Oct. 24, 1939. T. E. DADSON 2,177,173

ELECTRIC HEATER

Filed March 23, 1936 2 Sheets-Sheet 1

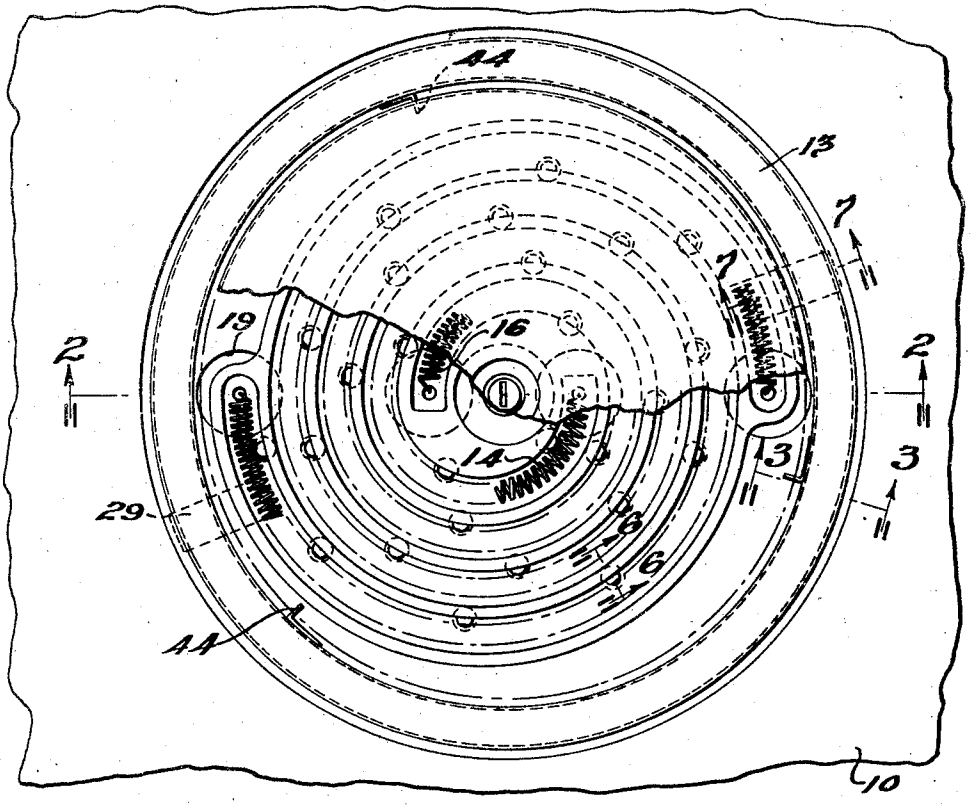


Fig. 1.

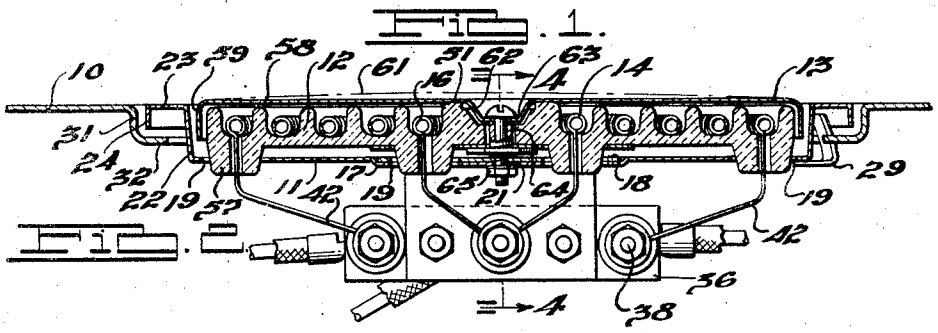


Fig. 3.

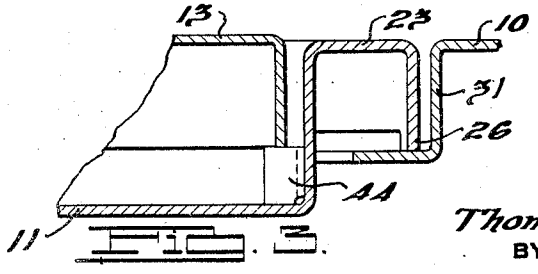


Fig. 2.

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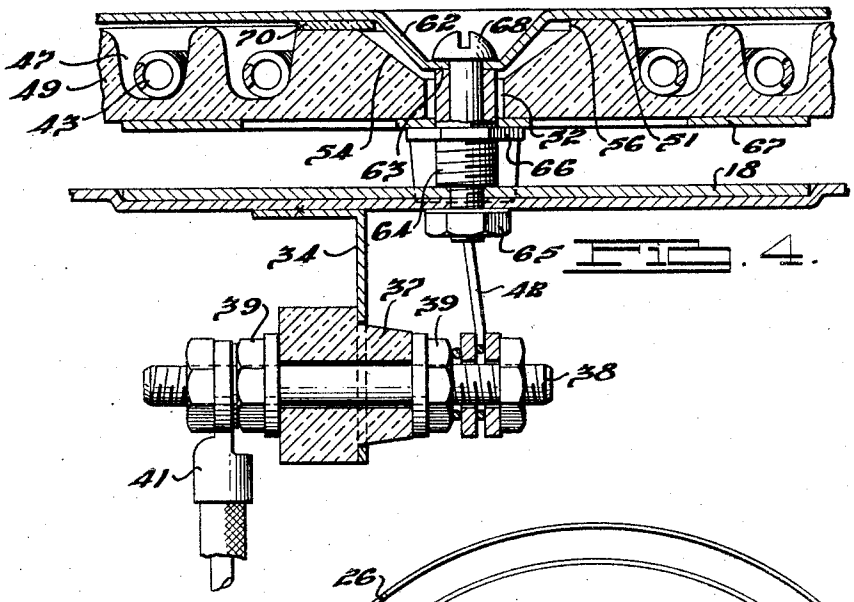


Fig. 4.

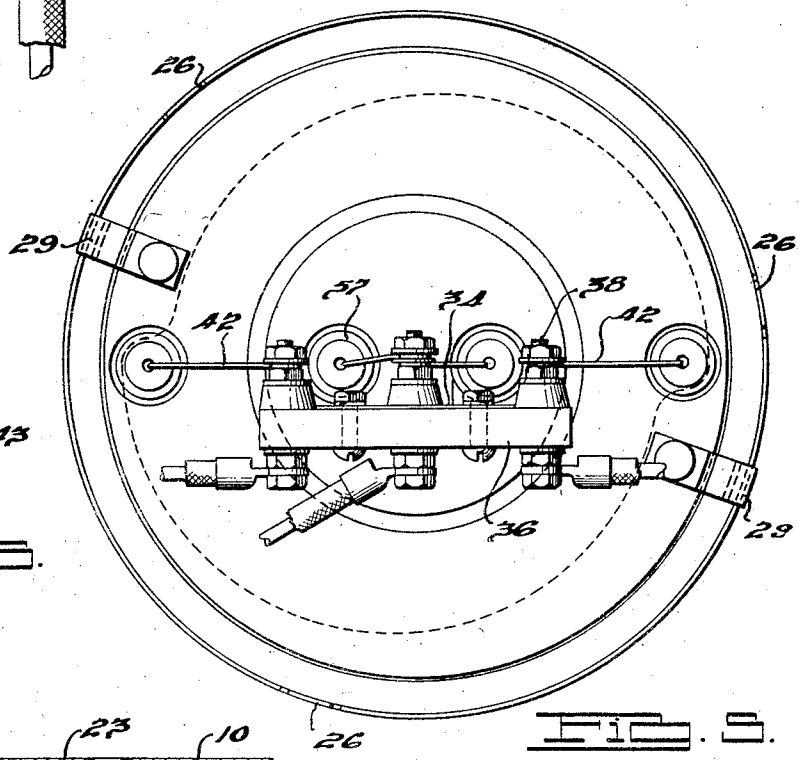


Fig. 5.

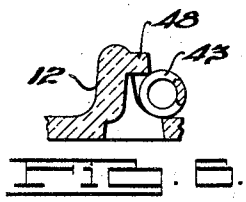


Fig. 6.

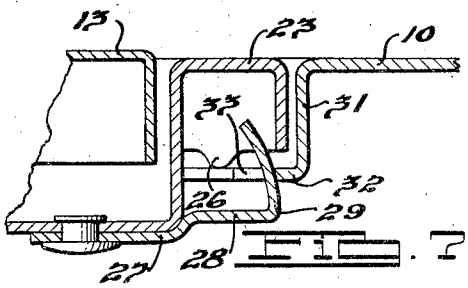


Fig. 7.

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ELECTRIC HEATER

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Application March 23, 1936, Serial No. 70,329

3 Claims. (Cl. 219—37)

This invention relates to electric heaters and more particularly to heater units especially adapted for electric cooking stoves.

Heaters of this nature are generally so built and assembled into the supporting stove structure that they may be readily removed and replaced. In recent years there has been a marked tendency towards using as the support, the panel forming the top of the stove.

It is one of the objects of my invention to devise a novel connecting or attaching mechanism whereby the heater unit, although readily removable, may yet be firmly held against accidental displacement from its operating position.

Heater units for this purpose generally comprise a refractory plate to which is affixed one or more spirally wound helices of resistance wire. The plate generally consists of baked clays or other frangible relatively inflexible materials. It is carried by a base plate usually of metal which in turn serves as the physical connection and support between the refractory and the top panel of the stove. Covers for the refractory, usually made of sheet metal, have been proposed in order to protect it and the heating wire against mechanical injury, or discoloration and spoilage due to the spilling of the materials being heated. Such covers have in the past presented several problems which my present invention solves.

One of the objects of my invention is to design a cover for enclosing a frangible refractory plate, which may be attached to the base in such a way that substantially no cooking utensil load can be applied to the refractory.

Another object of my invention is to devise a mounting for a frangible refractory plate, in an enclosed heating unit, in which the plate is securely held against displacement with respect to the enclosure and yet is still free to expand or contract under the influence of heat without being subjected, particularly at its perimeter, to loads of the bending type, or to shocks from the cooking utensils.

A still further object of my invention is to provide an enclosed heater unit in which, under the influence of temperature changes, the distortion of the several parts of the heater will be controlled so that the heater may remain serviceable over a long period of time.

Another object of my invention is to design a mounting for a heater cover which will tend to prevent buckling or warping of the top of the cover.

Another object of my invention is to provide a heater cover pre-formed to a distorted shape, which may be deformed when installed in such a way as to pre-load the cover, the deforming stresses set up in the cover serving to counterbalance heat stresses.

Another object of my invention is to provide a refractory member of the type described having an extremely low mass.

Another object of my invention is to provide a heater unit mounting in which the unit may be yieldably held against displacement with respect to its support and at the same time be slightly spaced therefrom so that there may be a minimum of heat transferred from the unit to the support.

Other objects and advantages of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawings:

Fig. 1 is a plan view of a portion of a stove top having a heater unit which incorporates my invention, portions of the unit being cut away more fully to disclose the invention.

Fig. 2 is a sectional view through the cover and the stove top taken on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged sectional view of a portion of Fig. 1 taken on the line 3—3 thereof.

Fig. 4 is an enlarged sectional view of a portion of the heater unit taken on the line 4—4 of Fig. 2.

Fig. 5 is a bottom plan view of the heater unit.

Fig. 6 is a section taken on the line 6—6 of Fig. 1 and illustrating an enlarged fragmentary view of a portion of the refractory plate and heating wire; and

Fig. 7 is an enlarged view of Fig. 1 taken on the line 7—7 thereof and illustrating particularly a portion of the heater unit supporting mechanism.

Referring to the drawings, 10 illustrates the top panel of a flat topped stove in which has been mounted a heater unit of the enclosed type. The unit in general comprises a sheet metal base plate 11, a refractory plate 12 carried thereby, a sheet metal cover 13, heater elements 14 and 16, and electrical connections and supports to be described.

The base member 11 comprises a central disc or plate portion having an indentation 17 in the center thereof, in which may be located a reinforcing disc 18 spot welded, or otherwise integrally secured thereto. The base and reinforc-

ing discs are provided with a plurality of apertures 19, arranged diametrically thereof, and a centrally located aperture 21.

Integrally formed with the base is an upstanding flange 22 extending circumferentially thereof, the top portion of the flange being bent to provide an annularly extending portion 23 and a depending lip 24 around the perimeter of the portion 23. At spaced intervals around the flange 24, suitable lugs 26 may be provided for carrying the weight of the heater unit.

Attached to the base 11 at points spaced circumferentially thereof, and preferably diametrically opposed, are a pair of leaf spring fingers 27 having a laterally extending portion 28 and an upstanding portion 29.

The base of the heater unit and the parts associated therewith, to be described, are arranged within a recess in the top panel 10, the side of the recess being deformed to provide a flange 31 and a shoulder 32 substantially parallel to the top of the panel.

The shoulder 32 provides a ledge portion on which the lugs 26 may rest. Spaced circumferentially of the shoulder, at positions opposite the spring fingers 27, is a pair of notches 33. The distance between the outer portion or base of the notches is arranged to be slightly less than that between the ends of the laterally extending portions 28 of the spring fingers. Thus when the heater base is in place, the spring fingers are bent slightly from the vertical as shown in Fig. 7. The spring tension thus induced thereby holds the unit with the lugs 26 in contact with the shoulder 32. The sides of the notches, which engage the sides of the upstanding portions of the spring fingers prevent rotation of the heater unit.

The unit may be installed by first engaging the upstanding portion 29 of one spring finger 27 with the bottom of its notch 33, the heater unit being tilted downwardly on this side as far as it can go. This makes it possible, by applying pressure to the other side of the unit, to compress the inserted spring finger 27 so that the laterally extending portion 28 of the other spring will snap past the shoulder 32. The heater may be removed by reversing this procedure.

Attached to the bottom of the base is a bracket 34 in which is mounted a refractory or insulating member 36 having hollow studs 37 extending through openings in the bracket. Through these studs extends an electrically conducting member 38 bolted as at 39 to the stud and thus axially fixed therein. One end of the stud is electrically connected, as by the connectors 41 to the power line and the other end may be connected to the ends 42 of the heating or resistance wires 43.

Inside the cup-shaped base formed by the flange 22 and the base portion 11, is a series of lugs 44 spaced circumferentially of the base. As shown, these lugs are angular strips of metal of uniform width. One leg is affixed to the flange 22, the other extending radially of the base and in contact therewith for a purpose to be described.

The refractory plate 12 comprises a body having an extended upper surface in which is located a pair of spiral grooves 47, the lead of the spiral being sufficiently great so that the two grooves may be nested. Within the grooves are the heating wires 43 shown as being of helical form. The material of the refractory plate forming the bottom of the groove 47 is punched upwardly during the forming process to provide a lug 48 for retaining the heating wire in place.

As shown, the spiral grooves are arranged with their inner and outer ends substantially 180° apart.

The refractory plate, as above indicated, is of fire brick material or baked clay capable of withstanding the high temperatures encountered in electric cooking. This material is frangible or inelastic and is substantially incompressible, and has a low coefficient of heat expansion. It is chosen chiefly for its ability as a non-conductor both of heat and electricity. The top surface of the plate is slightly convex from the center outwardly so that the height of the ridges 49 between the grooves, progressively decreases radially of the plate. At the center of the plate is a bore 52 having a substantially cylindrical portion extending upwardly for about half the thickness of the plate. At this point the bore is formed into a conical portion 54 which extends nearly to the top of the plate where the bore becomes again cylindrical as at 56. There thus is formed a plane annular section 51 extending around the bore.

The outer perimeter of the refractory plate is cut away radially adjacent the outer end of each spiral to expose the inner spiral. This forms an outer perimeter conforming to the outer portions of each of the spirals. In this way the mass of the plate is still further reduced as compared with a similar plate having a circular perimeter. This materially contributes toward the heating speed and efficiency. Bosses 57 integral with the plate extend downwardly through the openings 19 in the base 11, there being apertures in these studs through which the ends of the resistance wires 42 are led to the studs 38.

The cover plate 13 comprises a centrally located annulus or load receiving portion 58 and a depending flange portion 59 of less diameter and height than the flange 22 on the base. The annular portion 58 of the cover is slightly dished or convex upwardly and before being applied to the heating unit assumes the shape indicated in dotted lines at 61. At the middle of the plate is a truncated conical recess 62 having a shoulder 63. The angle of the conical portion 62 is less than the angle of the conical portion 54 in the refractory plate. Thus the cover will not produce a wedging action against the top of the bore 52 and there will be no tendency to disrupt the refractory plate.

Located within the bore 52 is a sleeve member 64 which bears against the base reinforcing member 18 and extends upwardly towards the shoulder 63 on the cover plate.

The sleeve is externally threaded. On the exterior is a refractory retaining nut 66 which engages a refractory supporting disc 67 having a diameter somewhat less than half that of the refractory plate. A bolt 68 extends through the sleeve and the bore, the head of the bolt resting on the shoulder 63, and a nut 65 bears on the lower face of the base 11 whereby the unit may be held together. In practice the nut 66 is tightened so that the refractory plate 12 is snugly held between the disc 67 and the cover which engages the annular portion 51 of the refractory. There is not, however, any appreciable compression stress in the refractory plate. It is only necessary to hold the refractory plate on the sleeve 64 against the jars and shocks of assembly and shipping operations. No attempt is made to confine the plate, with this mechanism, against

heat expansion forces. The side walls of the recess 62 carry all utensil loads and brace the cover portion 58 so that it cannot transmit loads to the portion 51 of the plate 12.

When the nut 65 is tightened the flange 59 of the cover, resting on the lugs 44 attached to the base, is forced upwardly at its perimeter until the convex cover has become substantially plane. When this has occurred the cover plate engages the annular portion 51 of the refractory only lightly, it being unnecessary and undesirable to have any compression force applied at this point. The sleeve 64 has a greater heat expansion than the refractory disc, so that load transmission to the refractory is still further minimized.

At this point it is occasionally helpful to use a washer 70, preferably of asbestos or other yieldable heat resisting material in order to insure a yieldable support. Such a washer is illustrated at the left side of Fig. 4, it being understood that this washer, when used, extends annularly between the cover and the refractory plate and has an outer diameter substantially equal to that of the annular portion 51 of the refractory, and an inner diameter substantially equal to the outer diameter of the conical portion 62.

With this mechanism it is seen that the sleeve is thus a load carrying means between the cover and the base in that it transmits loads between these two parts and prevents the application of loads to the plate.

With a mechanism of the type described utensil loads are carried by the cover and transmitted by the cover to the sleeve 64 and, through the flange 59, to the lugs 44, and from the base flange 24 to the stove panel 10. With this type of construction the refractory is free from utensil load in spite of occasional deflections of the cover.

It is also noted that the cover when installed on the heater is under a deforming stress due to the fact that the convexity thereof has been removed. With a pre-loaded cover of this nature, the heat expansion forces are insufficient to cause bulging, warping or twisting.

It should be noted, however, that the cover is free to expand laterally, the material of the flange 59 merely sliding over the co-planar top edges of the lugs 44. Hence, under no conditions can the refractory be subjected to bending forces inasmuch as its perimeter is spaced vertically and laterally from the cover.

When the terminal junction studs 38 are mounted on the base, it will be noted that the refractory cannot be injured by any mechanical forces applied to the power connectors 41.

The radial space between the cover and base flanges 59 and 22 respectively, plus the spacing provided by the lugs 44, between the bottom of the flange 59 and the base, allows venting of the region between the cover and the base, this venting being limited, however, and occurring only inside the base flange 22.

It will be noted that the base has two flanges only one of which makes contact with the top panel 10, and then only through a small number of scattered bosses 26 between which additional venting may occur. Consequently heat cannot be readily conducted from the heating elements 43 to the top panel 10 and this is particularly advantageous where the top panel is covered with a material which cannot readily stand wide ranges of temperature change.

It will also be noted that, when this heater unit is installed in the top panel 10 there are no exposed metal edges to scratch the utensils.

Although the invention has been described in connection with a specific embodiment, the principles involved are susceptible of numerous other applications which will readily occur to persons skilled in the art. The invention is, therefore, to be limited only as indicated by the scope of the appended claims.

I claim:

1. In combination, a base, a refractory plate having a heating element associated therewith, a cover comprising a convex top and a depending flange portion extending circumferentially of said plate, and connection means for deforming said cover and securing it to said base, said cover, when deformed, having a substantially plane top.

2. In a heating unit, a base member having a peripheral flange, a cover member having a peripheral flange, said members being disposed in confronting relation with their flanges telescoped and spaced apart, a heating element disposed between said members, spaced lugs carried by the member having its flange disposed outermost to form an abutment for slidingly engaging the edge of the innermost flange, whereby the members are maintained spaced apart but are free for radial expansion and contraction, and means for maintaining said members against separation.

3. In combination, a base structure, a refractory plate, a heating element associated with said plate, a cover for said plate having a convex form, means on said base structure defining an abutment for the periphery of said cover, and means for securing said cover to said base and applying pressure substantially at the center of the cover to force it against the abutment and cause it to assume a substantially planar form.

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