Sept. 9, 1969 N. J. BURGER 3,466,427

PLUG-IN ELECTRIC HEATING ASSEMBLY

Filed Oct. 13, 1967 2 Sheets-Sheet 1

Fig-1

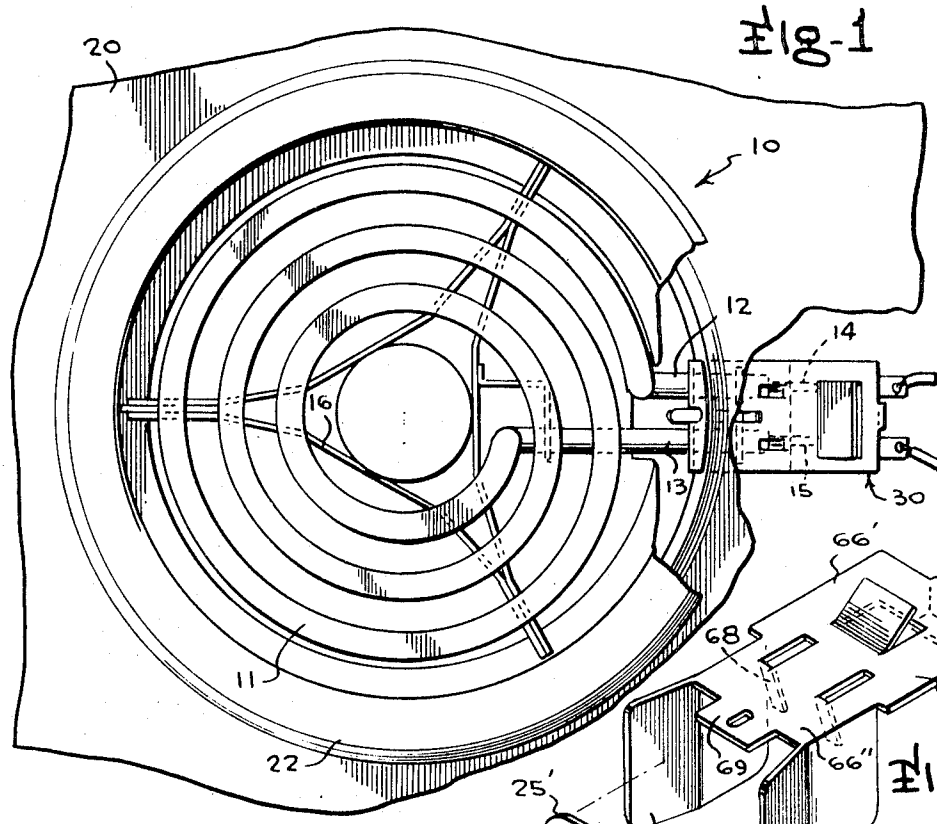
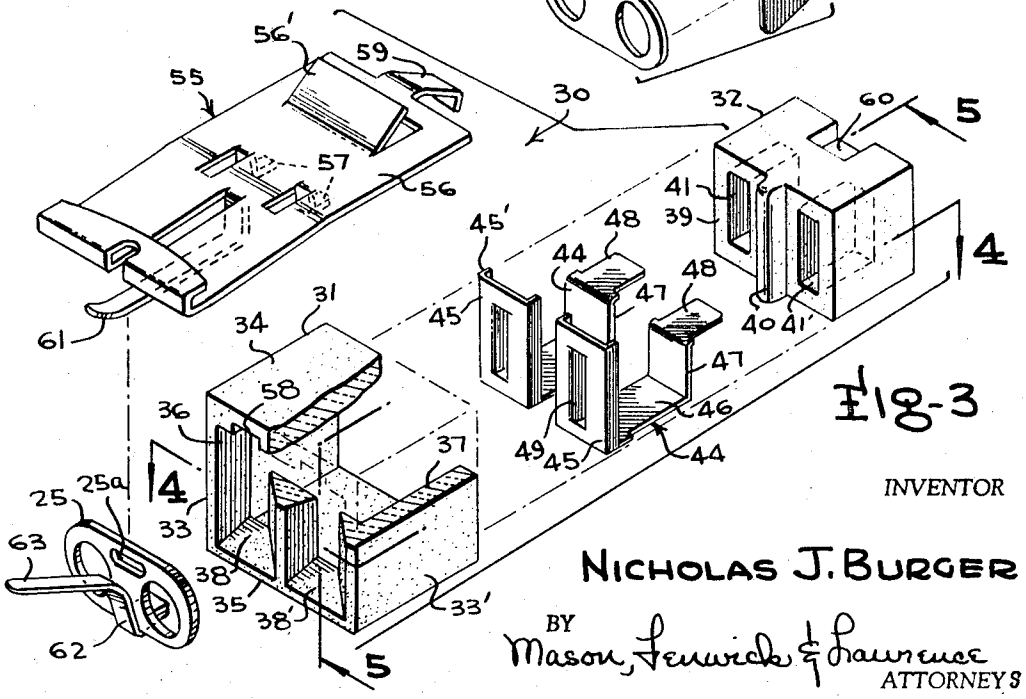


Fig-6

Fig-3



INVENTOR

NICHOLAS J. BURGER

BY Mason, Fenwick & Lawrence

ATTORNEYS

Sept. 9, 1969 N. J. BURGER 3,466,427

PLUG-IN ELECTRIC HEATING ASSEMBLY

Filed Oct. 13, 1967 2 Sheets-Sheet 2

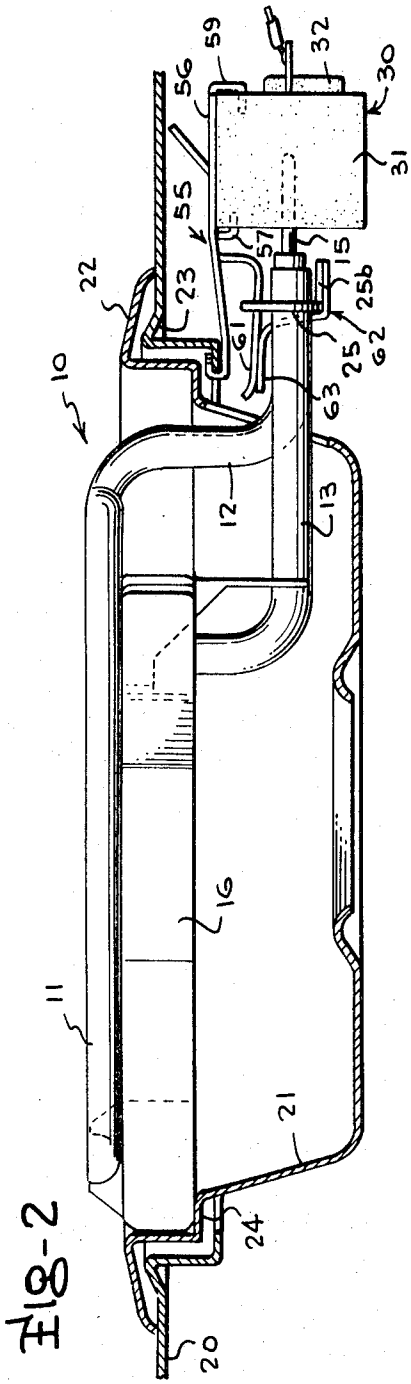


FIG-2

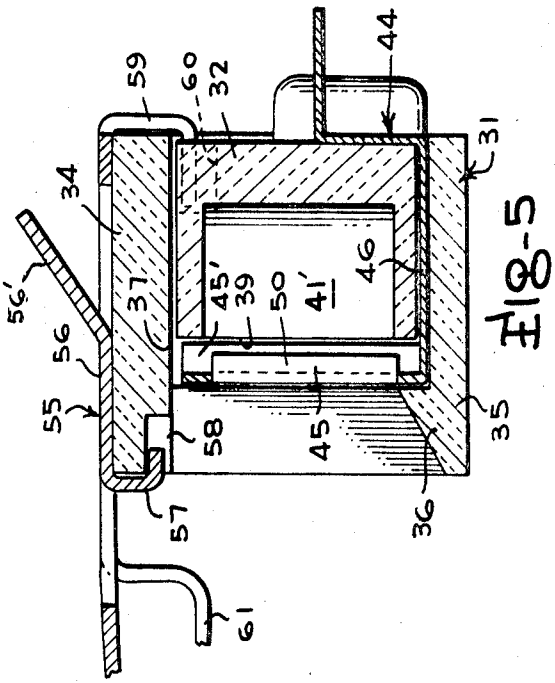


FIG-5

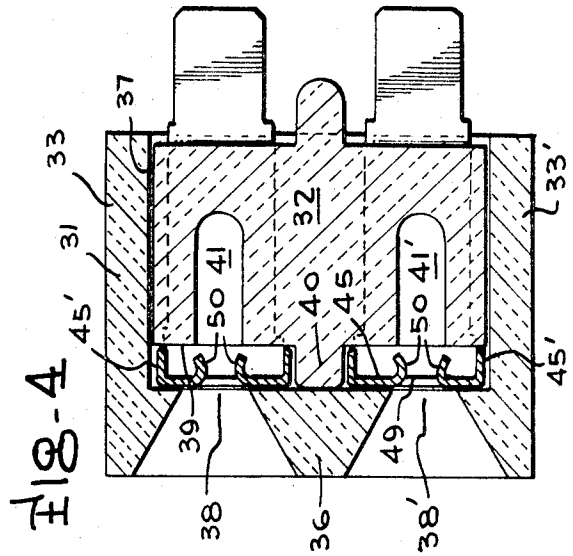


FIG-4

INVENTOR

NICHOLAS J. BURGER

BY Mason, Fenwick & Lawrence

ATTORNEYS

United States Patent Office 3,466,427 Patented Sept. 9, 1969

3,466,427

PLUG-IN ELECTRIC HEATING ASSEMBLY

Nicholas J. Burger, Silver Spring, Md., assignor to Electro-Therm, Inc., Laurel, Md., a corporation of Maryland

Filed Oct. 13, 1967, Ser. No. 675,240
Int. Cl. H05b 3/76
U.S. Cl. 219—451 10 Claims

ABSTRACT OF THE DISCLOSURE

A surface type plug-in electrical heating unit for electric ranges, wherein the surface heating unit has a tubular sheathed heating element in a spirally coiled configuration terminating in a pair of laterally spaced, side-by-side end portions or legs having a pair of parallel elongated contact pins projecting therefrom defining the male contact members. A grounding bracket is secured to and extends between the sheath legs near the contact pins. A female receptacle member defines contact sockets for the contact pins and is formed of an outer ceramic block having a rearwardly opening cavity and a pair of front access slots axially aligned with the male contact pins and an inner ceramic insert fitting into the cavity, between which a pair of female contact members are held. The female contact members have front legs behind the access slots provided with contact slots bounded laterally by rolled edges for wiping contact with the contact pins. A mounting bracket for the female receptacle fitting has means for completing a grounding circuit for the sheath, and in one form comprises a tongue which engages a spring on the grounding bracket on the terminal legs to exert resilient canting forces on the unit counter-balancing and equalizing forces tending to dislodge the unit from proper position in the trim ring.

The present invention relates in general to a plug-in electrical heating unit of the type commonly employed as the surface heating unit in electric ranges and the like, having one or more tubular sheathed heating elements adapted to support cooking utensils thereon, wherein the heating element is removably supported in an opening in the range top and is releasably coupled with a stationary female receptacle fitting or socket assembly supported from the range top.

Heretofore, many surface type electric heating units have been provided for electric range tops, wherein the heating unit is removable from and electrically disconnectable with respect to the electric range. Such units have customarily employed either a single tubular sheathed heating element, or a pair of such heating elements, arranged in a spirally coiled configuration over the main portion thereof, and having a pair, or two pairs, of terminal end portions or legs of the sheath extending in laterally spaced side-by-side relation, located generally below the level of the spirally coiled portion and projecting beyond the perimeter thereof. The terminal legs have customarily been provided with terminal blade members of a particular configuration joined to the usual terminal pins incorporated during production of the basic sheathed heating element, to be projected into accommodating apertures provided in insulating stationary female receptacle fittings of the insulating terminal block type having wiper type female contact clips therein to permit

selective coupling and de-coupling of the heating element with the electrical supply. Customarily the female contact members provided in the terminal blocks of such receptacle fittings are in the form of spring-like flat metal clips which are flexibly urged toward sliding contact with the sides or abutment with the ends of the male contact blades and are dependent upon back-up pressure from surfaces of the terminal blocks to maintain proper contact pressure with the male contact blades. Many times the materials employed for the terminal block are sufficiently temperature sensitive so that they expand or contract under the temperature conditions existing during use of the heating element, causing the female contact terminals of the terminal block to lose their contact pressure with the male contact blades of the heating element. It has been found that this may lead to introduction of gaps or lack of contact between the heating element terminal blades and the terminal block female contacts, causing an arcing condition which may lead to destruction of the terminal block assembly.

Further, it is desirable to simplify the design of plug-in heating element assemblies to achieve greater compaction of the design and reduction of cost. Additionally, the design of many plug-in type heating assemblies exerts unbalancing stresses on the heating element, tending to force the heating element out of the normally desired position within the opening in the range top.

An object of the present invention is the provision of a novel plug-in electrical heating element assembly of the surface type for use with electric ranges and the like, which is of simplified construction and can be manufactured at lower cost.

Another object of the present invention is the provision of a novel plug-in electrical heating element assembly for electric range tops and the like, having a female receptacle fitting including a terminal block wherein the female contact members in the terminal block are not dependent upon back-up pressure from surfaces of the terminal block to maintain appropriate contact pressure with the male contact terminals protruding from the ends of the heating element.

Another object of the present invention is the provision of a novel plug-in electrical heating unit for electric range tops and the like, wherein reliable operation is achieved while using the conventional terminal pins protruding from the ends of sheathed tubular heating elements as customarily manufactured without requiring special male contact terminals on the heating element.

Yet another object of the present invention is the provision of a novel plug-in type electrical heating unit for range tops and the like, wherein an equilibrium of forces between the female receptacle fitting and the heating element is achieved to maintain the heating element in proper balance when inserted in the tops of electric ranges to minimize dislocation of the heating element from the desired position within the range top opening.

Other objects, advantages and capabilities of the present invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings illustrating a preferred embodiment of the invention.

In the drawings:

FIGURE 1 is a top plan view of a plug-in electric heating unit constructed in accordance with the present invention;

FIGURE 2 is a section view of the assembled plug-in heating unit and associated mounting facilities of the range, taken along the line 2—2 of FIGURE 1;

FIGURE 3 is an exploded perspective view of the female receptacle fitting;

FIGURE 4 is an enlarged vertical section view taken along the line 4—4 of FIGURE 1;

FIGURE 5 is an enlarged horizontal section view, taken along the line 5—5 of FIGURE 2; and

FIGURE 6 is a perspective view of another form of mounting bracket and grounding bracket which may be employed with the receptacle fitting.

Referring to the drawings, wherein like reference characters designate corresponding parts throughout the several figures, the surface type electrical heating unit, indicated generally by the reference character **10**, in accordance with conventional construction practices, comprises a heating element **11** of the conventional tubular sheathed resistor type having a metallic tubular sheath and a helical coil of resistor wire embedded in compacted electrical insulation within the sheath. The heating element **11** is shaped to define a spirally coiled portion lying in a plane and forming the heat generating portion of the heating element, the end portions of which, indicated by the reference characters **12, 13** are bent downwardly from the plane of the spirally coiled portion to a lower level and extend outwardly in side-by-side relation beyond the perimeter of the spirally coiled portion. The coiled portion of the heating element constitutes the active portion of the heater and is preferably flat at the top to provide flat surfaces for better conductivity of heat to a utensil placed thereon. In accordance with common practice, the helical coil of resistance wire within the sheath of the heating element **11** extends throughout the length of the coiled portion and the legs or end portions **12, 13** and has its opposite ends electrically connected to low resistance, axially elongated terminal pins **14, 15** at the ends of the sheath which extend outwardly through the terminal end portions. The sheath ends are sealed against entrance of moisture by providing suitable plugs which encircle the terminal pins and are inserted in the sheath ends to fit snugly therein under compression around the wire and against the interior of the sheath ends.

The coiled portion of the heating element **11** is suitably supported on a spider assembly **16**, formed in a generally triangular configuration, as illustrated, having holding bracket means adjacent the end thereof oposite the terminal end portions to securely hold the heating element. The heating unit **10** is designed to be removably supported in one of the openings provided in a conventional electric range top, indicated at **20** in FIGURES 1 and 2, for example, on a removable reflector pan **21**, having an outwardly projecting annular top flange **22** at the top thereof to rest on the raised bead **23** or adjacent portions of the range top **20** and serve, if desired, as an ornamental trim ring, the reflector pan being shaped to provide an annular shoulder **24** spaced slightly below the annular top flange **22** to provide a horizontal support surface for the bottom edges of the spider **16.**

A transversely extending grounding bracket or bridge plate **25** extends transversely of the legs or terminal end portions **12, 13**, having apertures therethrough which receive the terminal end portions, the bounding wall of at least one of the apertures being crimped to the associated sheath leg serving to provide a mechanical connection between the sheath legs which acts to hold them in parallel relationship. This grounding bracket **25** includes other features which will be described hereinafter.

The stationary connector portion of the plug-in heating element assembly designed to removably receive the terminal pins **14, 15** therein and establish electrical contact from the supply of electrical energy to the terminal pins **14, 15** is in the form of a female receptacle fitting **30**, supported from the range top **20** in a manner hereinafter

described. The fitting **30** provides a pair of sockets opening toward the range top opening to readily receive the terminal pins **14, 15** and comprise san outer terminal block member **31** of generally rectangular or cubic external configuration and an inner terminal block member or insert **32.** Each of the members **31** and **32** is preferably formed of ceramic material which is highly stable under varying temperatures and exhibits substantially no thermal expansion or contraction characteristics within the temperature ranges normally encountered in the zone adjacent electric range heating elements. The outer terminal block member **31** has sidewalls **33, 33'**, top wall **34** and bottom wall **35** and an apertured front wall **36** collectively defining a rearwardly opening cavity **37** to receive the insert member **32.** The front wall **36** has a pair of vertically elongated access slots or apertures **38, 38'** therein designed to admit the terminal pins **14, 15** into the cavity **37**, the apertures **38, 38'** being bounded by outwardly diverging or bevellel lateral and lower surfaces, as shown.

The insert member **32** is of generally rectangular or cubic configuration, its transverse cross section corresponding substantially to the transverse cross section of the cavity **37**, and includes a front face **39** designed to be spaced inwardly somewhat from the front surfaces **37'** of the cavity **37**, interrupted by a forwardly projecting rib or partition member **40** adapted to abut the center portion of the front surface **37'** of the cavity **37** and space the front face **39** of the insert an appropriate distance from the front face of the cavity. Vertically elongated socket recesses or cavities **41, 41'** in the insert member **32** open through the front face **39** and are aligned with the apertures **38, 38'** to accommodate passage of the terminal pins **14, 15** into the insert member **32.**

A pair of stationary female contact members **44**, of identical construction, are provided in the terminal block assembly between the outer terminal block **31** and the insert **32**, each of which is formed of sheet copper or like highly conductive sheet material, and include a vertically extending front leg **45** adapted to lie between the front face **39** of the insert and the front surface **37'** of the cavity **37**, a flat horizontal base or bottom leg **46** of the length of the main body portion of insert **32**, a rear upstanding leg portion **47** and a rearwardly projecting terminal lug or tab **48** projecting from the top of the rear leg portion **47** for securement of the supply conductors thereto. The front leg **45** is formed with rearwardly projecting flanges **45'** to strengthen the leg and is provided with a vertically elongtaed contact slot formation **49** of special configuration. This slot formation **49** may be produced, for example, by cutting an I-shaped cut in the medial portion of the front leg **45**, the stroke of the I being of considerably smaller width than the diameter of the terminal pins **14, 15**, after which the lateral edge portions of the cut bounding the vertical stroke of the I are rolled rearwardly, for example, about an approximately $\frac{1}{32}$ inch radius, to produce rolled lateral contact surfaces **50** bounding the slot **49** and define a slot whose width corresponds substantially exactly to the diameter of the terminal pins **14, 15.** In this manner, a wiping action is produced against the terminal pins **14, 15** which permits introduction or extraction of the terminal pins without any difficulty of snagging or catching on the pins because of the rounded surfaces presented by the rolled contact surfaces **50.** It will be appreciated that if a slot having a width corresponding to the terminal pin diameter were simply cut in the leg **45**, leaving the raw edges of this cut as the laterally bounding edges of the slot **49**, this could cause a catching on the pin or produce a dragging action preventing the pin from being freely extracted from the terminal block. The bottom surfaces of the insert member **32** to each side of the longitudinal center thereof are slightly undercut or recessed relative to the center portion a sufficient distance to accommodate the thickness of the bottom leg or base **46** of the stationary contact members **44** therein.

The sub-assembly of the outer terminal block member **31**, insert member **32**, and the pair of stationary contact members **44** are held in assembled relation by a metallic mounting bracket, which may take the form illustrated in FIGURES 1 to 3, indicated by the reference character **55**. The mounting bracket **55** includes a substantially rectangular, elongated body portion **56** having a pair of depending hook-shaped tabs **57** struck therefrom providing rearwardly projecting lips at their free edges to be inserted into recesses **58** provided in the upper portions of the front wall **37** of the outer terminal block member **31**. The rearmost edge of the mounting bracket body portion **56** has a depending bendable hook-shaped tab **59** adapted to extend downwardly about the rear edge of the upper wall **34** of the outer terminal block member **31** and project forwardly thereunder into a rabbet or recess **60** in the upper rear edge of the insert **32** to abut the forwardmost wall of the rabbet **60** and fix the insert **32** in position in the cavity **37**. This sub-assembly may in turn be supported from the stove or range top **20** by the forwardly projecting hook-shaped portion of the mounting bracket **55** extending forwardly of the tabs **57**, to be hooked about and secured in any conventional manner to the lip or edge of the range top opening. The mounting bracket body **56** in the forward hook-shaped region thereof also includes a downwardly struck tongue or guide **61** which projects forwardly or toward the range top opening from the front wall **36** of the outer terminal block **31** at a level slightly above the level to be occupied by the heating element end portion or legs **12, 13** when the latter are in proper position. An upwardly inclined tongue **56'** may be struck in the body portion if desired, and bent to the appropriate angle to engage the underside of the stove top and stabilize or lease the mounting bracket **55** in proper position.

The grounding bracket or plate member **25** has an aperture **25*a*** cut therein spaced substantially centrally between the heating element leg portions **12, 13** and located above the level thereof to slidably receive the guide tongue **61** therethrough. Also, the grounding bracket **25** has a tab **25*b*** extending perpendicularly from an edge thereof to which is welded a guiding and equalizing spring member **62** having a bent spring-like tongue **63** projecting toward the center of the heating element from the grounding bracket **25** to underlie and bear against the guide tongue **61** during insertion of the terminal pins **14, 15** into the terminal block cavities to exert a slight resilient canting of the front end of the heating element opposite the terminal block assembly in a downward direction to equalize forces in the opposite direction normally encountered with such plug-in assemblies and facilitate proper balancing and positioning of the heating element within the range top opening.

It will be appreciated that the above described construction of the female receptacle fitting provides an arrangement wherein the stationary female contact members **44**, and particularly the contact-establishing leg portions **47** thereof, in no way rely upon back-up pressure or support from the outer or inner ceramic block components **31, 32** to maintain proper contact pressure on the male terminal pins **14, 15**. Rather, the upstanding front legs **45** of the two female contact members **44** provide their own structural support, the contact-establishing rolled surfaces **50** bounding the slot **49** being backed up by the amount of sheet metal material lying in the plane of the front leg between the slot **49** and the lateral ends of the front leg to maintain appropriate contact pressure on the male terminal pins. This considerably minimizes the tendency of the female terminal portions to gap and produce arcing conditions which may lead to destruction of the female receptacle fitting. Also, the present construction permits the use of the cold terminal pins customarily formed at the ends of a sheathed element in the process of manufacture as the male contact terminals of the assembly, thus eliminating a lot of tolerance problems and avoiding the necessity of additionally affixing specially shaped male contact terminals to the cold terminal pins. Also, because of the particular construction of the female receptacle fitting, the male terminal pins can extend into the terminal block the maximum distance or the minimum distance, or any distance in between and still receive appropriate contact from the female contact members **44**. Further, the interaction of the guide tongue **61** with the slot **25*a*** in the grounding bracket **25** and with the guiding and equalizing spring member **62** exerts a resilient canting force on the plug-in heating unit counter-balancing the forces which may otherwise tend to tilt the front of the element upwardly and out of properly restrained relation within the trim ring.

Another form of mounting bracket which may be used to support the block member **31**, insert member **32**, and contact member **44**, is illustrated in FIGURE 6 and designated by reference character **65**. The mounting bracket **65** is formed from a blank of electrically conductive sheet material and include a top panel portion **66**, the rear portion **66'** of which is of rectangular configuration to overlie the block member **31** and has a depending hook-shaped tab **67** extending downwardly from the rear edge of the body portion **66** which is preformed to the final configuration thereof illustrated in FIGURE 6 to extend about the rear edge of upper wall **34** of terminal block member **31** and project forwardly thereunder into rabbet **60** to abut the forwardmost wall of rabbet **60** and fix the insert in position. A pair of depending tabs **68** are struck downwardly along rearwardly inclined planes from the top panel portion **66** at locations spaced forwardly from the tab **67** a distance slightly greater than the front-to-rear length of upper wall **34** to receive the block member therebetween, after which the free end portions of tabs **68** may be bent rearwardly into the recess **58** to secure the block member **31** to the mounting bracket **65**. The top panel portion also includes a narrower front extension **66''** projecting forwardly of the rear portion **66'** which terminates in a slotted tongue or extension **69** to underlie the horizontal inwardly projecting lip at the lower end of the cylindrical flange surrounding the range top opening to be secured thereto by a mounting screw. The front extension **66''** is laterally flanked at each edge by integral, downwardly extending side plate portions **70** having somewhat outwardly flared front end portions projecting forwardly of the top panel portion **66**. The side plate portions **70** are spaced laterally apart a distance slightly less than the transverse width of the grounding bracket **25'** on the sheath legs to be engaged and sprung slightly apart by the lateral edges of the grounding bracket during insertion of the heating element just prior to engagement of the contact pins **14, 15** with the contact members **44** for grounding the sheath. With this type mounting bracket, the grounding bracket **25'** need not have the slot **25*a*** or the spring **62** and tab **25*b*** of the earlier described grounding bracket **25**. The mounting bracket **65** may be simply formed of a single piece of metal sheet material cut in an appropriate pattern to provide top panel portion **66** and side plate portions **70**, the tabs **67** and **68** and side plate portions **70** being then bent to the position illustrated in FIGURE 6.

While but one particular embodiment of the present invention has been specifically shown and described, it will be apparent that various modifications may be made therein within the spirit and scope of the invention, and it is desired therefore that only such limitations be placed on the invention as are imposed by the prior art and set forth in the appended claims.

I claim:

1. A plug-in surface electrical heating unit for electric ranges comprising a spirally coiled sheath type heating element having end portions defining spaced legs paralleling a reference axis and terminating in a pair of laterally spaced parallel cylindrical terminal pins extending parallel to said axis forming male contact

pins, a female receptacle fitting for removably receiving said contact pins for communicating an electrical supply thereto comprising an insulator block having a pair of internal contact chambers and a front wall facing the heating element having a pair of vertically elongated parallel entrance slots therein communicating respectively with said chambers and spaced laterally to accommodate entry of the contact pins therein, a pair of female contact members of sheet material supported in said block each including a vertically elongated contact leg located in the respective chambers vertically spanning the height of the slots and lying principally in a common vertical plane perpendicular to the insertion axes of the contact pins, said contact legs each having a vertical contact slot respectively aligned with the entrance slots and bounded laterally by rearwardly rolled portions of the sheet material to present rounded convex lateral slot surfaces to the contact pins inserted therein.

2. A plug-in surface electric heating unit as defined in claim 1, wherein said vertically elongated contact leg includes a vertical substantially planiform panel portion of a width materially greater than the width of said entrance slots arranged in a plane lying transverse to the direction of insertion of the contact pins, said contact slot in said contact leg being vertically elongated and located substantially in the transverse center thereof for passage of one of the contact pins therethrough, in conductive contact with said slot surfaces.

3. A plug-in surface electric heating unit as defined in claim 2, wherein said panel portion terminates at the opposite lateral edges thereof in rearwardly projecting flanges extending substantially the height of said contact leg.

4. A plug-in surface electric heating unit as defined in claim 2, wherein said contact members each comprises a horizontal base leg extending rearwardly from the lower edge of said contact leg, said base leg terminating rearwardly in a vertically rising rear leg having a rearwardly projecting tab extending therefrom for securement of an electrical supply conductor thereto, and said insulator block including an outer block member having a rearwardly opening cavity therein and an insulator insert member interfitted in said cavity and substantially filling the same having first surfaces coacting with confronting surfaces of said cavity to engage and locate said base legs and second oppositely facing surfaces to be embraced between said contact leg and rear leg and position said contact members within the cavity.

5. A plug-in surface electric heating unit as defined in claim 4, wherein said insert is of substantially rectangular solid configuration having laterally spaced front face portions separated by a forwardly projecting spacer rib for abutting the cavity surface defined by said front wall and locating said portions in spaced relation to said cavity surface to define therebetween said chambers for acommodating said contact legs.

6. A plug-in surface electric heating unit as defined in claim 1, including a mounting bracket for dependently supporting said insulator block from a top panel of an electric range having an aperture in which the coiled portion of the heating element is to be removably located, said mounting bracket including an elongated rigid tongue member disposed adjacent the front wall of said insulator block and extending therefrom toward the heating element immediately above and between the insertion paths of the heating element end portions, a grounding bracket secured to and extending transversely between said heating element end portions having spring means projecting therefrom between and above the level of said heating element end portions to enter into bearing contact with said tongue member upon entry of the contact pins into the entrance slots of the receptacle fitting and be stressed by such bearing contact to exert resilient canting pressure on the heating element to restrain the latter in selected position in the top panel aperture.

7. A plug-in surface electric heating unit as defined in claim 6, wherein said spring means comprises a spring tongue inclining in selected relation to the axes of the heating element end portions to attain slightly stressed bearing contact with said rigid tongue member when said contact pins are inserted into contact making relation with the contact members in the receptacle fitting.

8. A plug-in surface electric heating unit as defined in claim 6, wherein said grounding bracket has a slot for accommodating passage of said rigid tongue member therethrough during movement of the contact pins along their insertion path toward the receptacle fitting to define a fulcrum coupling of the grounding bracket with the tongue member about which resilient pressure of the spring means is applied.

9. A plug-in surface electric heating unit as defined in claim 1, wherein said insulator block comprises an outer insulator block member including said front wall and having a rearwardly opening cavity thereon and an inner insulator block member substantially complementing said cavity seated therein and coacting with confronting surfaces of the outer block to support the contact members, said heating unit including a mounting bracket for dependently supporting said insulator block from a top panel of an electric range having an aperture in which the coiled portion of the heating element is to be removably located, said mounting bracket including an elongated rigid tongue member disposed adjacent said front wall and extending therefrom toward the heating element immediately above and between the insertion paths of the heating element end portions, a grounding bracket secured to and extending transversely between said heating element end portions having spring means projecting therefrom between and above the level of said heating element end portions to enter into bearing contact with said tongue member upon entry of the contact pins into the entrance slots of the receptacle fitting and be stressed by such bearing contact to exert resilient canting pressure on the heating element to restrain the latter in selected position in the top panel aperture, said mounting bracket having depending tab members terminating in mutually converging lips to embrace opposite end portions of the upper portion of said outer block to support the same, the lip of the tab members at the rear end of the outer block abutting a surface of the inner block to retain the latter in selected position with said cavity.

10. A plug-in surface electrical heating unit for a generally planar electric range top having an opening therein and a reflector pan in the opening for removably receiving the heating unit, comprising a sheath type heating element having a spirally coiled portion lying in a common plane to be removably supported by said reflector pan in a selected normal position in said opening substantially paralleling the plane of the range top and having end portions paralleling a reference axis and terminating in a pair of contact pins extending parallel to said axis, a female receptacle fitting disposed alongside and below said opening for removably receiving said contact pins for communicating an electrical supply thereto comprising an insulator block having a pair of internal contact members therein and a front wall facing the heating element having a pair of entrance slots therein to accommodate entry of the contact pins into engagement with said contact members, a mounting bracket dependently supporting said insulator block from the range top including an elongated guide tongue extending from adjacent the front wall toward the center of said opening immediately above and between the insertion path of the contact pins into said entrance slots, an electrically conductive grounding bracket secured to and extending transversely between said heating element end portions having a slot therein located above said end portions for accommodating passage of said guide tongue therethrough dur-

ing movement of the contact pins along their insertion paths and defining with said guide tongue a fulcrum for said grounding bracket, and said grounding bracket including a spring tongue disposed to resiliently bear against said guide tongue when the contact pins are inserted into said block and exert canting forces on the heating element about said fulcrum to resiliently urge said coiled portion downwardly in said reflector pan and oppose accidental upward dislodgement of the front zone of said coiled portion lying opposite said end portions from said selected normal position.

References Cited

UNITED STATES PATENTS

3,016,444	1/1962	Jasionowski	219—541
3,327,095	6/1967	Hanson	219—451

BERNARD A. GILHEANY, Primary Examiner

F. E. BELL, Assistant Examiner

U.S. Cl. X.R.

219—541