Oct. 27, 1964 P. J. BINDER 3,154,669

ELECTRIC HEATER AND SUPPORT ASSEMBLY

Filed Oct. 19, 1959 3 Sheets-Sheet 1

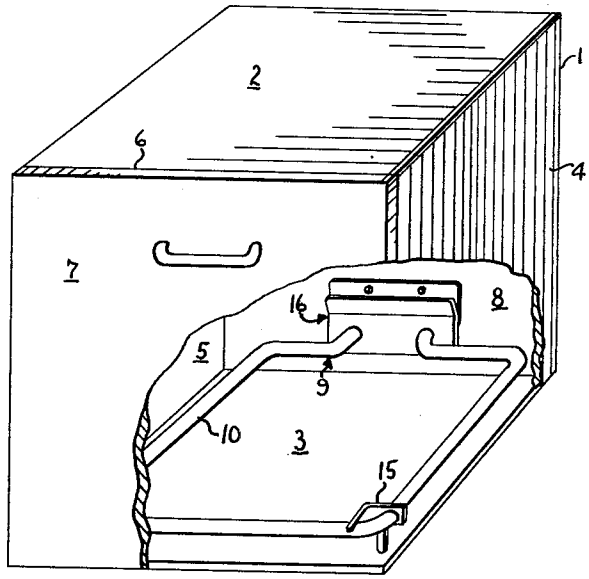


FIG. 1

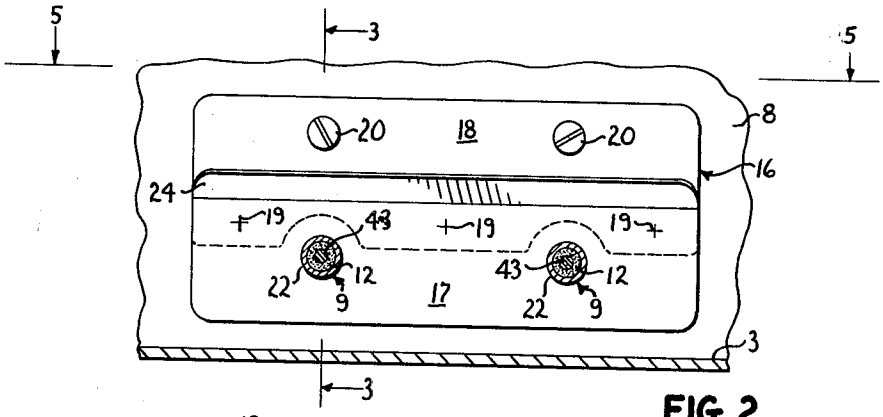


FIG. 2

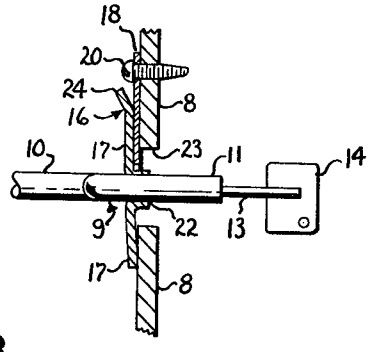


FIG. 3

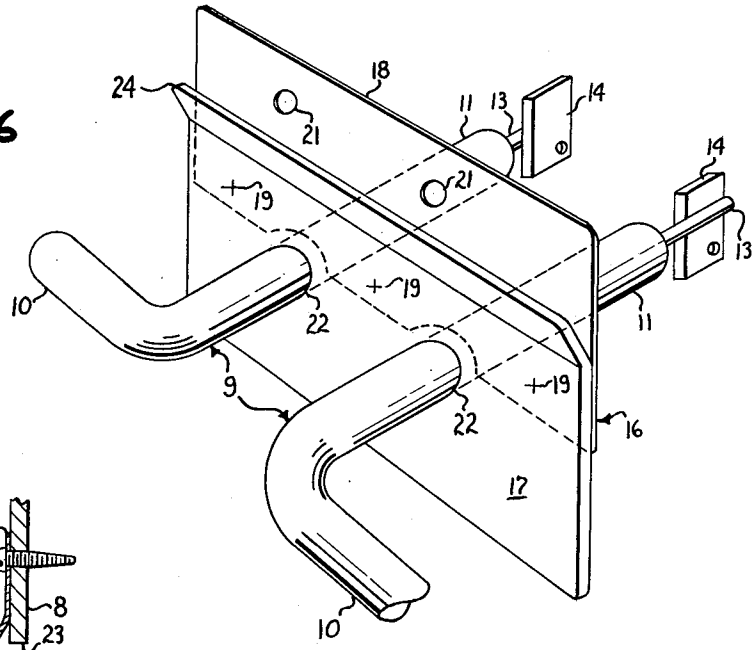
INVENTOR.
PAUL J. BINDER
BY Vernon F. Kall
ATTORNEY

Oct. 27, 1964 P. J. BINDER 3,154,669

ELECTRIC HEATER AND SUPPORT ASSEMBLY

Filed Oct. 19, 1959 3 Sheets-Sheet 2

FIG. 6



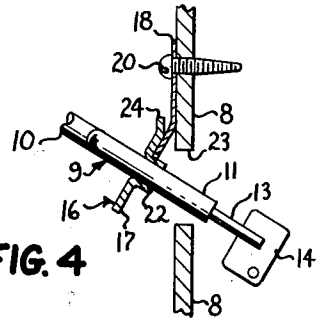


FIG. 4

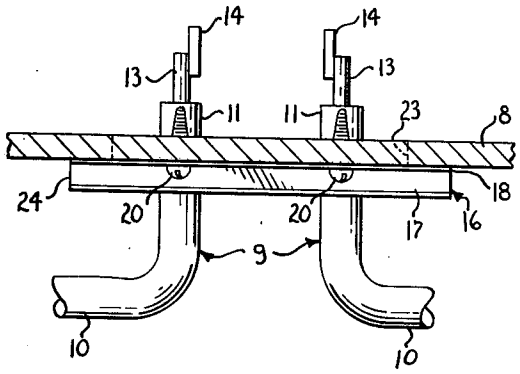


FIG. 5

INVENTOR.
PAUL J. BINDER

BY Vernon F. Kalb
ATTORNEY

Oct. 27, 1964 P. J. BINDER 3,154,669

ELECTRIC HEATER AND SUPPORT ASSEMBLY

Filed Oct. 19, 1959 3 Sheets-Sheet 3

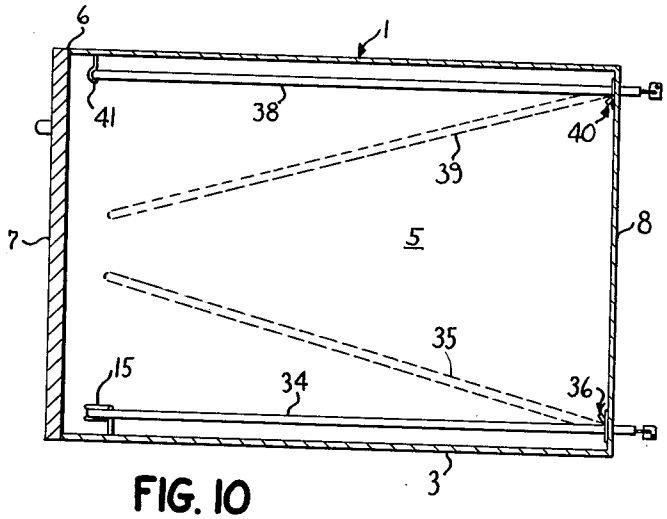


FIG. 10

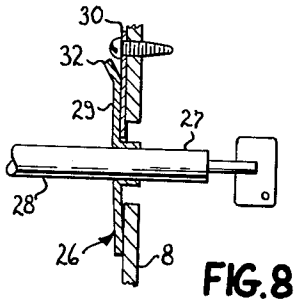


FIG. 8

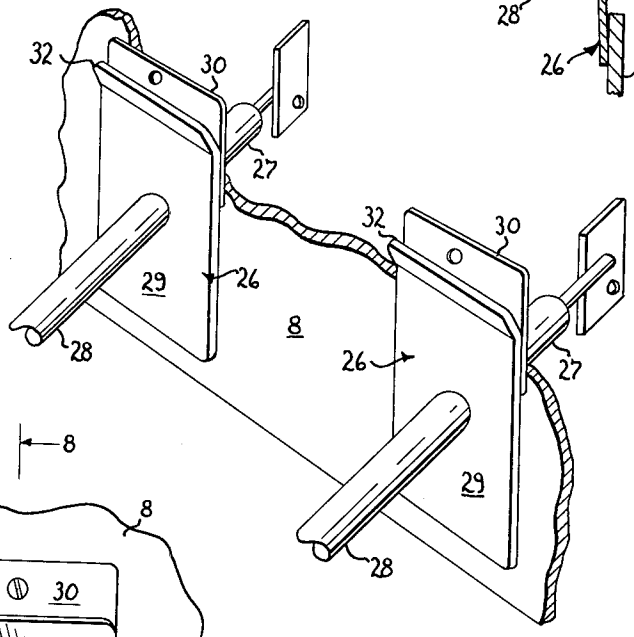


FIG. 9

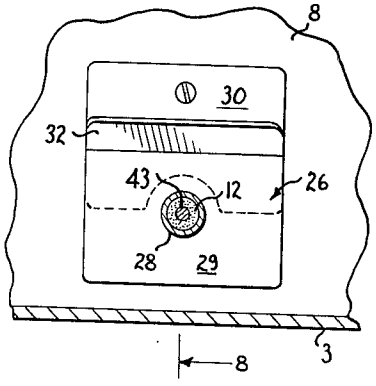


FIG. 7

INVENTOR.
PAUL J. BINDER
BY Vernon F. Kalb
ATTORNEY

United States Patent Office 3,154,669 Patented Oct. 27, 1964

3,154,669

ELECTRIC HEATER AND SUPPORT ASSEMBLY

Paul J. Binder, Shelbyville, Ind., assignor to General Electric Company, a corporation of New York

Filed Oct. 19, 1959, Ser. No. 847,297
2 Claims. (Cl. 219—404)

My invention relates to electric heater apparatus, and more particularly to support assemblies for the mounting of electric heaters.

Various electrical apparatus, such as electric ranges, employ electric heaters in the oven compartment for the baking and broiling of foods. It is desirable that these heaters be positioned in the oven in such a manner that they may be moved out of their normal position to facilitate cleaning the compartment.

Previously, it was the general practice to utilize electric heaters which could be removed from the oven to facilitate cleaning. Generally, these heaters were plugged into a terminal connection in the rear of the oven and could be removed by breaking this electrical connection.

These prior art assemblies were objectionable in many ways. Some of these objections are: (*a*) the female connectors were relatively expensive in that they had to support the weight of the heater as well as to provide the necessary electrical connections, (*b*) the terminal prongs on the heater were difficult to insert in view of the location of the female connection in the back of the oven, (*c*) the electrical connections frequently became loose after the heater had been removed several times thereby interjecting undesirable resistance into the heater circuit which caused heating of the terminals, (*d*) and, frequently the terminal prongs were improperly inserted which thereby resulted in arcing which caused excessive deterioration of the electrical connections.

Subsequently, to overcome the above difficulties, pivotable supports were devised to support the heater assemblies on the oven wall and further, to allow the heater to be pivoted out of heating position to facilitate the cleaning of the oven. Permanent electrical connections were made between the heater and the electrical conductors which carry the energizing current to the heater, these electrical conductors being flexible to facilitate the moving of the heater assembly. In this manner the difficulties encountered in disconnecting the electrical circuit to facilitate the cleaning of the oven were overcome.

The supports heretofore utilized, however, have been objectionable in other ways. Several precisely located holes of a specific size had to be provided in the oven wall to facilitate the attachment of the heater and support assembly. Some of these holes were elongated in shape thereby causing undue weakening of the oven wall resulting in the flexing of this wall during shipment due to vibration and causing the porcelain to chip and crack. These holes were also difficult to form because in the manufacturing operation the punches would frequently break since they were weakened due to their elongated configuration. Also, some of these openings were left partially uncovered by these prior art supports which allowed the vapors from the oven to escape into the surrounding air. This caused both a loss of heat and a loss of odors to the surrounding atmosphere. The amount of these vapors which escaped was further amplified by the fact that portions of the supports extended out from the oven wall towards the center of the oven in such a manner as to guide the vapors into these openings. An additional major difficulty with these supoprts was the fact that an additional ground connection had to be utilized between the heater and the oven wall to provide an adequate electrical ground to the heater for safety purposes.

My invention is a simplified type of support assembly for a heater which requires fewer holes in the oven wall

for the attachment of the support assembly to the oven wall and which further sufficiently covers these required holes to prevent the leakage from the oven. Also, since the individual elements of the support assembly are metallic and rigidly fastened together, an additional ground wire is not needed between the heater and the oven.

It is therefore one of the objects of my invention to provide an improved and simplified support to be utilized to support a heater within an electric oven or similar electrical appliance.

It is a further object of my invention to provide an electric heater support which both supports the heater and electrically grounds the heater to the oven.

A further object is to provide a support which is easier to assemble and which requires fewer and less complex mounting holes in the heating enclosure, thereby simplifying the manufacture thereof.

Another object of my invention is to provide a support which sufficiently covers the necessary openings required in the heating enclosure so as to greatly reduce the amount of vapor leakage from the oven.

In carrying out these objects I have provided a support comprising a heater mounting plate and a unitary resilient metallic member. The mounting plate is securely fastened to the terminal portion of the heater. The unitary resilient member is thereafter fastened to this mounting plate with another portion securely fastened to the oven wall adjacent to an opening in the wall through which electrical connections may be made to the heater. The cleaning of the oven is facilitated since the heater may be pivoted out of normal position, this pivoting movement being allowed by the bending of the resilient member which may be made of a suitable spring material. In this manner my support serves to support the heater and, since all the members of the support are metallic and securely fastened together, no separate grounding means is necessary between the heater and the oven for safety purposes. This improved support greatly simplifies the manufacturing steps in the assembly of the electric oven. It should be understood, however, that even though, for the purposes of clarity, my invention is described as being used in a conventional electric oven, it may also be used in other types of heating enclosures with equal beneficial results.

The subject matter which I regard as my invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. My invention, however, both as to organization and method of operation together with further objects and advantages thereof may best be understood by reference to the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a perspective view, partly in section, of an electric heating enclosure, such as an electric oven, showing one embodiment of my invention,

FIG. 2 is an enlarged fragmentary front view of the heater and support assembly as viewed from FIG. 1,

FIG. 3 is a fragmentary sectional view taken along the line 3—3 in FIG. 2, showing the heater in its normal position,

FIG. 4 is a view similar to FIG. 3 showing the heater pivoted to cleaning position,

FIG. 5 is a top view of the rear portion of the heater and the support assembly taken along the line 5—5 in FIG. 2,

FIG. 6 is a fragmentary perspective view illustrating the rear portion of the heater and support assembly,

FIG. 7 is an enlarged fragmentary sectional view of a second embodiment of my invention wherein each terminal portion of the heater is supported by a separate support,

FIG. 8 is a fragmentary sectional view taken along line 8—8 of FIG. 7,

FIG. 9 is a fragmentary perspective view of this second embodiment of my invention,

FIG. 10 is a schematic view showing my invention utilized with both baking and broiling heating elements in an electric oven.

Referring now to FIGS. 1–6, the embodiment therein disclosed is utilized in cooperation with a heating enclosure 1, such as an electric oven, which is shown in a partial perspective view most fully in FIG. 1. The oven is of the usual construction comprising top and bottom walls 2 and 3, side walls 4 and 5, and a front opening 6 which is closed by a suitable door 7, and a rear wall 8 which is situated opposite the front opening 6.

An electric heating element or heater 9 is provided for the purpose of heating the interior of the oven 1. This heater includes a heating portion 10 which extends into the interior of the oven and a terminal portion 11 which extends through the rear wall 8 of the oven. The heater 9 illustrated in the drawing is of a well-known construction known as a sheath type heater; this heater comprises a helical resistance element 43 which is embedded in a compacted electrical insulating material 12 within the metal sheath. The insulating material most generally used is granular magnesium oxide which is tightly compacted around the resistance element to hold the element in spaced relationship with the metal sheath.

The resistance element 43 extends through the heating portion 10 of the heater 9 with terminal conductors 13 attached to each end; these terminal conductors extend beyond the terminal portions 11 of the electric heating element. Welded to these terminal conductors 13 are terminal connectors 14 which are provided with screw holes or some other suitable means for the permanent attachment of a suitable type of flexible electrical conductor. As shown in FIG. 1 the heater 9 is of a general rectangular form to facilitate good heat distribution within the oven 1 and is supported on the front end by legs 15 or some other suitable means to hold the heater parallel to this wall of the oven. The terminal portions 11 of the heater are supported on the rear wall 8 of the oven by a support 16.

This support 16 comprises a metallic plate member 17 which is fastened to the terminal portions 11 of the heater 9, and a unitary resilient metallic member 18 which is fastened to this plate member 17 and to the rear wall 8 of the oven. The utilization of this resilient member 18 allows the plate member 17 and the heater 9 to be pivoted away from the bottom wall 3 of the oven. As best shown in FIG. 4, the resilient member 18 is bent outward by the pivoting movement of the heater so that the bottom of the oven is easily accessible and may be readily cleaned. The gauge of material used for the resilient metallic member 18 will vary from one installation to another, but for ordinary applications a thickness in the order of .010" will be satisfactory.

The plate member 17 and the resilient member 18 are preferably fastened by spot welding as illustrated at 19 in FIG. 2, so that a good electrical connection is provided between the two members. Some removable fastening means, such as metal screws 20 extending through mounting holes 21 in the resilient member 18, is best utilized to fasten the resilient member to the rear wall of the oven to facilitate the removal of the heater from the oven for purposes of repair, replacement, etc.

The terminal portions 11 of the heater extend through holes 22 of plate member 17 and subsequently through a larger opening 23 in the rear wall 8 of the oven 1. The large opening 23 in the oven wall 8 allows the heater element 9 to pivot with respect to the oven wall 3 by allowing for a vertical movement of the terminal portions 11 of the heater. To facilitate the movement of these terminal portions, flexible type conductors, (not shown) are attached to the terminal connectors 14 for the energization of the heater 9. Also in order to insure that the large opening 23 is completely covered when the heater 9 is in the normal position, it is apparent that the plate member 17 must be larger than this opening 23.

In order to facilitate the pivoting of the support 16, the upper extending portion 24 of plate member 17 is bent outward in the direction away from the resilient member 18. This bent portion allows the resilient member 18 to "roll" thereover and allows the support assembly 16 to bend with greater ease. Also this extending portion 24 makes the plate member 17 more rigid, thereby adding to the over-all strength of the support assembly.

The holes 22 in the member 17 have extruded edges to facilitate the clamping of the plate member around the terminal portion 11 to obtain a rigid support and further provide a good electrical contact between the heater 9 and the support. It should be understood, however, that other means may be utilized to secure the plate member to the heater so long as the members are rigidly secured and a good electrical contact between the heater and the plate member is provided.

It is apparent that a permanent electrical ground is provided between the heater 9 and the oven 1 since the support serves as an uninterrupted electrical conductor between the heater and the oven wall. As disclosed previously, the plate member 17 is securely fastened to the heater 9 and the resilient member 18 with the resilient member being subsequently rigidly affixed to the enclosure wall 8. A good electrical contact is therefore provided by these metallic members between the heater and the enclosure which is not interrupted when it is desired to pivot the heater to the cleaning position, as illustrated in FIG. 4. This electrical ground connection is also of a large cross-sectional area as compared to the use of a separate conductor wire as in prior art devices. Because of this, even if high grounding currents occur, the voltage to ground will still be negligible.

Further, since the heater is supported by a resilient member, a natural damping effect to vibrations is provided which aids in the shipping of the apparatus. The resilient member will flex and reduce the vibrations transmitted from the heater to the oven wall, thereby reducing the tendency to crack the porcelain finish on the wall. This chipping and cracking of the porcelain is also reduced by the fact that only two mounting holes are utilized along with the larger opening for the heater terminals. These smaller circular holes do not weaken the oven enclosure as did the necessary elongated holes utilized by the prior art devices.

A second embodiment of my invention is illustrated in FIGS. 7 through 9. It is often desirable that several different configurations of the heaters be utilized in the various heating enclosures to facilitate the distribution of heat within the oven. Because of this, I have illustrated a heater support 26 which may be utilized with each terminal portion 27 of a heater 28 so that the terminal portions of the heater may be separately located on the oven wall 8. It is obvious, however, that to enable the pivotal movement of the heater, the location of the two supports should be such that the pivot axis of each support be on the same straight line.

In this embodiment, a plate member 29 is securely fastened to the terminal portion 27 of the heater 28 by means of a unitary resilient member 30 rigidly affixed to the plate member 29 and a rear wall 8 of the oven 1. It is desirable that the support 26 be removably affixed to this rear wall 8 for the purposes stated previously. Also to facilitate the pivoting of the heater 28 to the cleaning position, the upper edge of the plate member 29, that is the edge parallel to the pivot axis of the support 26 is bent outward to form the extending portion 32.

It is apparent that this second embodiment of my invention provides all the advantages of the previously described embodiment and further provides the versatility of allowing the separate terminal portions of the heater to be located at remote points within the oven.

It is also apparent from the foregoing that the herein described invention may be utilized in any type of heating enclosure to allow for the pivoting of a heater therein to facilitate the cleaning of the enclosure or any other desired operation. The invention disclosed herein may be utilized in an electric range in cooperation with either or both the baking and broiling units of the oven as illustrated in FIG. 10. In the manner previously described, the baking heater 34 may be pivoted to the position 35 to facilitate the cleaning of the oven by utilizing a support 36 located on the rear wall 8 of the oven 1. Similarly, the broiling heater 38 may be pivoted to a position 39 by the utilization of a support 40 also located on the rear wall 8 of the oven. Support 40 is identical to support 36, but to facilitate cleaning, support 40 will be placed in an inverted position to support 36. A hinged bracket or resilient hook 41 will be attached to wall 2 and will suspend and support the distal end of heater 38 in spaced relation from wall 2. In this manner all of the surfaces of the oven may be easily and readily cleaned.

While I have illustrated and described particular embodiments of this invention, modifications thereof will occur to those skilled in the art. I desire it to be understood, therefore, that this invention is not to be limited to the particular embodiments disclosed and I intend in the appended claims to cover all modifications which do not depart from the sphere and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In an electric heating apparatus, the combination comprising a heating enclosure having an aperture through one wall thereof, a sheathed electric heating element including a heating portion and a terminal portion, said

terminal portion extending through said aperture, a metal support assembly for the heating element comprising a plate member and a resilient strap member, said plate member being rigidly attached to said terminal portion, said resilient strap member having one portion rigidly fastened to said plate member and another portion rigidly fastened to saide wall adjacent to said aperture for electrically grounding and mechanically supporting said heating element, said metal support assembly having edges overlapping the edges of said aperture and said strap member being biased to urge said support assembly to close said aperture against leakage of vapors from the oven when the heating element is in normal position.

2. For use with a wall having an aperture, a sheathed electric heating element having an end constructed to extend through the aperture, and support means for mechanically supporting said end and for electrically grounding said sheath to the wall, said support means comprising a resilient electrically conductive strap member having one portion rigidly fixed with respect to the sheath and another portion constructed to be rigidly fixed with respect to the wall, said support means having an area greater than that of the aperture and providing edges constructed to overlap the edges of the aperture and said strap member being biased to urge said support means to close the aperture when the heater element is in normal position.

References Cited by the Examiner

UNITED STATES PATENTS

Re. 22,177	9/42	Sharp	219—461
2,565,432	8/51	Kirk	219—463
2,740,097	3/56	Edelman et al.	339—4
2,918,560	12/59	Kruse	219—536 X
2,955,189	10/60	Fry	219—463

RICHARD M. WOOD, *Primary Examiner.*

MAX L. LEVY, *Examiner.*