

June 1, 1948.

F. H. McCORMICK

2,442,659

SURFACE HEATER FOR ELECTRIC RANGES

Original Filed July 5, 1940

4 Sheets-Sheet 1

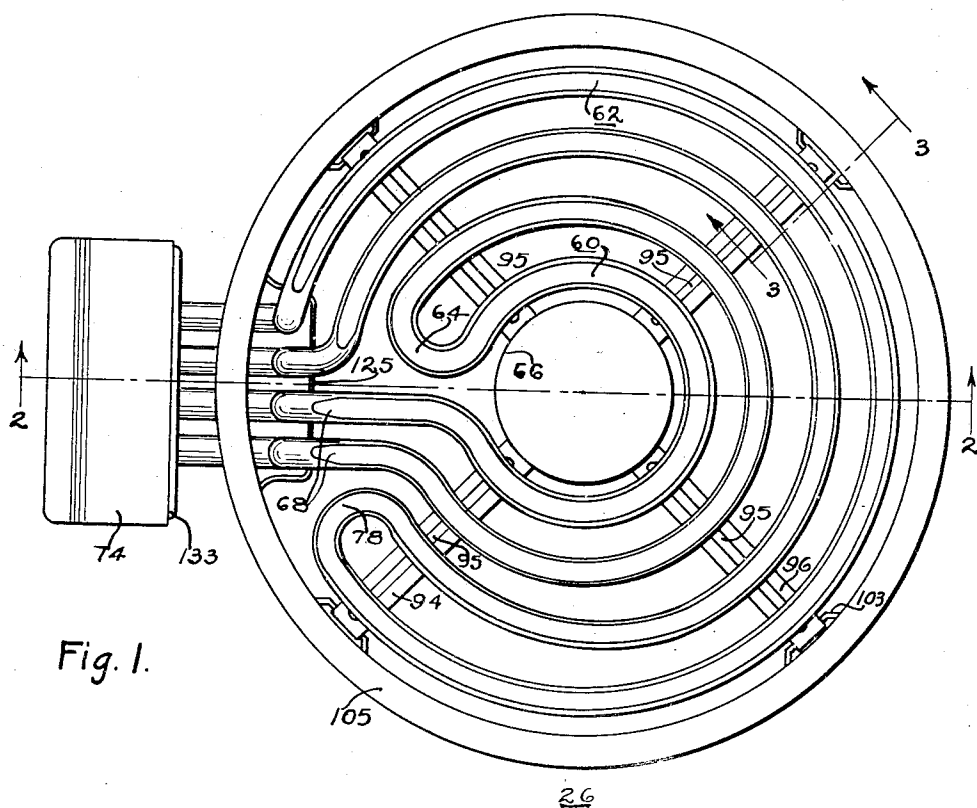


Fig. 1.

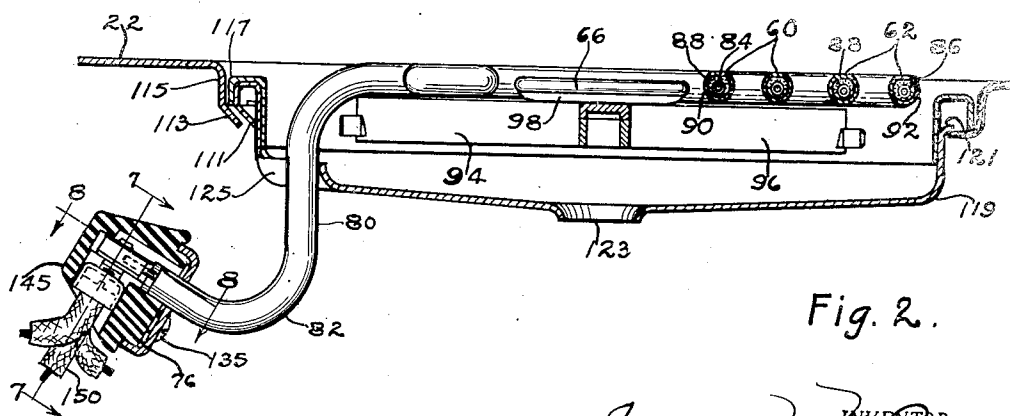


Fig. 2.

Francis H. McCormick
BY
Spencer Hardman & Sohn
Attorneys

June 1, 1948.

F. H. McCORMICK

2,442,659

SURFACE HEATER FOR ELECTRIC RANGES

Original Filed July 5, 1940

4 Sheets-Sheet 2

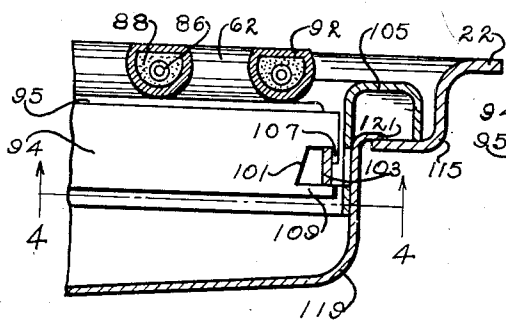


Fig. 3.

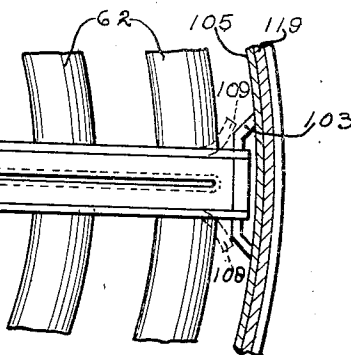


Fig. 4.

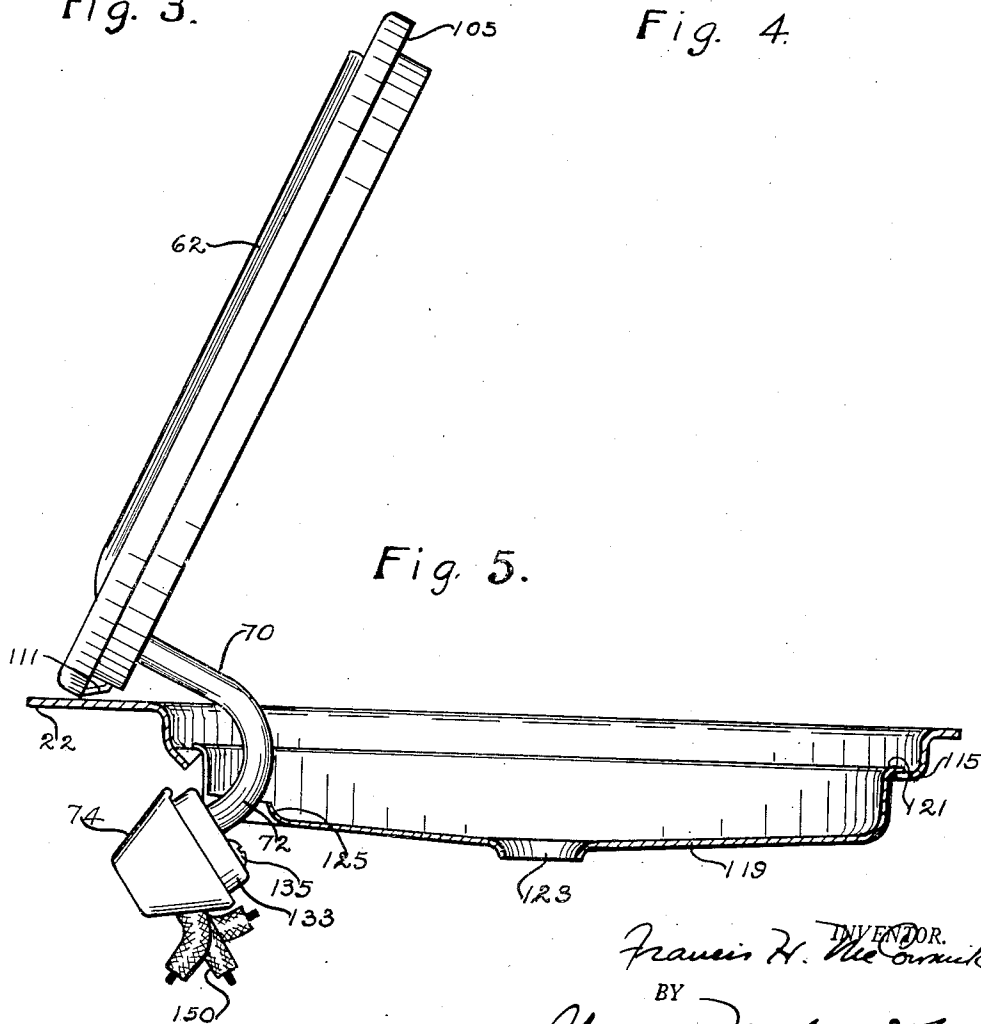


Fig. 5.

INVENTOR.
Francis H. McCormick
BY
Spencer Hardman & John
Attorneys

June 1, 1948.

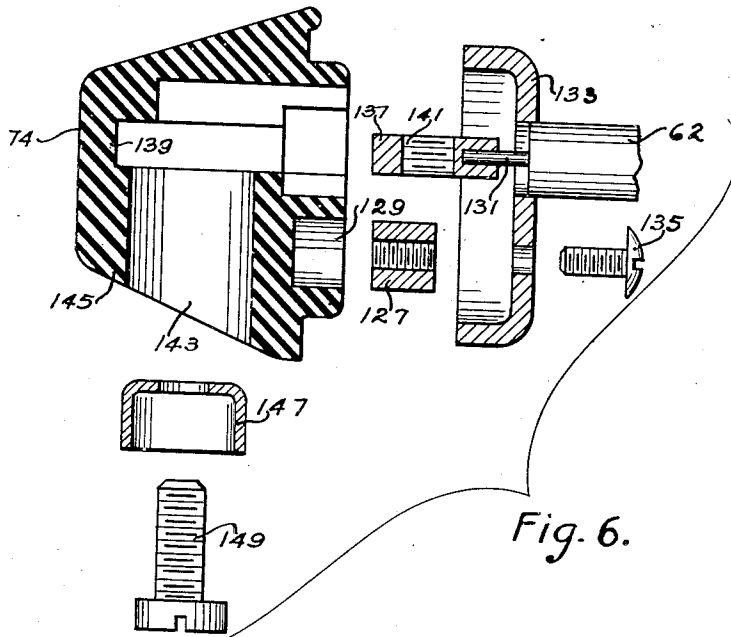
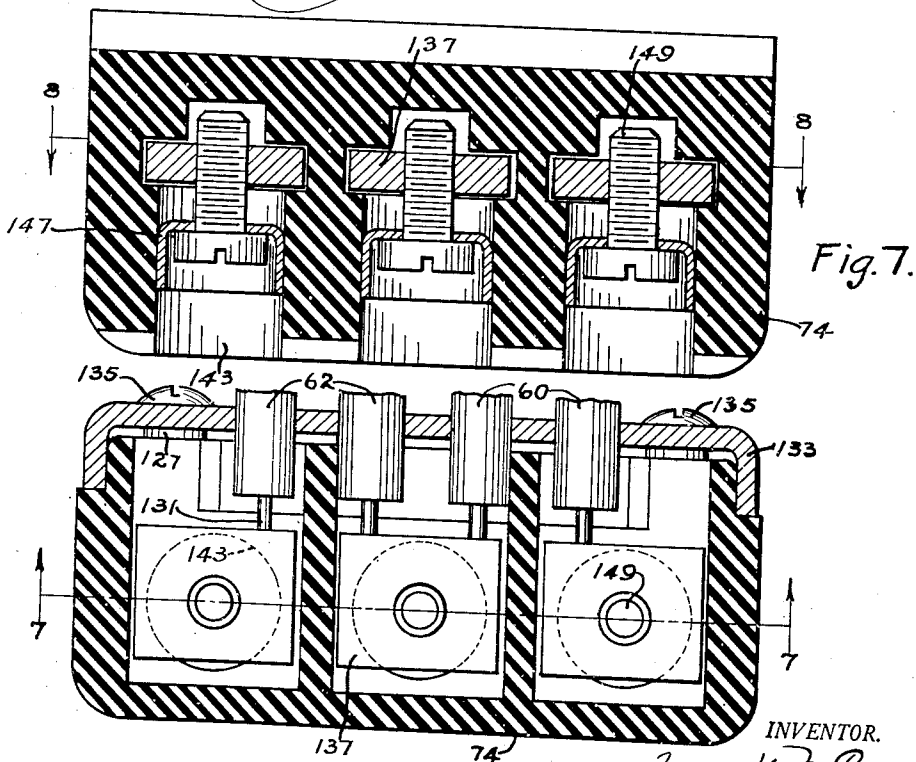
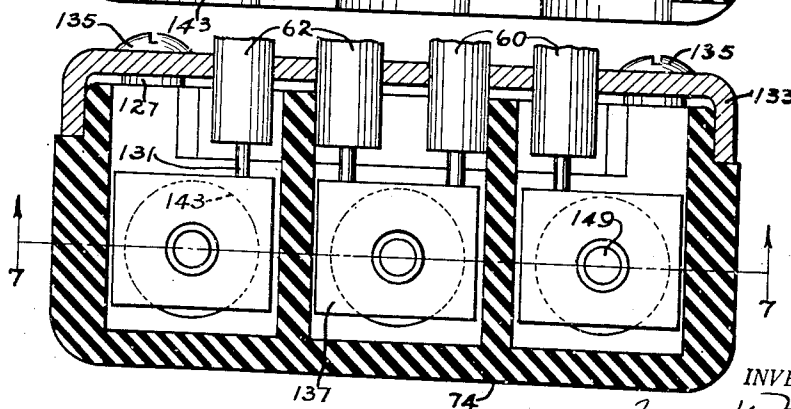
F. H. McCORMICK

2,442,659

SURFACE HEATER FOR ELECTRIC RANGES

Original Filed July 5, 1940

4 Sheets-Sheet 3



INVENTOR.

BY

BY James H. McConel
Spencer Hadman & Co
Attorneys

Spencer Hardman & Co.
Attorneys

Attorney

June 1, 1948.

F. H. McCORMICK

2,442,659

SURFACE HEATER FOR ELECTRIC RANGES

Original Filed July 5, 1940.

4 Sheets-Sheet 4

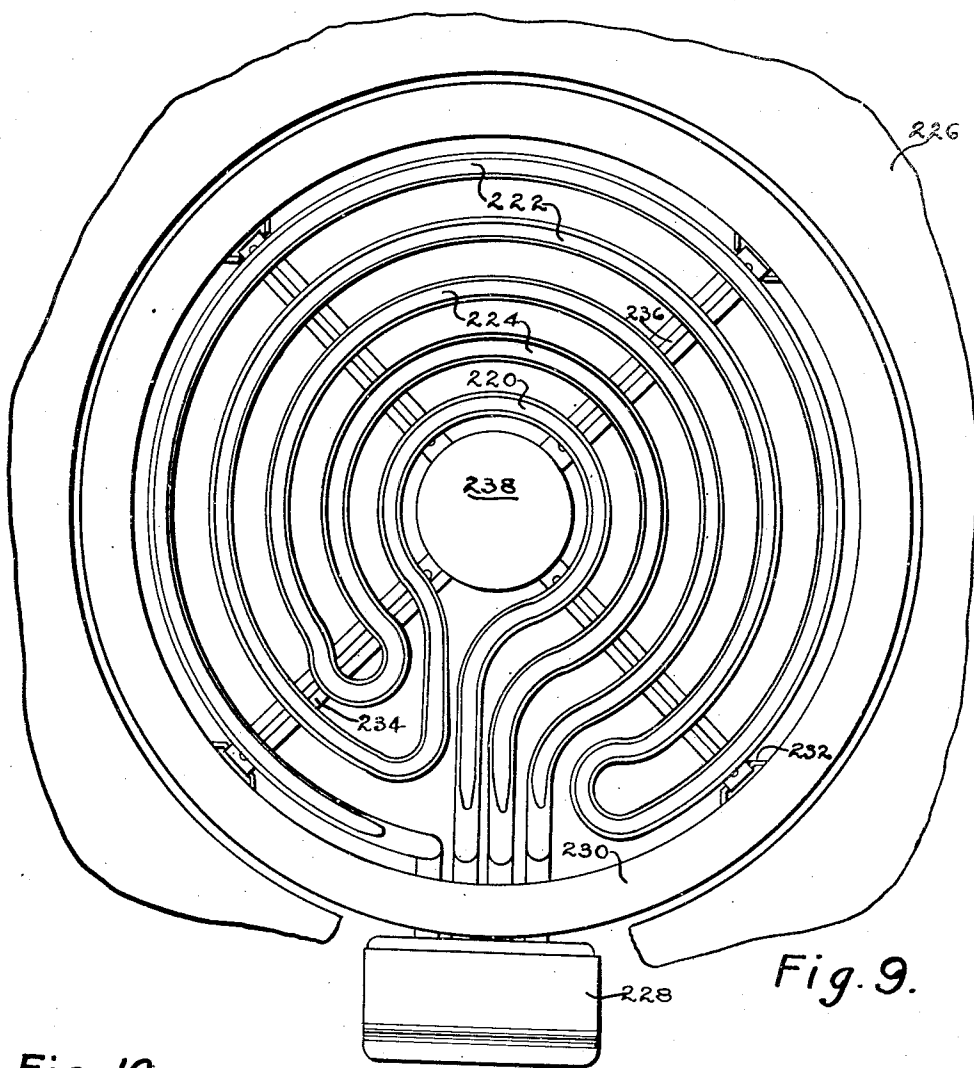
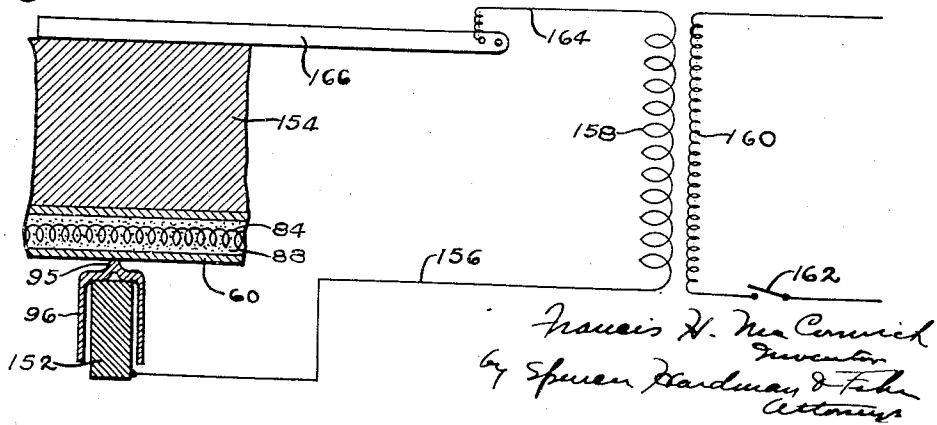


Fig. 10.



UNITED STATES PATENT OFFICE

2,442,659

SURFACE HEATER FOR ELECTRIC RANGES

Francis H. McCormick, Oakwood, Ohio, assignor
to General Motors Corporation, Dayton, Ohio,
a corporation of Delaware

Original application July 5, 1940, Serial No.
344,018, now Patent No. 2,320,041, dated May
25, 1943. Divided and this application March
19, 1943, Serial No. 479,689

5 Claims. (Cl. 219—37)

1

This invention relates to a domestic appliance and more particularly to surface heaters for electric ranges.

This application is a division of my copending application Serial No. 344,018, filed July 5, 1940, for Domestic appliance (Patent 2,320,041, granted May 25, 1943).

It is an object of my invention to provide a surface heater of the tubular sheath type in which the upper surface of the sheath is held rigidly in a single plane.

It is another object of my invention to provide an arrangement for a surface heater of the tubular sheath type whereby the heater can be readily cleaned without disturbing the electrical connections.

It is another object of my invention to provide an arrangement of a surface heater of the tubular sheath type in which the terminal connections are adequately shielded from spillage.

It is another object of my invention to provide a terminal member for a surface heater in which the terminal connections are so located as to be protected from spillage.

It is still another object of my invention to provide a surface heater of the tubular sheath type in which the sheath is very small in diameter so that it may be more readily formed into the desired configuration in order to obtain the desired heat distribution.

It is another object of my invention to provide a two-element surface heater of the tubular sheath type having an improved configuration to provide improved heat distribution.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a top view of one of the surface heaters of an electric range including its terminal block;

Fig. 2 is a sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 1;

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 3;

Fig. 5 is a sectional view showing the method of lifting up one of the surface heaters for cleaning purposes;

Fig. 6 is an exposed view of the terminal block and connections;

Fig. 7 is a sectional view of the terminal block taken along the line 7—7 of Fig. 2;

Fig. 8 is a sectional view taken along the line 8—8 of Fig. 2;

Fig. 9 is a top view of a larger heating unit; and

2

Fig. 10 illustrates the method of welding used to construct the unit.

As shown in Fig. 5, my improved heating units are provided with extensions connecting with the terminal block so shaped that the surface heating units may be readily tilted up for cleaning purposes without disturbing the electrical connections. The terminal blocks are so formed that the connections from the surface heating units and from the switch mechanism enter upon the bottom sides of the block so that the entrances are protected from spillage from above as shown in Fig. 2.

I have shown an electric range in which the surface heaters are of the tubular sheath type. The surface heaters are of the two-element type for general operation with a three-wire Edison circuit with the inner element operating at maximum wattage when connected to a 115 volt circuit and the outer element operating at maximum wattage when connected to a 230 volt circuit. The two elements of each unit are welded to a framework and surrounded by a ring in order to insure rigidity. The ends of each of the connections extend downwardly and thence are curved outwardly to terminate in their respective terminal blocks which are located beneath the top surface of the electric range where they are shielded from spillage.

Referring now to the drawings and more particularly to Fig. 1 there is shown a surface heating unit 26 supported in the flanged aperture of the supporting top 22 of an electric range. This heating unit includes an inner element 60 and an outer element 62.

The inner element 60 begins with a looped end 64 and extends in a clockwise direction around a central disk 66 to the extent of nearly 360° after which it extends radially outwardly as indicated by the reference character 68, thence downwardly to form a portion indicated by the reference character 70 followed by a lower portion 72 which is curved outwardly and upwardly so that its two ends enter the terminal block 74 upon its face 76. This face 76 is turned slightly downwardly so that liquid cannot drain into the interior of the terminal block through the apertures provided for the sheathed elements. The outer element 62 begins with the looped end 78 which is adjacent the radially extending portion 68 and extends in a counter-clockwise direction around the inner element 60 until it again reaches the radially extending portion 68, after which it extends directly downwardly as designated by the reference character 80, followed by an outwardly extending curve 82 so that it also enters the terminal block 74 through the face 76. The downwardly and outwardly extending portions of both elements are all parallel.

Each of the elements contains a helical elec-

trical conductor such as the conductors 84 and 86. These conductors are each surrounded by a suitable electrical insulating material, such as magnesium oxide designated by the reference character 88, and the insulating material is enclosed within a tubular metal sheath, preferably of high chrome-nickel steel. The sheath of the inner element is designated by the reference character 90 and the sheath of the outer element by 92. The elements may be made by any suitable process, for example, one similar to that shown in the Lightfoot Patent 1,359,400 may be used for its manufacture. After the elements are bent to the shape shown in Fig. 1 they are slightly flattened upon their upper surface as shown in Figs. 1 and 2, thus providing a greater contact area with the kitchen utensils used.

These elements are rigidly supported upon a frame-work formed by the crossed stainless steel channel members 94 and 96 which are each provided with a narrow bead 95 for contact welding the members to the bottoms of the elements as hereafter explained. These channels are notched at their centers to provide an overlapping joint beneath the ornamental disk 66 which is fastened to another disk 98 which in turn is spot-welded to the channel members 94 and 96 in order to reinforce their overlapping joint to firmly hold the channel members together.

The elements 60 and 62 are preferably fastened to the crossed channels 94 and 96 by contact or projection welding. This step is illustrated in Fig. 10 which shows a portion of the inner element 60 together with a portion of one of the channels 96. As shown, the crossed channel members are supported upon a lower supporting member 152 which is shaped so that it supports the channel members directly beneath the narrow bead 95 which is provided for welding purposes. The two elements are then placed upon the crossed channel members in proper position after which a pivoted weighted member 154 is brought to bear upon the upper surface of the elements 60 and 62 in order to hold them firmly upon the various portions of the bead 95. The lower supporting member 152 is connected by a suitable conductor 156 to the secondary coil 158 of a transformer. The primary coil 160 of the transformer is connected to a power source under the control of a manual switch 162. The other end of the secondary coil 158 is connected by a conductor 164 to a pivoted supporting arm 166 for the weighted member 154. When the switch 162 is closed current passes through the secondary circuit and sufficient current to weld passes between the elements and the channels at the crossing points between the beads and the various portions of the elements. This provides a simple method for simultaneously welding the elements to the channels at the crossing points and insures a substantially flat top surface for all portions of the elements forming the main portion of the heating unit. I call this projection welding.

The opposite ends of the channel members are provided with notches similar to the notch 101 in Fig. 3. Each of these notches 101 receives the adjacent struck-in portion 103 of the rim 105 which surrounds the outer element 62. The ends of the channels are each provided with a downwardly projecting lip 107 which together with a lower projection 109 firmly locks the ends of the channels to the projecting portions of the rim 105. The lower projections 109 are bent outwardly as shown in dotted lines in Fig. 9 in order

to allow the projection 103 to be placed in the notch 101. After this the projections 109 are bent straight again so that the projections 103 are firmly locked in place within notches 101.

The rim 105 is made from a straight strip of metal and is curled into circular form with its joint adjacent the terminal 74. This joint is made rigid by the connecting piece 111 which is welded to the two ends of the strip forming the rim so as to make a firm joint which is practically invisible. This connecting piece 111 also serves to locate the surface heaters radially, since it is provided with a tongue adapted to register with the notch 113 provided in the flange 115 surrounding the aperture provided in the supporting surface 22 of the range. The rim 105 is provided with a flange 117 which rests upon the flange 115 of the supporting top 22. By this construction the upper surfaces of each element are maintained rigidly in a single plane.

Beneath each heating unit is a metal reflector 119 which may be formed of aluminum coated steel, chrome plated metal or stainless steel in order to reflect the radiant energy from the heating elements for insulating purposes. This reflector 119 reflects any heat rays from the heating element upwardly onto the bottom surface of the container being used upon the surface heater. The reflector 119 is provided with the flange 121 which rests upon the flange 115 beneath the rim 105. The reflector 119 is provided with the drain aperture 123 beneath the central disk 66 so as to catch and drain any spillage which may fall between the convolutions of the heating elements from the containers used on top of the range. The spillage will pass through the flanged aperture 123 onto a drain pan normally provided beneath the reflector. The reflector 119 is provided with a cut-out or cut-away portion 125 through which the downwardly extending portions 70 and 80 of the inner and outer heating elements pass.

It should be noted that the terminal block 74 is not beneath the heating unit but is beneath the supporting top 22 of the range so that any liquid which spills upon the heating unit will not fall upon the terminal block and possibly enter to cause a short circuit. Also by curving the terminal outwardly in the manner described the entire assembled heating element may be lifted upwardly as shown in Fig. 5 without disturbing the electrical connections to the switch mechanism. This exposes the reflector 119 which may also be lifted and entirely removed for more convenient cleaning if desired, without further disturbance.

Within the sheathing of each element, the helical electrical resistors are connected at their ends to a solid electrical conductor terminal such as the conductor terminal 131. This conductor 131 protrudes from the end of the sheathing which is cut off to expose the end of the solid conductor terminal 131. The end of the sheathing is fitted into a metal cap 133 which is fastened to the terminal block 74 by the screws 135 which are threaded into the bushing 127. The terminal block 74 is molded of some suitable electrical insulating plastic as shown in Fig. 6 with the threaded bushing 127 lodged directly in the recess 129. The conductor 131 within the terminal block 74 is securely fastened to a rectangular terminal lug 137.

When the cap 133 is fastened in place upon the terminal block 74, the terminal lugs 137 extend into the recesses 139. The threaded aper-

ture 141 in each of the terminal lugs 137 then registers with the center of one of the round passages 143 extending to the face 145 of the terminal block 74. A cup washer 147 fits into each of the recesses 143 and one of the binding screws 149 receives the eyeletted end of one of the flexible conductors 150 extending from the switch mechanism. Each of these binding screws extend through the aperture in one of the cup washers 147 and is threaded into one of the terminal lugs 137 in order to provide the necessary electrical connection between the particular flexible conductor extending from the switch mechanism and the conductor terminal 131 which connects to the helical conductor within the sheathing. When in operating position, the face 76 as well as the face 145 of the terminal block 74 are each turned partially downwardly so that liquid falling upon the terminal block in its normal position will not enter the passages provided for the different conductors but these passages will be protected by the impervious upper faces of the block.

This two-part heating unit is connected to a three-wire Edison circuit through a multi-heat switch mechanism to secure various other lower wattage inputs with resulting changes in heat distribution for various cooking purposes. Several of the circuits which apply are disclosed in my copending application S. N. 236,471, filed October 22, 1938 (Patent 2,259,258, granted October 14, 1941).

In Fig. 9 I have shown a heating unit which is larger in size than the unit shown in Figs. 1 to 5, but which is identical in other respects excepting that the outer element 222 is provided with a loop 220 within the inner element 224. Like the smaller unit 26 the larger unit is supported within the flanged aperture of the range top 226 which covers the terminal block 228. The unit is provided with a rim 230 which rests upon the flange of the aperture in the range top 226. This rim is provided with struck-in portions 232 which support the ends of the crossed stainless steel channel members 234 which are each provided with a narrow welding bead 236 upon which rests the bottoms of the two elements at the points at which they cross the channel members 234. The channel members 234 are provided with a central disk 238 as in the smaller unit. The elements 222 and 224 are fastened to the crossed channel members by projection welding as in the smaller unit. The end portions of the elements extend downwardly and are curved outwardly so that they extend into one of the downwardly turned faces of the terminal block 228 exactly in the manner as shown best in Figs. 2 and 5 in connection with the smaller unit.

The provision of the additional inner loop 220 of the outer element 222 greatly improves the heat distribution of the larger unit by providing heat in the center as well as the edge portions by the outer element and in particular makes it possible to make the outer element much longer than the inner element. This lends itself admirably to my preferred arrangement of operating the inner element at a maximum wattage upon 115 volts and the outer element at maximum wattage upon 230 volts in standard three-wire Edison circuit.

As mentioned in connection with the smaller unit, the elements of the larger unit are con-

nected by flexible electric conductors to a multi-heat switch mechanism which in turn is connected to a three-wire Edison circuit source in order to secure various lower wattage inputs with resulting changes. Several of the circuits which apply are disclosed in my copending application S. N. 236,471, filed October 22, 1938.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. An electric surface heater including a tubular sheath type heating element, an inverted channel supporting member transverse to the heating element having a bead formation in the longitudinal central portion of said supporting member extending transversely to and in contact with the adjacent tubular portions of the heating element, said heating element being welded to said formation at said points of contact.

2. An electric heater including a circular rim, intersecting inverted channel members extending transversely across the rim and fastened at their ends to the rim and secured together at their intersection, and a heating element supported upon and welded to the longitudinal central portions of said members to form a unitary structure.

3. An electric surface heater including a sheathed heating element having a sinuous form, a plurality of cross supporting inverted channel members intersecting said element at a plurality of points along the longitudinal center lines of said members, said element and members being welded together at said plurality of points.

4. An electric surface heater including a sheathed heating element having a sinuous form, a cross supporting inverted channel member intersecting said element at a plurality of points along the longitudinal center line of said member, said element and member being welded together at said plurality of points.

5. An electric heater including a circular rim, intersecting inverted channel supporting members extending transversely across said rim and fastened at their ends to the rim and fastened together at their intersection, a tubular sheath heater element having a sinuous form intersecting said supporting members at a plurality of points along the longitudinal center of said members, said element and members being welded at said plurality of points.

FRANCIS H. MCCORMICK.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,085,089	Lachman	Jan. 20, 1914
1,998,330	Nicholson et al.	Apr. 16, 1935
2,094,480	Vogel	Sept. 28, 1937
2,214,583	Hepler	Sept. 10, 1940
2,302,808	Smith	Nov. 24, 1942

FOREIGN PATENTS

Number	Country	Date
636,652	Germany	Oct. 12, 1936