

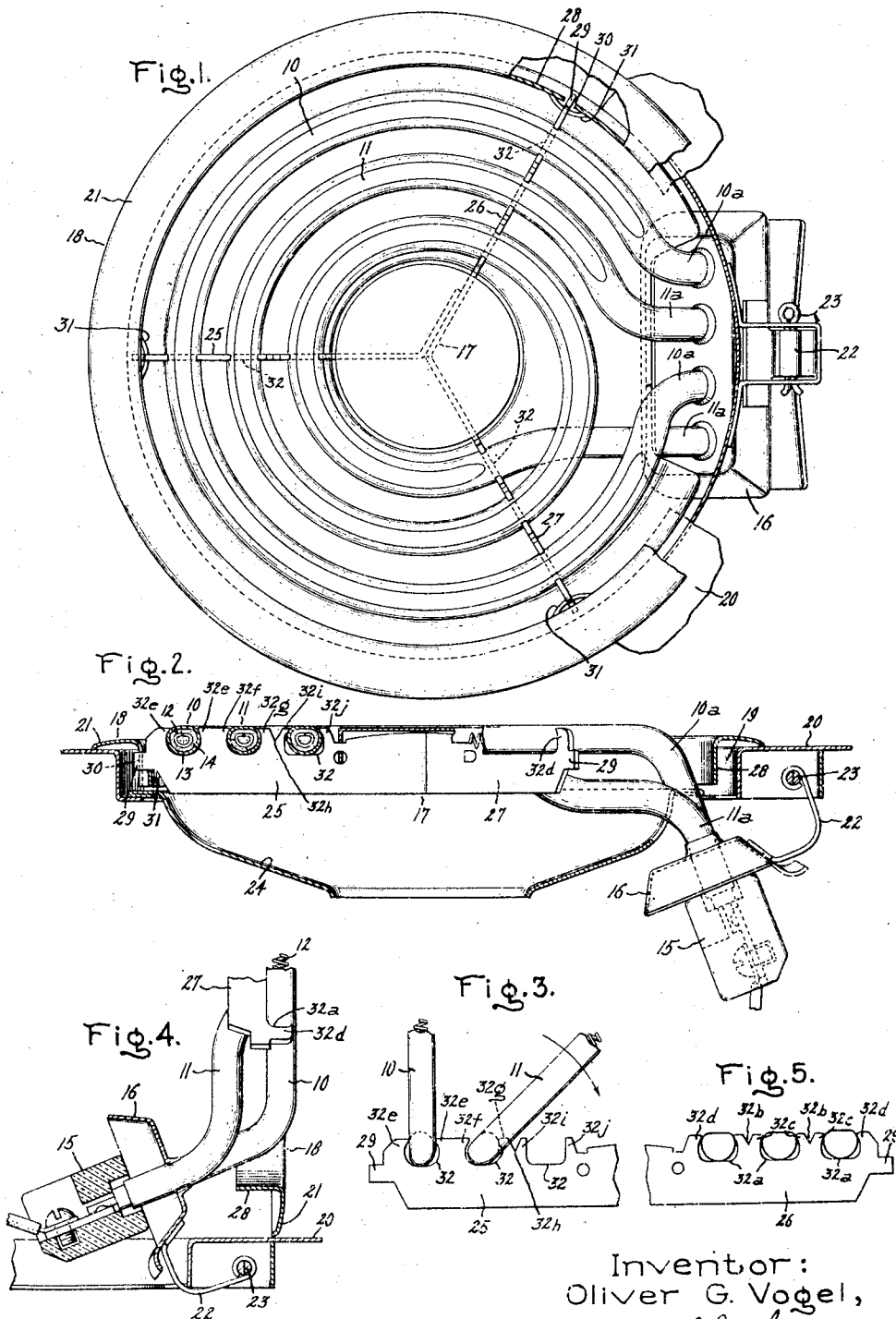
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HEATER

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HEATER

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This invention relates to heaters, more particularly to electric heaters of the hotplate type, such as are used with electric ranges, and it has for its object the provision of an improved heater of this character.

This invention has particular application to electric hotplates having sheath wire heating elements arranged in the form of flat loops or coils. Certain well known heating elements of this character have a resistance conductor housed in a metallic sheath and embedded in and supported in spaced relation with the sheath by a compacted layer of heat conducting, electrically insulating material, such as powdered magnesium oxide. In a particular known electric range hotplate employing a sheath wire heating element of this type, the turns of the heating element are supported by metallic strips connected to form a grid-like spider and arranged to hold the turns in a substantially horizontal position in the top opening of the range; the turns of the heating element are inserted into a plurality of notches provided for them in the top edges of the strips; and the top edges of the strips also are provided with upright ears at the sides of the notches which after the turns are placed in the notches are peened over the turns so as to clamp them rigidly to the spider. As there are expansion and contraction of the turns of the heating element as its temperature is elevated and reduced, considerable strains are set up in the strips which may result in buckling of the heating element so that it is no longer flat, or in bending of the strips. At other times, the ears are actually pushed away by the coils so that the coils are free to work up out of the spider.

This invention contemplates an improved heater wherein the notches in the upper edges of the strips where the greatest expansion and contraction in the heater element turns occur are formed in the solid metal of the strips, and are preformed with parts at the sides shaped to over-hang the turns when inserted in the notches. In other words, these notches are not provided with ears or the like extending upwardly and peened over after assembly with the heater elements, as in prior constructions, but are preformed in the solid walls of the strips, whereby the over-hanging parts are comparatively strong and durable, and cannot be pushed out of position by the heater elements.

In addition to this, the preformed notches are relatively elongated in the plane of the coils so that the turns are relatively free to expand and contract in this plane.

The heating elements are given a non-circular cross-section. One dimension of this section lying in the plane of the coils is greater than is another dimension thereof positioned at an angle to this plane. By reason of this arrangement, the heating element may be easily and quickly inserted into its operative secured position in the preformed notches by holding the heating element at an angle to the grid so that the short dimension can be inserted between the top edges of the notch and into the notch, and then the heating element may be rotated in the notch into its proper operative position. When it has been moved into this position the long dimension of the cross-section falls under the over-hanging edges of the notch so that the heating element is secured against vertical movement. However, inasmuch as the notches are elongated in the plane of the heating element, the heating element has freedom to expand and contract.

For a more complete understanding of this invention, reference should be had to the accompanying drawing in which Fig. 1 is a plan view of an electric hotplate having a pair of heating elements, and provided with holding means for the heating elements constructed and arranged in accordance with this invention, parts being broken away so as to illustrate certain details of construction; Fig. 2 is a sectional view taken through the hotplate of Fig. 1; Fig. 3 is a fragmentary view of a portion of the hotplate of Figs. 1 and 2 illustrating the manner in which the heating elements are assembled with one part of their supporting grid; Fig. 4 is a fragmentary view, mainly in section, of a portion of the hotplate shown in Figs. 1 and 2, but illustrating certain of the elements in different operative positions; and Fig. 5 is a fragmentary view of a portion of the hotplate illustrating the manner in which the turns are held in a part of the grid.

Referring to the drawing, this invention has been shown in one form as applied to an electric range hotplate of the type described and claimed in the patent to John C. Sharp, Reissue No. 22,177, dated September 8, 1942. As there described, this hotplate comprises a pair of heating elements 10 and 11 which are of the sheathed type, such as described above; thus, each heating element comprises a coiled resistance conductor 12 mounted in a metallic sheath 13 and embedded in and supported in spaced relation with reference to the sheath by a highly compacted layer 14 of heat conducting, electrically insulating material, such as powdered magnesium oxide. The heating element 10, as shown,

is in the form of a partial circle, while the element 11 is formed into a spiral positioned inside of the element 10. The terminal ends 10a and 11a of each of the heaters are adjacent each other at one side of the hotplate, and they are alternately positioned with reference to each other, as clearly shown in Fig. 1. These terminal ends are secured to a suitable terminal block 15 which is provided with a terminal shield 16.

The heating elements 10 and 11 are supported upon a suitable spider-like grid 17 which in turn is mounted in a supporting ring 18 that is adapted to fit into an opening 19 of the top plate 20 of an electric range. The supporting ring 18, as shown, is provided with an outwardly extending flange 21 which rests upon the surface of the top plate around the opening so as to support the grid in the range top with the heating elements lying in a common horizontal operating position. Secured to the terminal shield 16 is a hinge 22 pivotally secured to a pin 23 that is mounted under the range top whereby the unit may be swung up and down in the opening 19. Positioned under the unit is a suitable reflector 24.

It will be observed that the grid supports the heater elements so that their upper surfaces lie in a plane that is above the upper edges of the grid strips, and also the top surface of the ring 18.

The grid 17 in the embodiment of the invention illustrated is formed by three diverging strip-like members 25, 26 and 27 formed from metal stampings and arranged generally radially within the circular supporting ring 18, and preferably, at angles of substantially 120° to each other. Preferably and as shown, the two strips 26 and 27 will be made from a single piece of metal which will be bent at the middle to form the two strips, as shown, while the third strip 25 will be separate and attached to the two strip assembly in any suitable manner, as by welding. The ring 18 has a flange 28 extending downwardly through the opening 19 in which the grid is mounted. The grid strips are provided with tongues 29 at their outer ends which are received in openings 30 provided for them in the flange 28 and which are supported by sections 31 of the flange under the openings as clearly shown in Figs. 1 and 2. The two legs 26 and 27 of the grid span the terminal ends of the heater elements, as shown in Fig. 1.

The strips 25, 26 and 27 of the grid are made relatively thin and stand vertically on edge. The upper edge of the strip 25 is provided with notches or recesses 32, and the upper edges of the strips 26 and 27 are provided with notches 32a, all for receiving the turns of the two heating elements 10 and 11.

The upper edges of the strips 26 and 27 also are provided with relatively shallow notches 32b (Fig. 5) between the notches 32a so as to form upright ears 32c. In addition, the top edges of these strips are shaped to form similar ears 32d at the outer and inner sides respectively of the outer and inner notches 32a. As will be pointed out in greater detail hereinafter, after the turns of the heater element are assembled with the grids, the ears 32c and 32d are peened over, as shown in Fig. 5, so as to secure the turns to the grid strips 26 and 27. This arrangement of securing the turns to the strips 26 and 27 follows the practice heretofore generally used.

However, with reference to the third grid strip 25 that is located opposite the terminals of the heater, the outer notch 32 of this strip is preformed in the metal of the strip to its final shape

with its over-hanging sides 32e formed in their over-hanging position before assembly with the turns of the heater elements. That is, this notch with its over-hanging parts 32e is located within the limits of the plane of the metal, and is not formed with upright projecting ears, as in the case of the notches 32a in the strips 26 and 27. Also, the outer over-hanging side 32f of the central notch 32 of this strip 25 will be preformed in the solid stock of the strip. The inner side 32g of this central notch 32 is preferably preformed also. But the outer side of the inner notch will be provided with an upright ear 32i by inserting between these notches a shallow notch 32h, and the inner side of the inner notch will be provided with a similar ear 32j, all in a manner similar to the notch arrangement of the strips 26 and 27 previously described.

Therefore, the outer and central notches 32 in the strip 25 are provided with over-hanging sides formed solidly in the body of the strip, whereby they constitute very strong retaining sections, as compared with the ears 32c and 32d of the strips 26 and 27, and the ears 32i and 32j of the strip 25.

The cross-sections of the heater elements 10 and 11 are similar, and preferably they will have a relatively elongated horizontal dimension as compared with the vertical dimension of the section, as clearly shown in Fig. 2. This shape may be and preferably will be obtained by flattening the tops of the heater elements, as described and claimed in Vogel Patent No. 2,094,480, dated September 28, 1937. The long dimension is such that the over-hanging sides of the notches will hold the elements firmly in place while the short dimension is less than the shortest distance between the opposed over-hanging sides 32e of the outer notch 32 in the grid strip 25.

The heater elements 10 and 11 are assembled with the grid 17 in the following way: The grid strips 25, 26 and 27 all will be formed as previously described. Before the assembly of the heater elements with the grid, the ears 32c and 32d of the strips 26 and 27, and also the ears 32i and 32j of the third strip 25 will be upright. Prior to their assembly with the heater elements, the grid strips may be rigidly secured together in assembled relation, or the heater elements may be assembled first with the strip 25. Let it be assumed that the grid strips are assembled together and rigidly secured, as shown in Fig. 1. Then to assemble the heater elements, the inner element 11 first is held in a vertical position and then is dropped into its outside notch 32 in the strip 25 which is the central notch of this strip; and then it is swung in the clockwise direction, as shown in Fig. 3, down to its horizontal operative position so that all of its turns are received in their inner notch 32 in strip 25 and the notches 32a in strips 26 and 27. Then the outer heater element 10 is held in a vertical position above the grid and moved downwardly into its outside notch 32 of strip 25, as shown in Fig. 3, and finally it is swung down in the clockwise direction to its horizontal position with its turns received in the outer notches 32a of the strips 26 and 27. Preferably, the smallest dimension between the two inturned sides of the outer notch in the strip 25 will be slightly larger than is the small vertical dimension of the cross-section of the heater 10 so that the heater may be readily slid into the notch.

After the heater elements have been rotated to their operative positions with their turns received in all the notches, the ears 32c and 32d

of the strips 26 and 27 and the ears 32i and 32j of the strip 25 are peened over the turns of the heater, as shown.

If the grid strip 25 is not secured to the strips 26 and 27 prior to assembly of the heaters, the heater elements may be assembled first with the strip 25 in the manner just described, and swung downwardly into their operative positions with reference to the strip, and then the strips 26 and 27 may be applied to the heaters and secured to the strip 25, after which the ears 32c, 32d, 32i and 32j will be peened over.

The reason that it is necessary to preform only the outer notches of the third strip 25, as described, is that the major portion of the expansion and contraction of the turns of the heater elements 10 and 11 takes place in the 240° arc opposite the terminals and lying between the strips 26 and 27; this is because the major portion of the lengths of the two heaters lie in this area. Therefore, while the retaining ears 32c and 32d of the strips 26 and 27 are relatively small they will effectively hold the turns in place, because very little strain is imposed on them. Likewise, very little strain is imposed by the inner turn of the heater 11 on the strip 25 and, therefore, it will be satisfactory to hold this strip by peened over ears 32i and 32j. However, the outer turn of the heater 11 and the turn of the heater 10 supported in the strip 25 can exert considerable lateral and upward pressures due to expansion and contraction. The preformed over-hanging ears 32e and 32f effectively prevent upward displacement of the heater elements, and hold them down in their operative positions.

Furthermore, it is to be observed that the various notches 32 and 32a in the strips 25, 26 and 27 are somewhat elongated with reference to the heater sections received in them in the plane of the heaters so that the turns can move inwardly and outwardly in this plane as they expand and contract without exerting any material stress on the sides of the notches.

It has been found that it is not always necessary to provide the left-hand ear 32i of the inner notch 32 in the strip 25 and peen it over the heater, but that this side may be left vertical, the right-hand ear 32j alone being sufficient to hold the heater element. In this case, the right-hand over-hanging side 32g of the middle notch of this strip may be preformed, omitting the shallow notch 32h, as is the left-hand side 32f of this notch and as are the over-hanging sides 32e of the outer notch of this strip. This reinforces the holding means of the central notch.

It will be observed that I have provided a simplified heater structure embodying means permitting the expansion and contraction of the heater elements without imposing strains upon the heater elements themselves or upon their supporting grid. It will also be observed that this means is constructed and arranged to facilitate and provide an easy way of assembling the heaters with the grid.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

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

1. A heating unit comprising a relatively rigid rod-like heating element having a curved length

that expands and contracts as the heating element heats and cools, said heating element being flattened so that it has a cross-section having a relatively long dimension and a relatively short dimension, and a grid for supporting said heating element having a strip with a notch therein for receiving and retaining said curved length in its operative position with the long dimension of said section positioned crosswise of said notch, said notch being preformed in said strip from the body thereof and having at least one side that over-hangs a part of said heating element along the long dimension thereof to prevent movement of the element out of said notch, the length of the opening of said notch between the inner edge of the over-hanging side and the opposite side of the notch being less than said relatively long dimension but long enough so that it will pass said relatively short dimension into the notch, whereby the heating element can be assembled with said strip only by inserting said short dimension through said opening into said notch and then by rotating the heating element relative to said strip so that said long dimension is positioned crosswise of said notch.

2. A heating unit comprising a relatively rigid rod-like sheathed heating element having a curved portion that has a non-circular cross-section one dimension of which is relatively long and one relatively short, a support having an elongated notch preformed therein for receiving said curved portion in operative position with its long dimension longitudinally positioned in said notch crosswise thereof, the notch having its side walls spaced apart sufficiently far to provide for expansion and contraction of said curved portion relative to said support, and said side walls also over-hanging said curved portion to prevent displacement of said portion out of said notch, the over-hanging sections being spaced apart a distance which will permit the movement of said short dimension into said notch but which is too short to permit insertion of the long dimension into said notch so that the heater can be assembled in said support only by positioning it with reference to the support so that said small dimension may be received in said notch and after being so received by moving it angularly with reference to said support to its normal operative position wherein the long dimension is positioned crosswise of said notch.

3. A hotplate comprising a curved rigid rod-like sheathed heating element which expands and contracts responsively to heating and cooling, a strip support for supporting said heating element with the element in a substantially horizontal cooking position, said strip being arranged vertically on edge so that its upper edge lies in a plane substantially parallel to the plane of the cooking surface of said heating element, and said upper edge having a notch for receiving said heating element to support it, the cross-section of the heating element having its horizontal dimension relatively longer than its vertical dimension, said notch being formed in said strip before the assembly of the strip with the heating element and having side walls that are spaced apart sufficiently far to provide for expansion and contraction of said heating element in the plane of the element, and also having sections over-hanging both sides of said element to prevent substantial displacement of said element upwardly from said notch, the inner edges of the over-hanging sections being spaced apart a distance substantially equal to the vertical di-

mension of said element in cross-section so that said element can be inserted in said notch only when in a position substantially at right angles to its normal cooking position, and is secured in said notch by turning it to its normal position wherein said relatively longer horizontal dimension is received under said over-hanging sections.

4. A hotplate comprising an elongated metallic sheathed heating element formed into a curve with the two ends of the element adjacent each other at one side of the heater, a plurality of rigidly united radially positioned strips for supporting said heating element in a substantially horizontal operative position, the heating element having a non-circular cross-section with a relatively long dimension in the horizontal direction and a relatively short dimension in the vertical direction, one of said strips being positioned opposite said two ends and having a notch for receiving said heating element, said notch in said one strip having side walls spaced apart sufficiently far to provide for expansion and contraction of said heating element and also having over-hanging sections which prevent substantial displacement of said heating element upwardly from said notch, the over-hanging sections being spaced apart a distance substantially equal to the vertical dimension of said cross-section so that the heating element can be inserted into said notch when it is in a position substantially at right angles to said strip and then is secured in said notch by swinging it into its normal operative position in said strip, and means for rigidly securing the remaining strips to said heating element to prevent relative movement between them.

5. A hotplate comprising an elongated metallic sheathed heating element formed into a curve with its two ends adjacent each other at one side of the heater, a plurality of rigidly united strips substantially equally spaced with reference to each other positioned radially with reference to each other and having notches for receiving said heating element and for supporting it in a substantially horizontal operative position, the heating element having a flattened top wall which is presented above the upper edges of said strips, and having curved side and bottom walls, the horizontal dimension of the cross-section of said heating element being substantially greater than the vertical dimension thereof, one of said strips being positioned opposite said two ends and the notch in said one strip having side walls spaced apart sufficiently far to provide for expansion and contraction of said heating element and also having sections over-hanging the curved side walls of said heating element to prevent substantial displacement of said heating element vertically from said notch, the over-hanging sections being spaced apart a distance substantially equal to the vertical dimension of said cross-section so that the heating element can be inserted in said notch when it is held at right angles to said one strip and then is secured in the notch by swinging it down into its operative position in the strip, and the side walls of the notches in the remaining strips being peened over the parts of the heating element received in them.

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