Nov. 11, 1941. E. N. LIGHTFOOT 2,262,507

ELECTRIC HEATER

Filed Oct. 2, 1939 2 Sheets-Sheet 1

Fig. 1

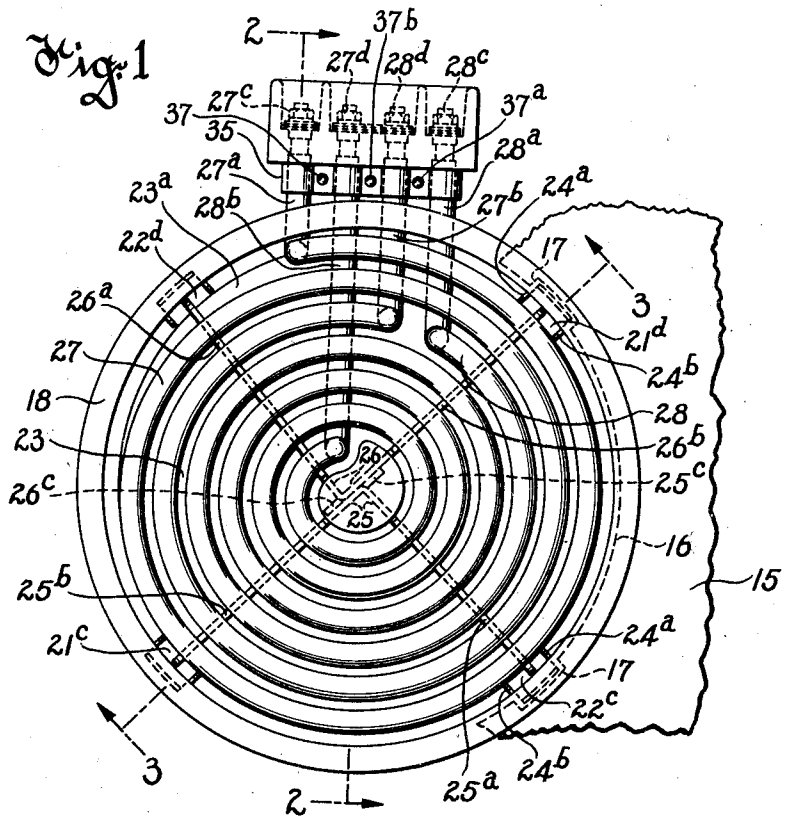


Fig. 2

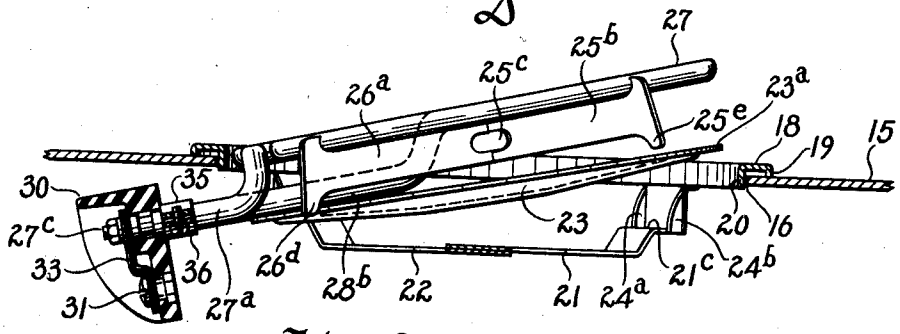
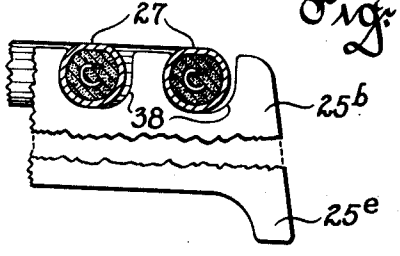


Fig. 7



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Fig. 3

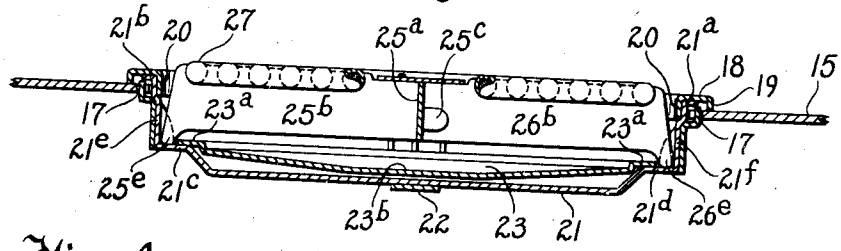


Fig. 4

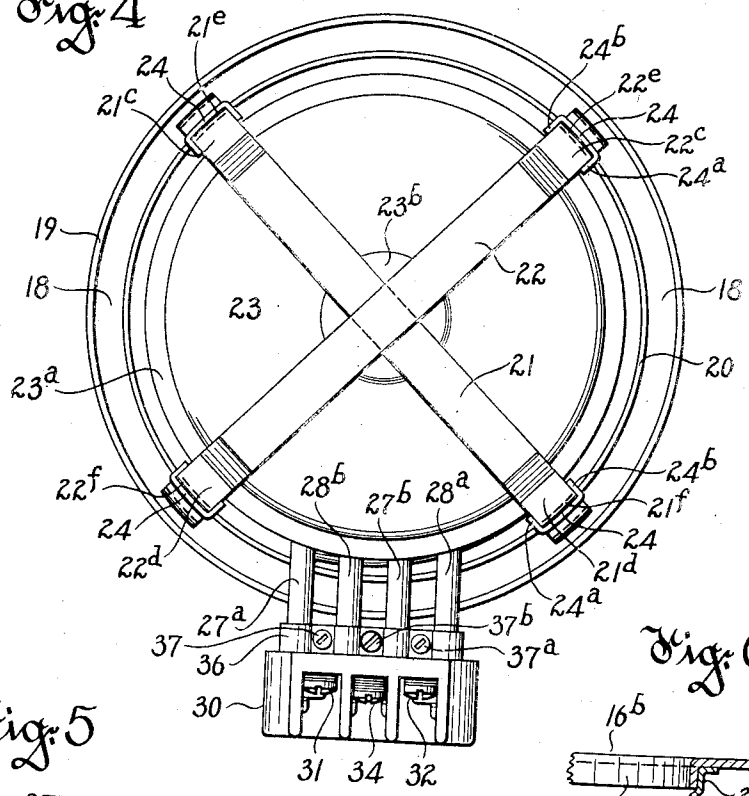


Fig. 5

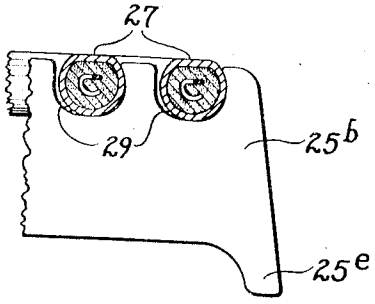
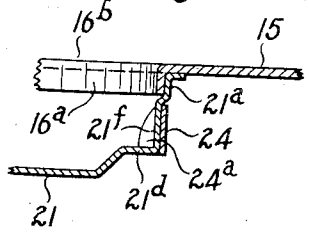


Fig. 6



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ELECTRIC HEATER

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Application October 2, 1939, Serial No. 297,499

5 Claims. (Cl. 219—37)

This invention relates to improvements in electric heaters, and the invention relates more particularly to electric heaters of the range top type.

An object of the invention is to generally improve the details of construction and arrangement of the parts of such heaters whereby the utility and efficiency thereof is increased, and whereby such increased efficiency may readily be maintained.

Another object is to provide a unit comprising one or more spirally coiled heating elements of the tubular or sheathed type.

Another object is to provide a concentric arrangement of a plurality of inner and outer coiled heating elements whereby a greater number of heating effects may be produced thereby.

Another object is to provide novel supporting means for the heating element or elements.

Another object is to provide a drip and reflector pan of novel form which may be very readily removed for cleaning and polishing thereof for the purpose of sanitation and for maintaining the desired efficiency of the heating element.

Another object is to so arrange the terminals of the heater element or elements at one side of the opening in the range top as to provide for protection thereof and of the circuit wires connected thereto.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawings illustrate a preferred embodiment of my invention, and modifications of certain structural details thereof, which will now be described; it being understood that the device illustrated is susceptible of change in respect of other structural details thereof within the scope of the appended claims.

In the drawings, Figure 1 is a top plan view of an electric range top heater and the supporting and reflecting elements associated therewith, a fragment of the range top being shown to illustrate the notched form of the opening therein.

Fig. 2 is a view partly in side elevation and partly in vertical section on the line 2—2 of Fig. 1, and showing the manner in which the reflector pan may be tilted to facilitate removal thereof.

Fig. 3 is a vertical sectional view, on the line 3—3 of Fig. 1, parts of the heating elements being shown in side elevation, and parts thereof being broken away, the various elements of the device being shown in the normal positions thereof when in use.

Fig. 4 is a bottom plan view of the device shown in Figs. 1 to 3, the range top plate being omitted to better illustrate certain structural details of the device.

Fig. 5 is a fragmentary view, partly in side elevation and partly in vertical section, illustrating certain coils of one of the tubular heater elements and the manner in which the same are interlocked with the frame comprising a plurality of plates arranged on edge.

Fig. 6 is a fragmentary vertical sectional view illustrating a modified form of support for the frame and its associated tubular heater coils, this arrangement providing for elimination of the rim or ring, or for use of a rim or ring unattached to the support for the heating unit, and

Fig. 7 is a fragmentary view quite similar to Fig. 5, but with a different form of notches for interlocking engagement with the tubular heater coils.

Referring first to the device illustrated in Figs. 1 to 5, the numeral 15 designates a range top, which may be formed of sheet metal, such as stainless steel, or of ordinary sheet steel having its outer surface provided with a coating or covering of vitreous enamel to facilitate cleaning or polishing of the range top. The range top is provided with one or more substantially circular openings 16, the number of openings and the size thereof being varied in accordance with the number and size of the heating units to be associated with the range top. Opening 16 is preferably provided with four equally spaced peripheral notches 17 which are adapted for interlocking engagement with parts of the unit supporting means to prevent relative rotary displacement between the same and the range top.

The supporting means for the heater unit preferably comprises a steel ring or rim 18 having a relatively short downwardly extending outer peripheral flange 19 (Fig. 2) the edge of which is adapted to seat against the outer surface of the range top plate 15, and a relatively longer downwardly extending inner peripheral flange 20 which freely penetrates the opening 16 in said top plate but is engageable with any portion of the wall of said opening to prevent substantial lateral displacement of the rim. The outer surface of rim 18, including the outer or exposed surfaces of flanges 19 and 20, is preferably plated with chromium or similar material, which plated surface is highly polished. A pair of strip metal members 21 and 22 are arranged to cross each other flatwise at right angles at a point concentric with the rim 18, and said members have their opposite flanged ends (see 21a, 21b, Fig. 3)

rigidly secured to the inner surface of the rim flange 20 and/or to the inner horizontal surface of the rim 18 as by welding. The intermediate horizontal portions of members 21 and 22 are offset downwardly a substantial distance below the plane of top plate 15, and the same are provided at opposite ends of the respective intermediate portions with upwardly offset horizontal portions 21^c, 21^d and 22^c, 22^d. Said last mentioned horizontal portions provide a seat for the peripheral flange 23^a of a reflector pan 23 which is of slightly dished or concave form as best illustrated in Fig. 3. The central circular portion 23^b of pan 23 is preferably located in a horizontal plane, as best illustrated in Fig. 3.

The upper surface of pan 23 is preferably chromium plated or otherwise provided with a lustrous finish, which is preferably highly polished to provide for upward reflection of those heat rays which emanate in a downward direction from the coiled tubular heater element or elements.

Welded or otherwise rigidly attached to the outer surfaces of the vertical portions 21^e, 21^f and 22^e, 22^f of members 21 and 22 are four like members 24, each of which has a pair of inwardly extending parallel lugs 24^a and 24^b, between each pair of which one of the four supporting feet or ends of a frame member is adapted to rest or seat against the respective portions 21^c, 21^d, 22^c, 22^d aforementioned (see Figs. 1 and 3).

Said frame member preferably comprises a pair of sheet metal elements 25, 26 of similar form, said elements being bent at points slightly offset from the mid-lengths thereof, respectively, to provide pairs of arms 25^a, 25^b and 26^a, 26^b extending at substantially right angles to each other (Fig. 1). Arms 25^a, 26^b have sheared and bent therefrom, to lie in the planes of their respective integrally connected arms 25^b and 26^b, lugs 25^c and 26^c. The arms 25^a, 25^b and 26^a, 26^b have their lower edges cut away to a predetermined degree except at the outer ends thereof which provide feet 25^d, 25^e and 26^d, 26^e for engagement with the aforementioned horizontal portions 21^c, 21^d and 22^c, 22^d (Figs. 1, 2 and 3). Said cut away portions of arms 25^a, 25^b and 26^a, 26^b thus provide clearance for the flange 23^a of pan 23.

The upper edges of the respective arms are suitably notched, in the manner best illustrated in Figs. 1 and 5, to accommodate the concentrically arranged outer and inner sets of spirally wound coils 27 and 28, respectively, of the tubular heater elements. The notches are formed as shown in detail at 29 in Fig. 5, the same being arranged to support all coils of the respective sets with the upper surfaces thereof in a common plane, slightly above the upper edges of said arms. As shown, the inner side wall of each of the notches 29 is substantially vertical and the outer side wall thereof is curved inwardly adjacent to the open end of said notch, to provide a sort of hook formation on the latter, to accommodate the correspondingly shaped transverse contour of the heating element in the normal position of the latter when assembled.

The end portions 27^a and 27^b of the outer set of coils 27 and the end portions 28^a and 28^b of the inner set of coils 28 are offset downwardly in a plane below that of said sets of coils and are arranged to just clear the upper surface of the peripheral flange 23^a of reflector pan 23, as best shown in Fig. 2. End portions 27^a, 27^b, 28^a and 28^b are brought together at one side of the heater unit where they penetrate spaced openings in an insulating terminal block 30, said end portions being provided with suitable terminal posts 27^c, 27^d, 28^c and 28^d, respectively, which are accessible from the outer face of block 30. Terminal posts 27^c and 28^c are electrically connected to terminal members 31 and 32, respectively, carried by block 30 (Fig. 4) as by connectors, such as that best illustrated at 33 in Fig. 2. Terminal posts 27^d and 28^d are similarly connected to a common terminal member 34, also carried by block 30. Each of said terminal members 31, 32 and 34 is provided with a binding screw, accessible from the outer face of said block, to provide for connection of said heater elements to a source of electric current supply through the medium of any suitable switching means to provide for heat control or regulation.

End portions 27^a, 27^b, 28^a and 28^b are rigidly clamped between the two suitably formed sheet metal members 35 and 36 comprising a clamping device which abuts the inner face of terminal block 30. Clamping members 35 and 36 are secured to each other by screws 37, 37^a and 37^b, the latter being also preferably employed to secure a wire to said clamping device whereby to provide for connection of the sheaths of said heater elements to a suitable ground.

Terminal block 30 and thus the aforementioned terminals are arranged beneath range top 15 at one side of the opening 16 therein and so are protected from dripping, boiling over or spilling of the contents of utensils which are set upon the heating elements or the range top. The aforedescribed arrangement of the terminals and said end portions permits use of a drip and reflector pan 23 which is imperforate, thereby insuring a maximum effective heat reflecting surface and retention in the pan of dripped and spilled substances, to facilitate maintenance of the range in a sanitary condition.

It is desirable to keep the drip and reflector pan 23 in a polished condition for purposes of sanitation and to maintain the heat reflecting efficiency thereof, and the aforedescribed construction facilitates convenient access to and removal of said reflector pan for cleaning and polishing the same. As best shown in Fig. 2 the heater coil and frame assembly (25, 26, 27, 28, Fig. 1) may be tilted to raise the side opposite to terminal block 30, said assembly being adapted to pivot upon the aforementioned feet 26^d and 26^e which rest upon the horizontal portions 22^d and 21^d, respectively, of said support members 22 and 21. When said coil and frame assembly is thus tilted the end portions 27^b, 28^a and 28^b of said heater coils engage the peripheral flange 23^a of reflector pan 23 intermediate the points thereof which bear on said horizontal portions 21^d and 22^d, thus depressing that side of pan 23 and causing the opposite side thereof to rise and present itself above the surface of the range top for convenient grasping and removal of the same.

Fig. 6 illustrates a modified form of support for the heater unit and reflector pan. The range top 15 in this form of the device is preferably made of stainless steel, since a protective ring or rim is not ordinarily used. The wall of the circular openings 16^b is preferably provided with an integral peripheral flange 16^a bent downwardly at substantially a right angle to the plane of top plate 15. The support members 21 and 22 have their opposite flanged ends rigidly secured to the inner surface of the flange 16^a

and/or to the inner horizontal surface of range top 15 as by welding, in the manner shown in connection with flanged end 21a of member 21 in Fig. 6. Members 24 are attached to the vertical portions of the support members in the manner aforedescribed.

Fig. 7 illustrates a modification of the arrangement shown in Fig. 5 wherein the arm 25b of frame element 25 is provided with notches 38, each of which has a substantially vertical outer side wall and an inner side wall which is curved outwardly with respect to the center of the frame adjacent to the open end of said notch, to provide a sort of hook formation on the latter, which hook formation is the reverse of that described in connection with Figs. 1 to 5. With the arrangement shown in Fig. 7 the heater coils are normally engaged with the inner curved side walls of notches 38 but are free to expand outwardly to a substantial degree within said notches upon heating thereof while in use, without danger of buckling or distortion of the coils by lateral restraint thereof by the outer walls of the notches, the curved inner walls of the notches acting to restrain the coils against substantial upward displacement.

The aforedescribed concentric arrangement of the outer and inner sets of spirally wound heater coils 27 and 28 is particularly advantageous in respect of the flexibility of heat control which is thus afforded. For example, the two sets of coils may be connected in multiple to provide maximum heat, or in series to provide minimum heat, or either of said sets may be connected individually to provide intermediate heat, the outer set of coils being connected as for heating large utensils, such as fry pans, and the inner set of coils being connected as for heating small utensils, such as sauce pans. Furthermore, the sets of heater coils may be made unlike in wattage, and additional flexibility is afforded by connecting the sets of coils individually or in various combinations to a three wire supply source. Thus in a three wire system the maximum heat would be provided by connecting the two heating elements in parallel across the 220 volt lines of the source of supply. The minimum heat would be provided by connecting the two heating elements in series across the 110 volt lines. Various other combinations in which the heating elements may be connected to the source of supply will be apparent to those skilled in the art.

What I claim as new and desire to secure by Letters Patent is:

1. In an electric range top heating unit, in combination, a spirally formed metal sheathed heating element, a stamped sheet metal frame comprising a multiplicity of rigidly united radially disposed arms arranged vertically on edge, each of said arms having a multiplicity of spaced notches formed in the upper edge thereof, the notches in said arms being jointly adapted to receive the coils of said heating element and to support the same with the upper surfaces thereof in a common plane slightly above the upper edges of the respective arms, the outer side wall of each notch being substantially vertical and the inner side wall of each notch being of laterally concave form to normally accommodate the correspondingly shaped transverse contour of said heating element in spaced relation to said outer side wall, said outer side walls of said notches providing a predetermined degree of lateral outward clearance for the adjacent portions of said element as an incident to expansion of the latter upon heating thereof, whereby buckling of said element relatively to said frame is prevented, and said inner side walls of said notches acting to restrain the coils against substantial upward displacement.

2. The combination with a range top having a substantially circular opening formed therein, of an electric heating unit arranged within said opening and comprising a tubular heating element arranged in spiral coil form, means comprising a ring associated with the rim of said opening and engaged with the outer surface of said range top to support the coils of said element in spaced relation and with the upper surfaces thereof in a common plane slightly above said range top, said heating element having terminal portions provided with wiring terminal members for connection to a source of energy supply, said terminal portions being extended laterally from one side of said unit beyond the periphery of said opening, whereby said wiring terminal members are disposed beneath said range top for protection against spillage and the like, and means associated with said ring to provide for bodily tilting of said heating element upwardly at spaced fulcrum points adjacent to the inner periphery of said ring.

3. In an electric range top heating unit, in combination, a metal sheathed heating element arranged in spiral coil form, a metal ring surrounding said element, and having an outer peripheral portion adapted to overlie the range top, means associated with said ring to support the coils of said element in predetermined spaced relation and with the upper surfaces thereof in a common plane slightly above said ring, an imperforate metal reflector pan carried by said supporting means beneath said heating element, said heating element having terminal portions provided with wiring terminal members for connection to a source of energy supply, said terminal portions being extended laterally from one side of said unit between said pan and said ring and beyond the latter, whereby upon assembly of said unit with a range top said wiring terminal members are adapted to be disposed beneath said range top.

4. The combination with a range top having a substantially circular opening formed therein, of an electric heating unit arranged within said opening and comprising a metal sheathed tubular heating element arranged in spiral coil form, means comprising a ring associated with the rim of said opening and engaged with the outer surface of said range top to support the coils of said heating element in fixed spaced relation with the upper surfaces thereof in a common plane slightly above said range top, said heating element having downwardly offset terminal portions, an insulating terminal block having a vertical wall and a horizontal wall, and wiring terminal members arranged upon said vertical wall on the side opposite to said heating unit and beneath said horizontal wall, whereby said terminal members are protected against spillage and the like, the terminal portions of said heating element being extended laterally from one side of said unit beyond the periphery of said opening and being adapted to penetrate the vertical wall of said block for mechanical and electrical securement to said terminal members to further protect the latter against spillage and the like, said terminal members providing for connection of said heating element to a source of energy supply.

5. The combination with a range top having a

substantially circular opening formed therein, of an electric heating unit arranged within said opening and comprising a metal sheathed tubular heating element arranged in spiral coil form, means comprising a ring associated with the rim of said opening and engaged with the outer surface of said range top to support the coils of said element in fixed spaced relation with the upper surfaces thereof in a common plane slightly above said range top, said means also comprising a pair of sheet metal support members extending flatwise diametrically across said opening at substantially right angles to each other, a coil supporting frame having four arms adapted to engage said support members, respectively, said heating element having downwardly offset terminal portions, said terminal portions being provided at their ends with wiring terminal members for connection of said heating element to a source of energy supply and being extended laterally beyond the periphery of said opening whereby said terminal members are disposed beneath said range top, an imperforate reflector pan carried by said support members inwardly of the outer ends of the arms of said coil supporting frame, said frame being tiltable upwardly and adapted to be fulcrumed at the ends of two of its arms upon said support members, and said pan being adapted upon upward tilting of said frame to be engaged at its adjacent peripheral edge portion by said downwardly offset terminal portions, whereby the diametrically opposite edge portion of said pan is simultaneously tilted upwardly and presented above said range top for free and unobstructed removal from beneath said frame upon a further slight degree of manual upward tilting of said pan independently of said frame.

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