an electrical circuit, said surfaces having converging portions whose widest spacing faces toward said element heating surface to provide a tapered pocket in which a respective element terminal end portion is readily slidable in a direction longitudinally of said element terminal end portions, said last named means having a portion yieldably locking the same in position with respect to said body.

2. The construction of claim **1** wherein the free end of each element terminal end portion provides vertically spaced arcuate surfaces each generated about a generally horizontal axis extending transversely of said element terminal end portions, wherein said dielectric body has a recess for receiving respective free ends of said element terminal end portions, and wherein each pair of surfaces is formed by respective vertically spaced legs of generally U-shaped leaf spring members disposed in respective recesses with their open ends facing said element, wherein a leg of each spring member slidably engages respective surfaces of respective free ends of said element terminal end portions, and wherein the legs of respective spring members are in converging relation with their widest spacing adjacent said element to provide for the insertion between said legs of respective free ends of said element terminal portions and to provide a resilient wedging interengagement between said spring members and said element portions to effect a low resistance electrical connection therebetween.

3. The construction of claim **1** wherein said dielectric body has a recess for receiving respective free ends of said element terminal end portions and wherein each pair of surfaces is formed by respective legs of generally U-shaped leaf spring members disposed in respective recesses with their open ends facing toward said element to provide for the insertion between said legs of respective free ends of said element terminal end portions.

4. The construction of claim **3** wherein the legs of respective spring members are in converging relation with their widest spacing adjacent said element and said legs being sprung apart by the insertion therebetween of respective free ends of said element terminal end portions.

5. The construction of claim **1** wherein a pair of ground spring members are carried by and disposed on opposite sides of said dielectric body and are yieldably urged to smaller than the transverse span of said element terminal portions and said ground spring members resiliently engaging the latter in spaced relation from their free ends, when said element is in its vessel supporting position, for grounding said element to the range.

6. The construction of claim **1** wherein said dielectric body is formed of two parts each of which carries a respective surface pair, and further including means connecting said body parts to said range for pivotal movement both with respect thereto and with respect to each other.

7. The construction of claim **6** wherein said connecting means provides a generally horizontal axis about which said body parts are pivotable.

8. The construction of claim **1** wherein said opposed surfaces are spaced vertically of each other and wherein each element terminal end portion has a curved surface engaged with a respective surface of said surface pair to provide a horizontal pivot connection therebetween.

9. The construction of claim **1** wherein said body is secured to said range for pivotal movement about a generally horizontal axis independently of movement of said element.

10. A range top heating unit comprising an electric heating element having a heat-generating portion providing a generally plane heating surface removably supported by the range in a generally horizontal position for underlying and supporting a vessel to be heated and said element having a terminal end portion disposed beneath said heating surface and projecting beyond the latter's periphery for conducting electric energy to said heat-generating element portion, a dielectric body carried by the range beneath the range top and spaced to one side of said element heating surface adjacent said element terminal end portion, said body having a horizontally extending recess entering from a body portion facing said element for removably receiving said element terminal end portion and said body having a boss substantially bisecting said recess, and a U-shaped resilient electrical contact member within said body recess having spaced legs disposed on respective sides of said boss and said member legs resiliently gripping the free end of said element terminal end portion therebetween to provide an electrical connection to the latter, each member leg having a transverse protuberance for resiliently engaging said boss to retain said member within said body recess.

11. The construction of claim **10** wherein said dielectric body is pivoted to the range about a horizontal axis extending transversely of and intermediate said contact member legs.

12. A range top heating unit comprising an electric heating element having a heat-generating portion provid-

ing a generally plane heating surface removably supported by the range in a generally horizontal position for underlying and supporting a vessel to be heated and said element providing a pair of separate electrical circuits, two pair of terminal conductors disposed in side-by side relation beneath said element heating surface and one end of each pair of conductors being connected to respective circuits for conducting electrical energy thereto, the opposite end of each conductor projecting beyond the periphery of said heating surface and one of said conductor pairs projecting beyond the other, the free end of each of said conductors having an electrical contact portion and the contact portions of said one conductor pair being larger in transverse size than the contact portions of said other conductor pair, dielectric body means carried by the range beneath the range top and having pockets open toward said element for receiving respective conductor free ends, the openings into the pockets which receive the contact portions of said other conductor pair being small enough to exclude entrance of the contact portions of said one conductor pair to insure against improper element assembly with said body means, and an electrical contact finger in each of said body means pockets for engaging respective conductor contact portions in electrically conductive relation, the contact fingers in those body means pockets which receive the contact portions of said one conductor pair being spaced within said pockets a distance to prevent engagement with the contact portions of said other conductor pair in the event the latter are erroneously inserted in such body means pockets.

13. In combination: a range top having an opening therein, a heating unit comprising an elongated metal-sheathed heating element having an intermediate heat-generating portion normally disposed generally within said range top opening for underlying and supporting a vessel to be heated and having terminal end portions extending from said intermediate portion for conducting electrical energy thereto, said terminal end portions being disposed in side-by-side relation below said heating surface and extending away from a side thereof, a metallic bracket electrically and mechanically connected to said range top and underlying the same adjacent to said range top opening, a dielectric terminal block swingable vertically about a horizontal pivot carried by said bracket, and having openings corresponding to said terminal end portions and into which the latter may be projected, said dielectric block also having terminals connectable to a source of electrical energy and said terminal end portions having corresponding terminals for plug-in connection with the terminals of said dielectric block when said terminal end portions are projected into said dielectric block openings, a spring arm carried by in electrical continuity with said metal bracket and extending therefrom in a direction toward the center of said range top opening, said spring arm having electrical grounding connection with at least one of said terminal leg portions when the terminals of the latter are moved to plug-in connection with the terminals of said dielectric block.

14. The construction of claim **13** wherein a metallic flange member extends between and mechanically and electrically connects the sheaths of said terminal leg portions, and wherein said spring arm is pressed against said flange member to ground the same when said terminal leg portions are projected into the dielectric block openings.

15. The construction of claim **13** wherein said spring arm underlies said dielectric block.

16. The construction of claim **13** wherein said metallic bracket is of U-shape and has its bight connected to said range top and its legs on opposite sides of said dielectric block, said horizontal pivot extending through said block with its opposite ends carried by respective bracket legs.

17. The construction of claim **13** wherein said bracket has abutments for limiting swinging movement of said dielectric block.

18. The construction of claim **16** wherein a pair of spring arms extend from respective legs of said metallic bracket and are disposed on opposite sides of and electrically grounded to said terminal leg portions when the latter are projected into said dielectric block openings.

19. The construction of claim **18** wherein said spring arms form a continuation of respective bracket legs.

20. The construction of claim **18** wherein the free end of each spring arm is curved to permit camming of said terminal leg portions therebetween.

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