March 18, 1941. S. S. VINEBERG 2,235,091

HEATING UNIT FOR ELECTRICAL COOKING DEVICES

Filed Sept. 12, 1936

Fig. 1.

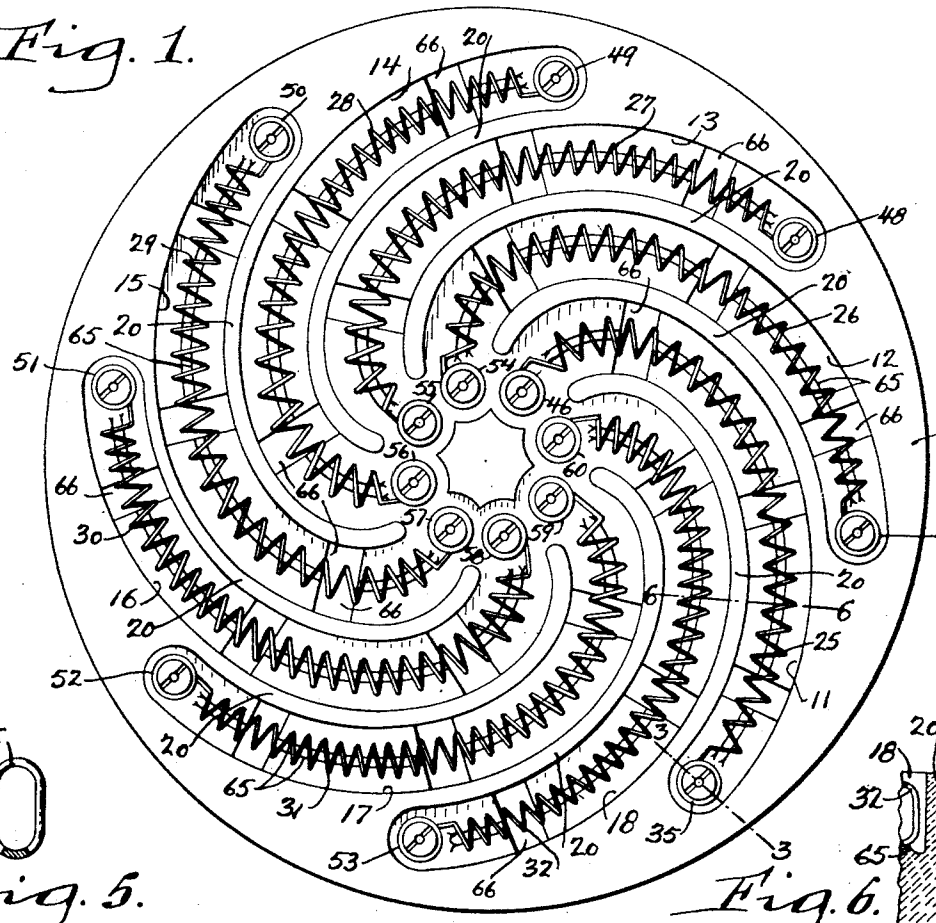


Fig. 5.

Fig. 6.

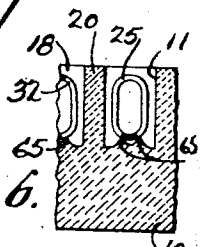


Fig. 2.

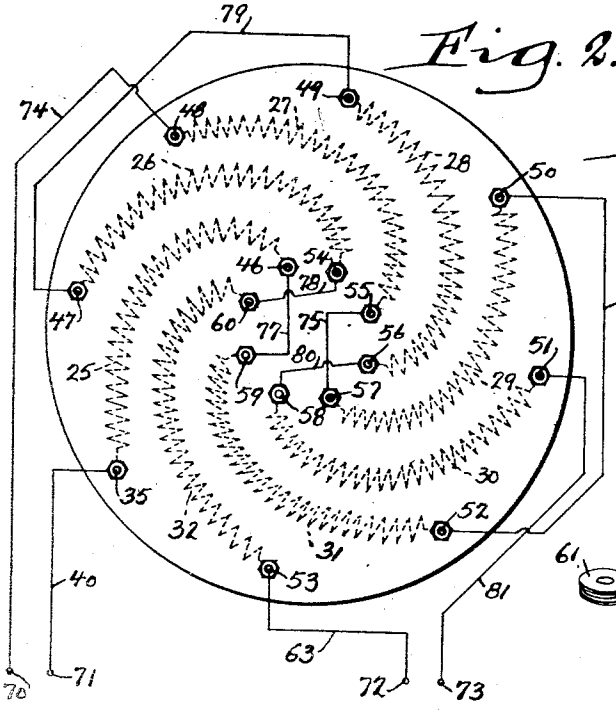


Fig. 3.

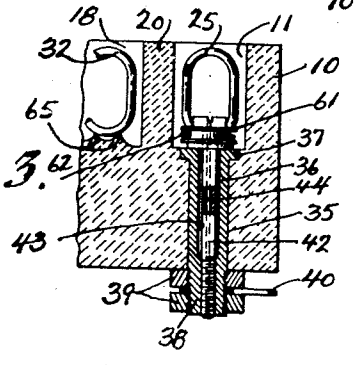
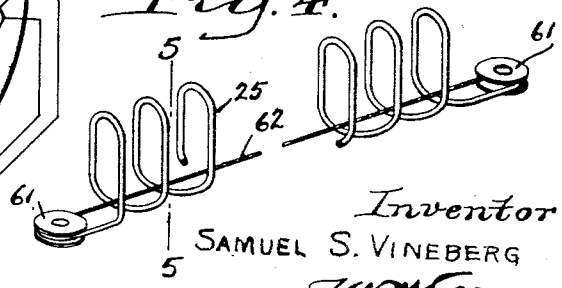


Fig. 4.



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HEATING UNIT FOR ELECTRICAL COOKING DEVICES

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2 Claims. (Cl. 201—63)

My invention relates in general to heating units, and more particularly to that type of unit used in connection with electrical stoves, and the like.

It is well known to those skilled in the art that the heating elements used in units of the type to which my invention applies are usually made in one or two pieces, of considerable length, and laid in long, continuous grooves of spiral form. In this present day form, the inner ends of the coil extend through suitable apertures near the center of the unit and the outer ends extend through apertures near the periphery of the unit. Each of such inwardly extending ends is secured to suitable terminals located under the unit and, when repairs are to be made, it is necessary to remove the entire unit from the stove before a new coil can be inserted. Furthermore, such coils must be threaded into the grooves and usually beneath retaining lugs and, unless great care is exercised, even by an experienced workman, the coil is easily stretched or otherwise mutilated during such threading process. Furthermore, when the heating element is in one continuous length, and one portion thereof becomes burned out, the entire element must be discarded and replaced by a new one.

The general objects of my invention have been to overcome the disadvantages above pointed out.

Another principal object has been to provide a heating unit having a heating element made up of a number of relatively short segments instead of a relatively long, continuous coil.

Another object has been to provide heating elements having each of their terminals fixed to an eyelet, such an eyelet containing sufficient metal to reduce its electrical resistance to a point where there shall be no danger of its becoming fused or welded to the connecting terminals.

A further object is to provide a plurality of terminal sleeves permanently fixed in the porcelain body of the heating unit, each sleeve being provided with means, accessible from the upper surface of the plate, for receiving a fastening screw to secure the element terminals in place.

Another object has been to provide a heating element having non-expansible means connecting the ends thereof so as to definitely determine the length of the coil when being assembled in the unit, such means being carbonized and thereby removed from the element when the same is first heated.

Furthermore, my unit is so designed that there is less waste on the heating surface than in present day designs, thereby assuring maximum heat transmission at a given temperature.

Moreover, it has been an object to so design the heating elements that all sharp turns in the element shall be eliminated, thereby preventing hot spots in the coil which cause the coil to burn out.

Another object has been to provide the unit with grooves, each so formed at the bottom as to allow circulation of air under the element and also to prevent hot spots in the element caused by the accumulation of liquids or melted solids.

A further object has been to provide heating elements which shall be formed in substantially elliptical shape so as to make possible the use of a greater length of wire for a given wattage, and thereby increase the life of the element, or make possible an increase of wattage of the element in a given space. The use of my element, therefore, makes it possible to minimize the waste surface on the heating unit by reducing the width of the porcelain shoulder between adjacent element grooves, which thereby increases the heat transmission efficiency of the unit as a whole.

Another object of my invention has been to place the elliptically-shaped coils of my elements with their major lateral axes perpendicular to the surface being heated, thereby making it possible to use a maximum amount of wire under a given surface.

The above objects and advantages have been accomplished by the device shown in the accompanying drawing, of which:

Fig. 1 is a plan view of my heating element.

Fig. 2 is a reduced, diagrammatic, bottom, plan view showing the connections between the various coils.

Fig. 3 is a side, fragmentary, sectional elevation taken through the unit on line 3—3 of Fig. 1.

Fig. 4 is a fragmentary, perspective view of one of my complete heating elements.

Fig. 5 is a cross-sectional view of a unit, showing the elliptical form of the coil.

Fig. 6 is a reduced, fragmentary, sectional view of my unit, showing the formation of the bottom of one of the grooves, and is taken on line 6—6 of Fig. 1.

My unit comprises the customary base or plate 10 which is usually of porcelain or like material. Instead of one or two spirally-formed grooves, as is customary in heating units of the present day art, I form in my plate a plurality of short, cam-shaped grooves 11, 12, 13, 14, 15, 16, 17, and 18. As shown in Fig. 1, these grooves are curved in

substantially parallel manner so as to utilize the maximum amount of exposed surface of the plate or base. The grooves are separated by means of a plurality of ridges or separating walls 20 which provide the customary supports for the surfaces being heated. The heating elements of my invention are preferably segmental in form and made up of a plurality of relatively short lengths. Segments 25, 26, 27, 28, 29, 30, 31, and 32 are mounted, respectively, in grooves 11 to 18, inclusive. At each end of each of the grooves there is provided a terminal sleeve each of which, for convenience, will be given separate numbers, the sleeve which is arranged at the outer end of the groove 11 being numbered 35. The sleeve 35, as well as each of the other sleeves, is provided with a body 36 formed with an integral shoulder 37 at the upper end thereof. The body part and shoulder of the sleeve are set into the base 10 with the top surface of the shoulder preferably flush with the bottom of the groove, as shown in Fig. 3. The body of the sleeve or the shoulder thereof may be so formed as to prevent rotations within the base of the unit. The lower end 38 of the body is extended below the bottom surface of the base 10 where it is screwthreaded for the reception of two nuts 39. These nuts provide means for permanently securing the sleeve in place within the base 10 as well as for permanently attaching a lead thereto, as shown by the lead 40 which is connected to the terminal sleeve 35. Each of the sleeves is provided with a centrally arranged and screwthreaded aperture 41 with which a terminal screw 42 is engageable. This screwthreaded aperture is formed at the lower end of the body and is, therefore, located as far as possible from that part of the sleeve which has the highest temperature. The body of the sleeve is preferably provided with a counterbore 43 which is somewhat larger than the diameter of the body of the screw 42. The screw 42 is preferably formed with a central aperture 44 therethrough. The counterbore 43 in the body of the sleeve and the aperture 44 of the screw are formed so as to provide air spaces to aid in keeping the terminal sleeve and screw as cool as possible. As hereinbefore stated, the terminal sleeve 35 is arranged at the outer end of the groove 11.

A similar sleeve 46 is arranged at the inner end of the groove 11. In like manner, the grooves 12 to 18, inclusive, are each provided with outer terminal sleeves 47 to 53, respectively, and with inner terminal sleeves 54 to 60 respectively. As shown in the drawing, my device, therefore, may comprise eight segmental heating elements, thereby dividing the single heating elements of the present art, which are usually approximately thirty-six inches in length, into a number of short, segmental elements. Each of these segmental elements can be easily installed and, when burned out, replaced irrespective of the others. Each of these elements, as shown in Fig. 4 comprises a coil of resistance wire preferably wound in substantially elliptical form, as shown also in Fig. 5, having each of its ends permanently attached to an eylet 61. These eyelets are so designed and proportioned that the resistance offered to the passage of the current will not heat them sufficiently so as to cause fusing or welding thereof to the terminal sleeve. They are preferably grooved, as shown in Figs. 3 and 4, and the engaging end of the element is securely wound about or otherwise fastened to the eyelet so as to become a permanent part thereof. The eyelet, as shown in Fig. 3, is clamped in position on top of the respective terminal sleeve by means of a terminal screw 42. By making the coil elliptical in cross-section, it is possible to increase the wattage of an element on a surface heating unit without increasing the area of the surface under the cooking utensil. This is because each turn of the coil of my element, due to its substantially elliptical form, is of greater length than the customary cylindrical form of coil for a given width of groove and, therefore, the total length of my element will be greater than the ordinary cylindrical coil for a given length of element and pitch of winding. This makes it possible to use a larger gauge wire in my element because of such increased length of wire, thereby bringing the emissivity rate within predetermined, safe limits. By reason of the elliptical form of my element, it may be designed to consume the same wattage as the present day units of finer wire, but the resistance of the wire of my new element will naturally be less than that of an element made of finer wire. The larger wire, therefore, reduces the burning temperature and emissivity rate, and thereby the life of the element is increased.

Therefore, owing to the use of an element of elliptical cross-section, placed as shown in the drawing, having its major, lateral axis perpendicular to the surface being heated, I can employ larger gauge element wire which permits the winding of element coils having greater width, thereby reducing the length of the element and consequently the length of the insulating ridges between adjacent elements. Since the top faces of the ridges are waste surfaces, from the standpoint of heat transmission, it is obvious that by reducing this waste area I can, as a result of my invention, increase the exposed space above the heating elements for heat transmission to the surface being heated. Therefore, by means of my invention I may either increase the capacity of the unit or reduce its burning temperature. Each of the segmental elements is provided with a cord 62 of cotton or other suitable material which will not stretch and which is, therefore, length-confining when in place, thereby definitely spacing the two eylets 61 of each heating element. This prevents the stretching of the coil beyond its normal length, and thereby makes it possible for any one, even though unskilled, to properly place the element in position. Obviously, the material used in the cord is such that when the element is first heated, it will carbonize and thereby remove itself from the element.

As shown in Fig. 6, the bottom of each of the grooves 11 to 18, respectively, is provided with two upstanding, interspaced ridges 65. These ridges are preferably V-shaped in form, thereby providing line contact with the bottoms of the heating elements, and thus holding the elements in spaced relation with the bottoms of the grooves and thereby allowing air to circulate under the coil. This is particularly valuable when water or other liquids have boiled over a cooking utensil or have been accidentally dropped upon the heating unit. This construction thus obviates the hot spots which are occasioned by the presence of such liquids in the bottoms of the grooves of the ordinary, present-day units. A number of holes 66 are preferably provided through the base 10, terminating in the bottoms of the grooves, through which such liquid may be drained.

In Fig. 2, I have shown a preferable arrangement of heating elements whereby either the entire number may be heated or only every

alternate one. I show four contact points 70, 71, 72, and 73. These contact points are supplied with current from a suitable source through a switch by which only a number of the coils may be heated, or all of them heated. This switch is a standard article of manufacture and is, therefore, not shown or described. The contact points 70 and 71 are designed to energize one group of segmental heating elements, and contact points 72 and 73 are designed to energize the other group of heating elements, each group of elements being preferably formed by alternately arranged elements. Contact point 70 is connected to the outer terminal sleeve 48 by means of a lead 74. Current is conducted from this terminal through the heating element 27 to the inner terminal sleeve 55. This terminal sleeve is connected to the inner terminal sleeve 57 by means of a lead 75. From terminal sleeve 57, the current is conducted through heating element 29 to the outer terminal sleeve 50 of that element. This last mentioned sleeve is connected to the outer sleeve 52 by means of lead 76. Current will flow from sleeve 52 through element 31 to the inner sleeve 59, which is connected to the inner sleeve 46 of the element 25 by means of a lead 77. Current passes from terminal sleeve 46 through the heating element 25 to the outer terminal sleeve 35 and thence through lead 40 to the terminal 71. Thus when current is applied across the terminals 70 and 71, heating elements 27, 29, 31, and 25 will be energized and heated. Terminal 72 is, in like manner, connected to the outside terminal sleeve 53 by means of a terminal 63 and current, when applied to said terminal, passes through the element 32 to the inner terminal sleeve 60 of that element. Sleeve 60 is connected to the sleeve 54 at the inner end of the element 26 by means of a lead 78. The sleeve 47 at the outside of the element 26 is connected to the sleeve 49 at the outside of the element 28 by means of a lead 79. The inner sleeve 56 of the element 28 is connected to the inner sleeve 58 of element 30 by means of a lead 80. The outer lead 51 of element 30 is connected to the lead 73 by means of a lead 81. Obviously, current applied across leads 72 and 73 will cause heating elements 32, 26, 28, and 30, to be energized and heated. It is also obvious that when current is applied across both groups of terminals 70 and 71, and 72 and 73, all of the heating elements will be energized and the unit will be giving its maximum heat.

As hereinbefore stated, each of the segmental heating elements is secured in place by means of two terminal screws 42. Each of these screws passes through the eyelet 61 at each end of the element and through the counterbore 43 of the terminal sleeve and into the screwthreaded opening 41 at the bottom thereof. The proportions of the terminal sleeve and the terminal screws 42, as well as the eyelets 61, as hereinbefore pointed out, are such that the electrical resistance offered by them to the current passing therethrough will not be sufficient to cause them to become heated and thus oxidize or burn the parts. They are so proportioned that they remain relatively cool, with the result that a good connection between the eyelets and the terminal sleeve is always assured. Each of the terminal screws is, of course, provided with a head which is accessible from the top side of the heating unit. When the screws are released, the element is completely detached from the unit and may, therefore, be easily removed. When a burned out element is to be replaced by a new element, the new element with its spacing cord 62 is placed in the groove and the terminal screws 42 are passed through the eyelets 61 of the new element and into the respective terminal sleeves, thereby securing the element in place. It will be obvious that all the connections just above described between the outer and inner terminal sleeves are of a permanent nature and the leads are secured to their respective terminals by means of one of the nuts 39 provided on the lower end of each of the terminal sleeves. These nuts are all located on the bottom of the unit where they are concealed and since such connections are permanent they are not touched when any of the heating elements of my unit are to be replaced.

While I have shown and described a segmental element provided with eyelets 61 and a non-stretching cord 62, which element is securable from the top of the unit, it is obvious that these novel features are also applicable to a heating element of the usual single-piece length of either circular or substantially elliptical cross-section. Furthermore, the terminal means carried by the base, instead of being in the form of a sleeve with a cooperating screw, as shown, may be replaced by a stud having an upstanding screw portion disposed in the groove for the reception of the eyelet of the element and a nut provided for securing the same in place. Also, while I have shown a terminal screw having but one slot in the head, it is obvious that a number of diametrically arranged and spaced slots may be formed therein to provide for a greater amount of radiation of heat from the screw head, the thickness of the head may also be increased to increase the surface presented to the air. These and other modifications of the details herein shown and described may be made without departing from the spirit of my invention or the scope of the appended claims, and I do not, therefore, wish to be limited to the exact embodiment herein shown and described, the form shown being merely a preferred embodiment thereof.

Having thus described my invention, what I claim is:

1. A replaceable heating element adapted to be flexed for insertion in an open facial groove of an electric heating unit, comprising as an entirety an open, coreless coil of resistance wire adapted to be flexed upon insertion, and a single, flexible combustible cord in the coil reduceable to ash upon initial heating of the said coil and being anchored only at its opposite ends to the ends of the coil for limiting the maximum distortion of the latter prior to placement in the heating unit, said cord passing unattached through the coil for permitting universal flexing of the coil to conform the latter to a groove in an associated heating unit.

2. A replaceable heating element adapted for insertion in an open facial groove in the body plate of an electric heating unit, comprising as an entirety an open, coreless coil of resistance wire flexible throughout and subject to being stretched from end to end, said element being of substantially elliptical cross-section and adapted to be so positioned with respect to the body plate of an associated heating unit as to have its major axis perpendicular to said surface, an anchoring eyelet at each end of the coil

and near the base thereof, each eyelet having its axis arranged substantially parallel to the major axis of the ellipse, a flexible cord passing unattached through the coil and secured at its ends only to said anchoring eyelets, said cord being reduceable to ash upon initial heating of the coil, and positioning and anchoring means passing through the eyelets for fastening the element in an associated heating unit in predetermined position.

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