

[54] **MOUNTING SYSTEM FOR SOLID PLATE SURFACE HEATING UNITS**

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219/464, 219/530

[51] Int. Cl.**H05b 3/68**

[58] Field of Search.....219/458-464, 429,
219/433, 439, 530

[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|-----------|---------|-----------|---------|
| 1,047,088 | 12/1912 | Kuhn..... | 219/433 |
| 2,691,717 | 10/1954 | Huck..... | 219/462 |

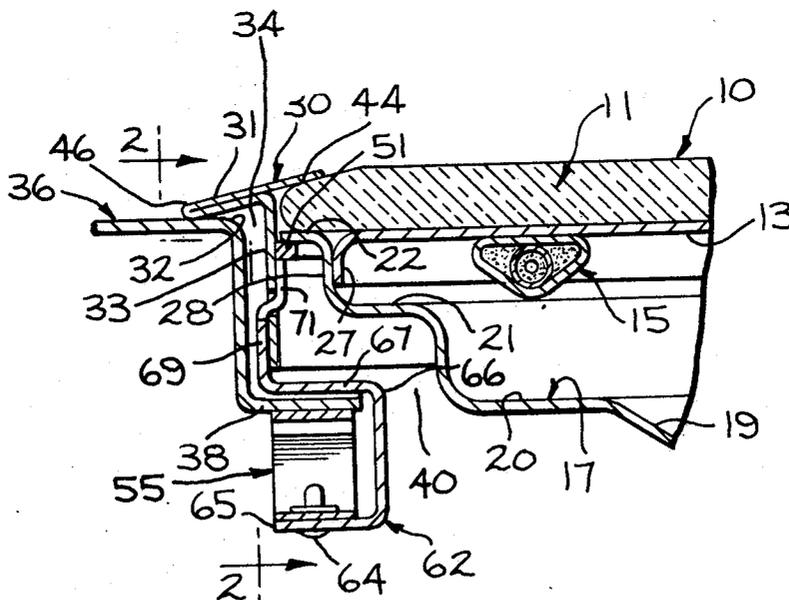
| | | | |
|-----------|---------|---------------|-----------|
| 3,086,101 | 4/1963 | Scofield..... | 219/464 X |
| 3,519,798 | 7/1970 | Walther..... | 219/439 |
| 3,569,672 | 3/1971 | Hurko..... | 219/464 |
| 3,581,144 | 5/1971 | Beggs..... | 219/530 X |
| 3,613,177 | 10/1971 | Davis..... | 219/463 X |
| 3,622,754 | 11/1971 | Hurko..... | 219/462 |
| 3,632,983 | 1/1972 | Dills..... | 219/464 |

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[57] **ABSTRACT**

A glass plate surface heating unit supported on a heat spreader plate that is combined with an underlying heating element and a heat reflector pan. A trim ring surrounds the unit, and the ring has support means for fastening the unit components together. The trim ring has a manually operable, top-serviceable spring locking means for fastening the heating unit in a supporting panel.

12 Claims, 4 Drawing Figures



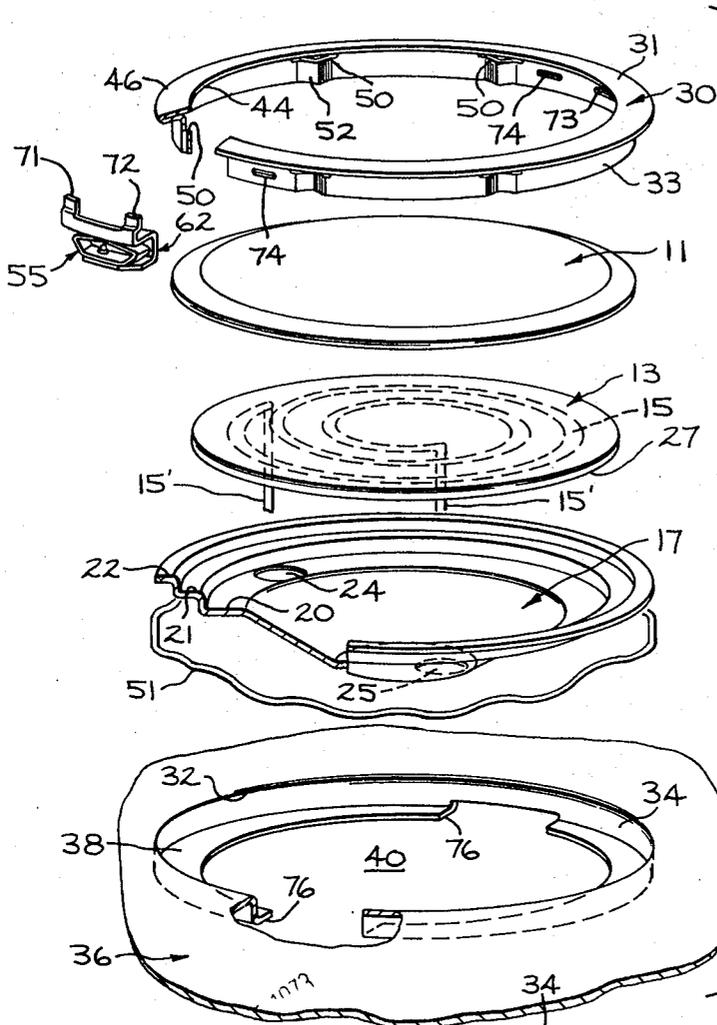


FIG. 4

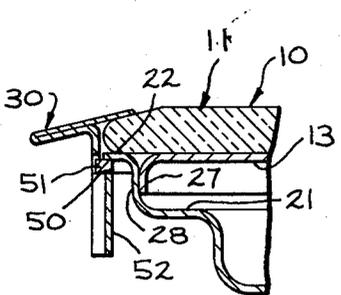


FIG. 3

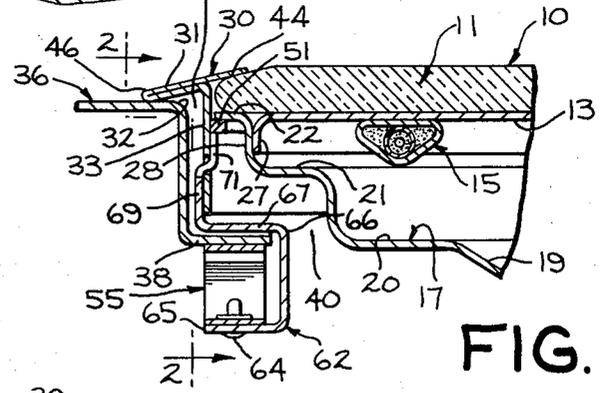


FIG. 1

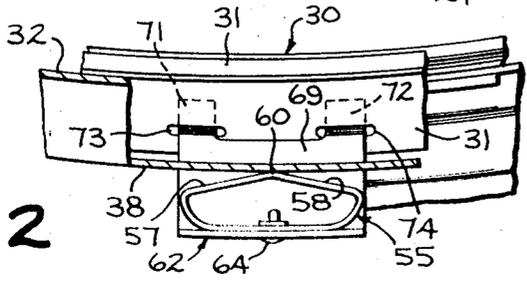


FIG. 2

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MOUNTING SYSTEM FOR SOLID PLATE SURFACE HEATING UNITS

BACKGROUND OF THE INVENTION

A standard electric cooktop for the kitchen is usually provided with a plurality of metal sheathed electrical resistance heating elements which are each wound in the form of a spiral coil and positioned in an opening formed in the cooktop. Each heating element is adapted to support a cooking utensil thereon. These metal sheathed heating elements are cleaned automatically of food soil due to the high temperatures they are allowed to reach once they are energized, but it is possible for spillovers to drain through the heating element and accumulate in a collecting pan located beneath the cooktop from which they must be cleaned by hand.

In order to simplify this cleaning problem, entire cooktops, or in some cases, individual solid plate surface units, have been offered in which the exposed surface is formed with a smooth surface of a glass-ceramic or crystalline glass plate. Examples of such material are the types of glass sold under such trademarks as "PYROCERAM", "CER-VIT" and "HERCUVIT." The opaque crystalline glass, because of its smooth top surface of almost ground glass appearance, not only presents a pleasing appearance, but it is also readily cleanable and it does not permit the drainage of spillovers therebeneath.

One problem that must be faced is that of designing a suitable mounting system for a single plate heating unit so as to lock the heating unit in the cooktop such that it may not move inadvertently during shipment of the range or during installation or normal use of the range in the kitchen. It is best that such a mounting system is top serviceable making it unnecessary to provide means for reaching the underside of the cooktop so as to release the heating unit.

The principal object of the present invention is to provide a solid plate surface heating unit with an improved mounting means for fastening the heating unit in place with a simple turning action thereby obtaining a tight spring holding force.

A further object of the present invention is to provide a solid plate surface heating unit with a trim ring provided with a spring locking means to bias the trim ring in a downward holding position.

A further object of the present invention is to provide a solid plate surface heating of the class described with a combined trim ring and spring means so as to exert a pull-down force on the trim ring to clamp the heating unit in a cooktop.

SUMMARY OF THE INVENTION

The present invention, in accordance with one form thereof, relates to a solid plate surface heating unit that has a trim ring encircling the unit where the trim ring has a flat annular flange and a cylindrical vertical shank portion having support ledges on its inner surface that engage under the solid plate unit. Spring locking means are associated with the lower portion of the trim ring and are adapted to engage beneath an adjacent surface of a heating unit supporting structure to bias the trim ring in a downward holding position.

BRIEF DESCRIPTION OF THE DRAWINGS

This invention will be better understood from the following description taken in conjunction with the accompanying drawings, and its scope will be pointed out in the appended claims.

FIG. 1 is a fragmentary cross-sectional elevational view of the left side of a flat plate surface heating unit embodying the present invention showing the nature of the trim ring encircling and supporting the unit and being provided with a spring locking means associated with the lower portion of the trim ring to bias the trim ring in a downward holding position.

FIG. 2 is a fragmentary side elevational view taken on the line 2—2 of FIG. 1 with the cooktop removed so as to show the nature of the spring locking means of FIG. 1 and the method of connecting it to the trim ring by means of a removable bracket member.

FIG. 3 is a fragmentary cross-sectional elevational view through the left side of the surface unit, similar to that of FIG. 1, except it is taken at a different diametrical line remote from the spring locking means to illustrate the manner of supporting the glass-ceramic plate and its underlying heat spreader plate and the lowermost heat reflector pan from the trim ring by means of lanced support ledges formed on the inner surface of the cylindrical shank portion of the trim ring, there being shown in addition an adjustable ring member compressed between the ledges of the trim ring and the peripheral edge of the reflector to create a tight clamping action.

FIG. 4 is an exploded view, on a somewhat smaller scale, of the components of the entire solid plate surface heating unit of the present invention showing the three-dimensional characteristic of the various components, and also the nature of the notches in the peripheral edge of the recessed opening in the cooktop in which the heating unit is to be mounted, where the notches are adapted to receive the spring locking means supported from the trim ring so that the entire unit may be turned and its spring means moved beneath the peripheral edge of the opening to exert a pull-down force on the trim ring.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to a consideration of the drawings and in particular to FIG. 1, there is shown a fragmentary cross-sectional elevational view of the left side of the flat plate surface heating unit 10 of the present invention. There is a disk or plate 11 of glass-ceramic material that is a high temperature, high resistivity dielectric material that is preferably opaque and milkwhite in appearance. This plate is supported on a thin heat spreader plate 13 of high thermal conductivity such as aluminum or stainless steel, or of composite plate material with an inner core of copper or the like and an outer skin of stainless steel or the like, where the peripheral edge of the composite plate is sealed by the stainless steel to prevent oxidation of the copper core at the high temperatures at which this member will be operated. Attached to the underside of the heat spreader plate 13 is a metal sheathed electrical resistance heating element 15 that is formed in a flat spiral with several turns so as to cover as much of the

surface of the spreader plate 13 as is possible so as to furnish generally uniform heat to the spreader plate and then to the glass-ceramic plate 11 for transfer to the bottom of the cooking utensil that would be seated directly on the glass ceramic plate 11.

Positioned beneath the heating element 15 in a spaced relation is a heat reflector pan 17 that is of dished configuration with a large central depression 19 and a series of three annular steps around the periphery; namely, lower step 20, middle step 21, and finally upper peripheral step 22, which is adapted to bear against the underside of the peripheral edge of the glass plate 11, as is best seen in FIG. 1. Notice that two holes 24 and 25 are formed in the reflector pan 17. These are adapted to receive the two terminal ends 15' of the heating element 15, which terminals are vertically arranged to extend down through the holes 24 and 25 for making an electrical connection with fewer lead wires (not shown) beneath the reflector pan. The heat spreader plate 13 is provided with a downturned flange 27 at its peripheral edge so as to reinforce the plate against buckling as well as to serve to support the plate 13 on the middle step 21 of the reflector pan 17. The diameter of the heat spreader plate 13 is of such a size that its flange 27 bears against the riser 28 that connects the middle step 21 with the uppermost step 22.

A thin sheet of metal trim ring 30 is adapted to slip down over the glass plate 11 and reflector pan 17 with the heat spreader plate 13 and the heating element 15 seated therein so as to fill the air gap or clearance between the glass plate 11 and the peripheral edge 32 that surrounds the opening 34 in the cooktop 36. The opening 34 is formed by a circular recess that has a bottom wall 38 which is provided with a large central opening 40 in which is centered the lower portion 19 of the heat reflector pan 17 as is best seen in FIG. 1. Because of the presence of the large central opening 40, the bottom wall 38 appears as a narrow ledge surrounding the opening 40.

The trim ring 30 has a generally I-shaped transverse elevational cross-section having a head portion 31 and a shank portion 33. The head portion 31 has an inner edge 44 both overlying the peripheral edge of the glass-ceramic plate 11 and an outer edge 46 adapted to overlie the peripheral edge 32 of the cooktop 36. Notice that the head 31 of the trim ring 30 is inclined upwardly toward the center for the reason that the edge of the edge of the glass-ceramic plate 11 is leveled and rises slightly above the top surface of the cooktop 36. The shank portion 33 of the trim ring is a generally cylindrical member of a rather shallow depth such that it does not reach the narrow ledge 38 in the recess 34 of the cooktop as is clear from FIG. 1.

Means must be provided to first assemble the glass plate 11, the heat spreader plate 13, the heating element 15, and the heat reflecting pan 17 to the trim ring 30. The shank portion 33 of the trim ring is provided with a series of widely spaced support ledges 50 which are created by forming lancings 52 as is best seen in FIG. 3, where the peripheral edge of the top step 22 of the reflector pan 17 is adapted to rest upon support ledges 50. Thus, to assemble these components together, the trim ring may be inverted and placed on a work bench. Then the glass plate 11 is slowly lowered into the trim ring thereby pressing tightly against the se-

ries of lancings 52. Then the heat spreader plate 13 with its attached heating element 15 are lowered down onto the glass plate 11 and finally the reflector pan 17 is lowered over the spreader plate such that the two terminals 15', 15' extend through the openings 24 and 25 of the reflector pan. In order to make for a tight fit, an annular spring means 51 of small gauge wire is installed to be sandwiched between the support ledges 50 and the underside of the peripheral flange or top step 22 of the reflector pan 17. This annular spring member 51 is of circular shape in plan view, but in elevational view it has a sinoidal shape such that it must be compressed in a vertical direction in order to confine it into position as best seen in FIG. 3.

Now the complete flat plate surface heating unit is assembled together except for the means for mounting the unit within the recessed opening 34 in the cooktop 36. Such a mounting means is exemplified by the spring locking means 55 that is best seen in side view in FIG. 2. It is an endless strip of spring material that is formed in the general shape of an oval when viewed from the side, except that the top surface has sharper features of inverted V-shape with inclined sides 57 and 58 that join at the middle at apex 60. This spring locking means 55 is fastened to a small sheet metal bracket 62 as by means of the rivet 64. The nature of the bracket can best be understood from FIGS. 1 and the exploded view of FIG. 4. The bracket 62 has a channel shape that is arranged on its side by lower flange 65, a vertical base portion 66 and an upper flange 67. Notice that the spring 55 is fastened to the lower flange 65 and that it extends from the lower flange 65 to the upper flange 67. The top of this channel shaped formation of the bracket is provided with a vertical strap 69 for making a connection to the shank portion 33 of the trim ring 30. Looking at FIG. 2, the strap portion 69 is provided with two offset tabs 71 and 72 which are adapted with an angular motion to slip into mating slots 73 and 74 respectively, such that when the surface unit is lowered into the recess opening in the cooktop, the bracket member is in its vertical position as best seen in FIG. 1. It will be understood that in order to install the bracket in the trim ring, it is necessary to angle the bracket from a generally horizontal position down into a generally vertical position thereby locking the tabs 71 and 72 into the slots 73 and 74 respectively. It should be appreciated that there would be at least two of these spring locking means 55.

Looking at the exploded view of FIG. 4, it will be noticed that the narrow ledge 38 within the recess 34 of the cooktop is provided with two spaced notches 76. These are for receiving the two opposite brackets 62 which are adapted to slip down through the notches so that when a turning force is applied to the surface unit 10, the locking springs 55 will slip under the narrow ledge 38 thereby exerting a pull-down force on the trim ring and consequently on the surface unit, thereby locking the surface unit in place.

Modifications of this invention will occur to those skilled in this art, therefore, it is to be understood that this invention is not limited to the particular embodiments disclosed, but that it is intended to cover all modifications which are within the true spirit and scope of this invention as claimed.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A flat plate surface heating unit comprising a recessed reflector pan and a flat substantially circular plate of high temperature, high resistivity dielectric material such as crystalline glass supported over the top portion of the reflector pan, a heat spreader plate of high thermal conductivity disposed against the underside of the crystalline glass plate, and a metal sheathed heating element attached to the underside of the heat spreader plate, and a trim ring encircling the unit and having a top flange with an inner edge overlapping the peripheral edge of the flat plate and an outer edge adapted to overlap an adjacent peripheral edge of a supporting structure, said trim ring also having a vertical shank portion with support ledges on its inner surface that engage under the peripheral edge of the reflector pan, and annular spring means associated with the said support ledges to clamp the unit within the trim ring, and spring locking means associated with the lower portion of the trim ring and adapted to engage an adjacent surface of a heating unit supporting structure to bias the trim ring in a downward holding position.

2. A flat plate surface heating unit as recited in claim 1 wherein the support ledges of the trim ring are inwardly lanced sections which allow the flat plate, the reflector pan and the annular spring means to snap into the trim ring.

3. A flat plate surface heating unit as recited in claim 1 wherein the said spring locking means is formed as part of a separable bracket member having quick-connect fastening means joining the bracket member to the shank of the trim ring, the top portion of the bracket member being engaged by the annular spring means to assist in holding the bracket in place.

4. A plate surface heating unit comprising a flat substantially circular plate of glass-ceramic material supported on a heat spreader plate of high thermal conductivity, a metal sheathed heating element attached to the underside of the heat spreader plate, a dished reflector pan supporting the assembly across the top portion thereof; the invention comprising, means for mounting the heating unit in a recessed opening in a supporting panel, said mounting means comprising a trim ring of generally T-shaped transverse cross-section having a head portion and a shank portion, the head portion of the trim ring having an inner edge overlying the peripheral edge of the glass-ceramic plate and an outer edge adapted to overlie the peripheral edge of the supporting panel, the shank portion of the trim ring having support ledges on its inner surface that underlie a peripheral flange at the top portion of the reflector pan, and a spring means attached to the shank of the trim ring and adapted to bear against the supporting panel to exert a pull-down force on the trim ring to clamp the heating unit in the opening in the supporting panel.

5. A plate surface heating unit as recited in claim 4 wherein the supporting panel is formed with a recess having a central opening in the bottom thereof that is surrounded by a narrow shelf, a notch formed in the said shelf whereby the spring means attached to the trim ring may be passed down through the notch and the trim ring turned in place to lock the spring means beneath the narrow shelf.

6. A plate surface heating unit as recited in claim 5 wherein the spring means is of endless strip configura-

tion that is capable of vertical compression to exert a strong force against the underside of the narrow shelf of the supporting panel.

7. A plate surface heating unit comprising a supporting panel having a recess, a large opening formed in the bottom of the recess leaving a narrow shelf surrounding the opening, a glass-ceramic substantially circular plate disposed within the recess, a heat spreader plate of high thermal conductivity contacting the bottom surface of the glass-ceramic plate, a metal sheathed heating element attached to the underside of the heat spreader plate, and a recessed reflector pan positioned under the heating element and having a top peripheral flange supporting the glass-ceramic plate across the top surface of the reflector pan, and mounting means for holding the surface heating unit within the recess in the supporting panel, said mounting means comprising a trim ring with a top head portion and a generally vertical shank portion in transverse cross-section, said head portion having an innermost edge overlying the peripheral edge of the glass-ceramic plate and an outermost edge overlying the peripheral edge surrounding the recess in the supporting panel, the shank portion having an inner surface with support ledges on which the top peripheral flange of the reflector pan is mounted, and at least one notch formed in the narrow shelf of the supporting panel, and a locking spring means supported from the shank of the trim ring and insertable down through the said notch whereby the surface heating unit may be turned bodily within the recess in the supporting panel to compress the locking spring means beneath the said narrow shelf.

8. A plate type surface heating unit comprising a thin substantially circular plate of glass-ceramic material, a heat spreader plate bearing against the underside of the glass-ceramic plate, a metal sheathed resistance heating element attached to the underside of the heat spreader plate, a heat reflector pan disposed beneath the heat SPREADER plate, and a trim ring encircling the unit; the invention comprising means for supporting the heating unit in the trim ring comprising a trim ring with a generally T-shaped transverse cross-section with a cylindrical lower portion and a generally flat double flange top portion where the inside flange overlies the peripheral edge of the glass-ceramic plate and the outside flange is adapted to overlie the peripheral edge of a stationary supporting structure, the inner surface of the cylindrical portion being provided with a plurality of spaced ledges which underlie the peripheral edge of the reflector pan whereby the glass-ceramic plate, the heat spreader plate, the heating element, and the reflector pan may be snapped past the ledges in the trim ring and held firmly in place thereby, and a spring locking means carried beneath the trim ring and adapted to engage under an adjacent surface of a stationary supporting surface by means of a turning action of the trim ring.

9. A plate type surface heating unit as recited in claim 8 with the addition of an adjustable ring member compressed between the ledges of the trim ring and the peripheral edge of the reflector pan to render a tight clamping action.

10. A plate type heating unit as recited in claim 8 assembled in a supporting panel that is formed with a recess having a center opening in the bottom thereof

that is surrounded by a narrow shelf, at least one notch formed in the said shelf, the said heating unit being assembled within the recess of the panel with the outside flange of the trim ring seated upon the edge of the panel that surrounds the said recess, the said spring locking means being adapted to slip through the notch of the shelf and to be compressed against the underside of the shelf when the trim ring is turned in place.

11. A plate type surface heating unit assembled in a

supporting panel as recited in claim 10 where the adjustable ring member is substantially circular in plan view and of sinusoidal form in elevational view.

12. A combined plate type surface heating unit and supporting panel as recited in claim 11 wherein the said spring locking means is in the form of a narrow width of tubular form of generally oval configuration.

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