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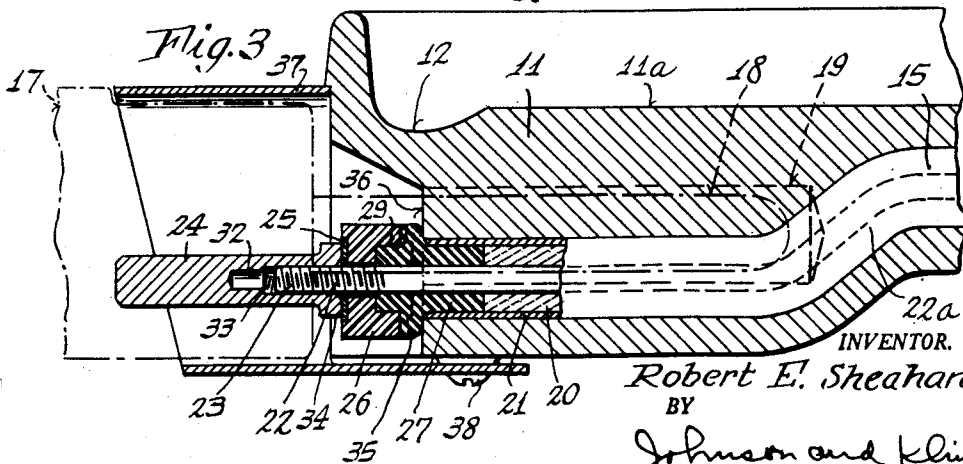
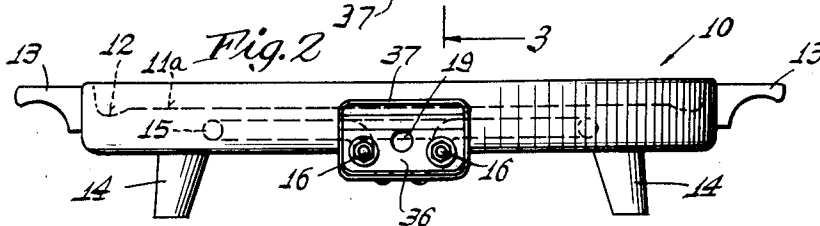
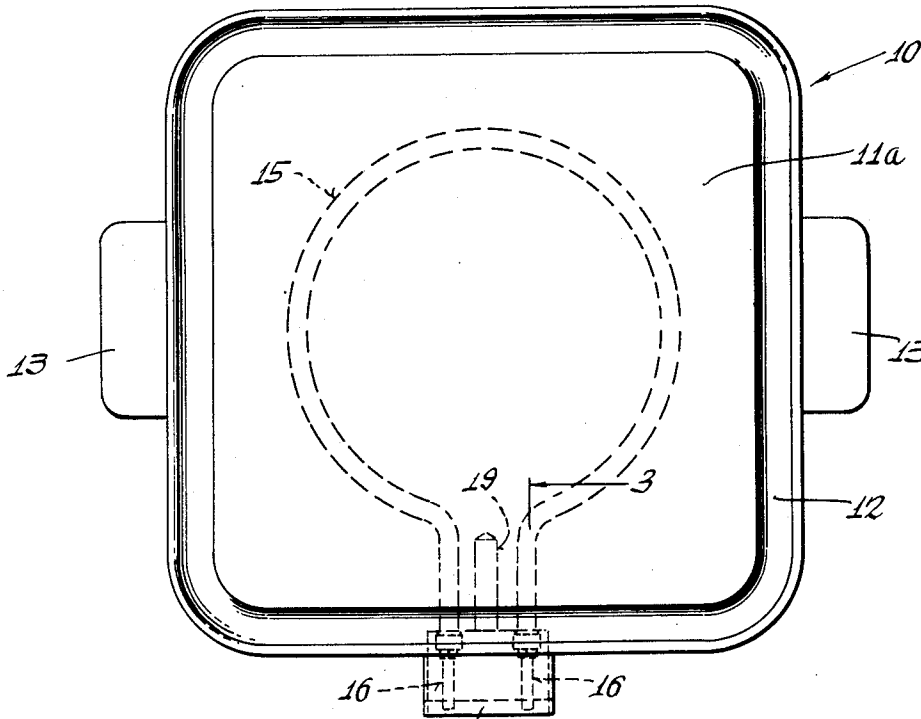
2,914,650

ELECTRICAL TERMINAL FOR A HEATING ELEMENT

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2 Sheets-Sheet 1

Fig. 1



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1

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ELECTRICAL TERMINAL FOR A HEATING ELEMENT

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The present invention is an improvement in an electrical terminal for a heating element of the type having a tubular sheath and more particularly to such a heating element which is embedded in the metal body of a cooking utensil.

An object of the present invention is to provide an electrical terminal which is fastened to an end of a heating element to form a seal therewith that is impervious to moisture and other corrosive elements to protect the heating element from such elements.

Another object of the present invention is to provide a utensil with a sheathed heating element embedded therein, in which the sheath is formed of an economical through corrodible material, and in which the terminal connection and/or the metal body protects the sheath from corroding elements.

A further object is to provide an electrical terminal for a heating element having a sheath in which a moistureproof seal for the heating element is produced solely by mechanical interaction, without the necessity of applying heat or the use of fusible sealing materials.

Another object of the present invention is to provide an electrical terminal for the above disclosed type of heating element in which there are relatively few parts, which is well adapted for the purposes intended, and is economical to manufacture.

A feature of the present invention resides in providing an elongated tubular seal or plug which is substantially heat resistant and resiliently deformable. A terminal pin is utilized to axially compress the plug and cause a radial or lateral expansion thereof to effectuate a seal for the heating element. This seal may be between the sheath and the plug as in one embodiment or between a cavity formed in the metal body of the cooking utensil and the plug as in another embodiment. The lateral expansion, moreover, is utilized to form a seal with the metal body adjacent the exposed end of the tubular sheath to protect the sheath from being attacked by the atmosphere, moisture, etc.

A further feature is that in both embodiments, the sheath is substantially flush with or recessed below the adjacent surface of the cooking utensil thereby providing a stronger terminal that is more resistant to mechanical breakage, and there is no exposed length of sheath which might corrode and cause electrical short circuits.

Other features and advantages will hereinafter appear. In the drawing:

Figure 1 is a plan view of the present invention as employed in an electric cooking grill.

Fig. 2 is an elevation thereof.

Fig. 3 is a section taken on the line 3-3 of Fig. 1, somewhat enlarged.

Fig. 4 is an exploded view of the elements comprising the terminal.

Fig. 5 is an end view of an insulating bushing.

Fig. 6 is another embodiment of the present invention.

Referring to the drawing, an electric grill is generally

2

indicated by the reference numeral 10, and has a unitary metal body 11 providing a flat cooking surface 11a and a grease groove 12. Handles 13 and legs 14 are attached to the body. The body is preferably formed of cast aluminum and during the casting operation a heating element 15 is embedded therein. While the invention is specifically disclosed as applied to a grill, it is only for the purpose of illustration since it is equally applicable to other electric utensils such as frying pans, skillets, Dutch ovens, etc.

In order to provide for heating the grill by passing electricity through the heating element 15, the ends thereof are connected to terminals 16, which in turn are adapted to be detachably connected to a female control plug 17, the latter being shown in dotted lines of Fig. 3. Electricity can thus be conducted from the plug 17 through one terminal 16, through the heating coil 15 to the other terminal 16, and back to the plug 17. The control plug 17 preferably contains a thermostatic switch (not shown), which is actuated by a temperature sensing rod 18 that is positioned in an aperture 19 formed in the body 11 between the two terminals 16 of the grill 10.

The heating coil 15, in the specific embodiment disclosed, consists of a helical wound length of resistance wire (not shown), which is embedded in a compacted mass of refractory insulating material 20 such as magnesium oxide, and is encased by a tubular metal sheath 21. The sheath has in the embodiment disclosed an annular cross section through an oval cross-sectional shape may be employed if desired. Since the heating element is embedded in the grill 10 during the casting operation, the sheath has to be formed of metallic material that is able to withstand the temperature of the molten aluminum without melting or being deformed and yet be economical. Accordingly, the sheath is formed of iron or steel, generally.

However, such material rusts when exposed to the atmosphere or moisture but the present invention provides for no portion of the sheath to be exposed. The end of the heating coil terminates in a terminal lead 22 which extends out from the sheath and has a provided threaded end portion 23. The terminal lead is a solid rod of iron or steel which is also corrodible and the terminal means is fastened thereon and serves to seal the lead from moisture, etc. As shown in Fig. 3, the lead 22 has a reversely bent portion 22a which increases the resistance to the lead 22 being pulled out from the sheath 21.

Referring to Fig. 4 the terminal means comprises a terminal pin 24, a washer 25, a bushing 26 and a tubular cylindrical plug 27. The plug 27 is preferably formed from a resiliently deformable material which can withstand cooking temperatures without deterioration and thus is made from silicone rubber. The bushing 26 is preferably made from incompressible molded ceramic having dielectric properties, and has formed therein on one face a circular recess 28 and on the other face a circular hole 29 both in alignment with a through aperture 30. Radial grooves 31 are formed in the face of the bushing in which the hole 29 is located for reasons to be later set forth. The washer 25 is formed from a heat resistant cold flow material such as tetrafluoroethylene, commonly known to the trade as "Teflon." The terminal pin 24 is preferably formed from nickel plated brass and has an internal bore 32 which is threaded as at 33, and a hexagonal head 34.

In assembling the device as shown in Fig. 3, the insulating material 20 is removed from the end portion of the sheath and the plug 27, the bushing 26 and the washer 25, in that order are threaded on the lead 22 such that portions of the plug 27 are inside the sheath

3

and inside the recess 29 and the washer 25 snugly fits within the recess 28. The pin 24 is then screwed onto the lead 22 and continued turning of the pin 24 causes compression of the plug 27 such that a mechanical seal is effected between the interior of the sheath 21 and the plug by reason of the lateral expansion of the portion of the plug within the sheath. Also the lateral expansion of the plug between the bushing 26 and the end of the sheath 21 creates a flange 35. This flange is utilized to seal the only exposed portion of the sheath namely the end thereof as the sheath terminates flush with the surface of the metal body. In addition, portions of the plug fill up the grooves 31 and prevent rotation of the plug and bushing during assembling and thereafter. The washer 25 is also compressed and tends to flow around the threads 23 and 33 to form a seal between the pin 24 and bushing 26 to prevent corrosion of the terminal lead from occurring. In addition, forming the washer 25 from a cold flow material such as "Teflon" decreases the friction between the pin 24 and the washer as it is threaded onto the lead 22. The pin is preferably locked in position by pinching the flats of the hexagonal head 34.

By reason of the above structure it will be perceived that a terminal which is moistureproof has been provided by the mere compression of the elements caused by threading a terminal pin onto the projecting lead of the heating element. In addition, the utilization of the ceramic bushing 26 provides a long leakage path from the terminal pin 24 to the grill 10 which even when the terminal is wet, which may occur after the grill has been washed, limits the amount of leakage current to a safe value. The terminal of the present invention is more capable of withstanding blows or forces against it than in prior terminals by reason of the sheath terminating flush with a surface 36 of the body 11 and the close proximity (about $\frac{1}{16}$ of an inch) of the bushing 26 to the surface with bulge 35 therebetween. Thus the sheath cannot be bent without bending the body and any deflection of the pin 24 caused by blows etc. is limited by the bulge 35 and by the bushing 26 and the surface 36. Accordingly, if there is any breaking of the elements caused by severe blows to the pin, the bushing 26 will break rather than the heating element sheath end being damaged. Replacement of the bushing 26 is easily accomplished while if the heating element is damaged, the grill is substantially irreparable. A shield 37 is provided to enclose the terminals 16 and is held as by a screw 38 to the grill 10 to protect the terminals 16.

Referring to Fig. 6 it will be seen that this embodiment differs from that previously described, in that rather than having the end of the sheath flush with the surface 36, it is recessed within. The terminal lead 22 extends out from a cavity 39 formed in the grill and a portion of the plug fits within this cavity to form a seal with the walls thereof. Thus in both embodiments there is a cavity formed in the body through which the lead 22 projects, the cavity side walls in one embodiment being the sheath and in the other being the body itself.

In the foregoing, there has been disclosed a terminal seal for a heating element of a cooking utensil in which mechanical pressure is utilized to form a seal to prevent corrosion to both the heating element and the sheath thereof. The terminal is economical to manufacture, easily assembled, and has increased capability for withstanding blows or deflecting forces without being damaged. In addition a severe blow only causes damaging of a small, easily replaced element rather than irreparably damaging the grill.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

I claim:

1. An electric cooking utensil having a metal body in which is embodied a sheathed heating element having a terminal lead extending beyond the exterior of the body

4

through an open cavity in the body for connection to a terminal contact pin with the sheath terminating at least flush with the exterior of the body adjacent the cavity with no portion of the sheath protruding beyond the exterior of the body: the improvement which comprises terminal means for creating a moistureproof seal with and between the terminal lead and the wall margin of the cavity of the body, said terminal means comprising a resiliently deformable tubular plug through which said terminal extends, said plug having an end portion fitting and located in said cavity; a bushing having an aperture through which said terminal lead extends, said bushing having an end provided with a recess within which the other end portion of the plug is fitted and positioned; and a terminal contact fastened to the end of said lead, said plug being under axial compression between the bushing and the body to cause radial expansion thereof forming a moisture-tight seal with the walls of the cavity, the portion of the plug between the bushing and the body bulging laterally to form a flange providing a moisture-tight seal between the exterior surface around the cavity and the end of the bushing, said resiliently deformable tubular plug being formed of insulating material and electrically insulating said terminal lead from said body in the vicinity of said cavity.

2. The invention as defined in claim 1 in which the sheath terminates substantially flush with the exterior surface of the body with no portion of the sheath protruding beyond the exterior of the body and the plug fits within the sheath; and in which the flange overlies the end of the sheath.

3. In an electrical cooking utensil having a metal body in which is embedded a sheathed electric heating element having a resistance wire provided with a threaded end portion projecting out from and beyond a cavity formed in the body: the improvement which comprises terminal means for the projecting end portion of the wire for forming a moistureproof seal between the terminal means and the body, said terminal means including an internally threaded contact threadable onto the projecting end portion; an annular ceramic bushing positionable between the sheath and the contact and having a circular recess in each of its ends; a flat washer formed of material that is substantially resistant to high temperatures yet capable of cold flow positioned in the recess adjacent the contact; an elongate cylindrical washer formed of cured resiliently deformable material and having one end portion positioned within the other recess of the ceramic bushing and its other end portion adapted to extend within the cavity whereby threading of the contact on the end portion causes cold flowing of the flat washer to effectuate a moistureproof seal between the ceramic bushing and the contact and compresses the elongate washer to effectuate a moistureproof seal between the ceramic bushing and the walls of the cavity.

4. The invention as defined in claim 3 in which the side face of the ceramic bushing adjacent the elongate washer is formed with a radial slot into which a portion of the washer enters upon compression to prevent turning of the elongate washer with respect to the bushing.

5. In an electrical cooking utensil having a metal body in which is embedded a sheathed electric heating element having a resistance wire provided with a threaded end portion projecting beyond the sheath and the body; said sheath being formed of oxidizable material and having an end substantially flush with an adjacent portion of the utensil: the improvement which comprises terminal means for the projecting end portion of the wire for forming a moistureproof seal, said terminal means including an internally threaded metal contact threadable onto the projecting end portion; an annular ceramic bushing positionable between the sheath and the contact and having a circular recess on each of its side faces; a flat washer formed of material that is substantially re-

5

sistant to high temperatures yet capable of cold flow positioned in the recess adjacent the contact; an elongate cylindrical plug formed of resiliently deformable material having one end portion positioned within the other recess of the ceramic bushing and its other end portion adapted to extend within the sheath whereby threading of the contact on the end portion causes cold flowing of the flat washer to effectuate a moistureproof seal between the ceramic washer and the contact and compresses and bulges the elongate plug to effectuate a moistureproof seal between the ceramic washer and the interior of the sheath and in which the bulge is compressible against the end portion of the sheath and against the adjacent portion of the utensil body material to provide a seal for the end of the sheath.

6. The invention as defined in claim 5 in which the side surface of the ceramic bushing positionable adjacent the sheath is spaced from the wall of the utensil by the thickness of the bulge whereby any movement of terminal means is limited by the bushing abutting the wall.

7. An electric cooking utensil having a metal body in which is embodied a sheathed heating element having a terminal lead extending beyond the exterior of the body through an open cavity in the body for connection to a terminal contact pin: the improvement which comprises terminal means for creating a moistureproof seal with and between the terminal lead and the wall margin of the cavity of the body, said terminal means comprising a resiliently deformable tubular plug through which said terminal extends, said plug having an end portion fitting and located in said cavity; a bushing having an aperture through which said terminal lead extends, said bushing having an end provided with a recess within which the other end portion of the plug is fitted and positioned; and a terminal contact fastened to the end of said lead, said plug being under axial compression between the bushing and the body to cause radial expansion thereof forming a moisture-tight seal with the walls of the cavity, the portion of the plug between the bushing and the body bulging laterally to form a flange providing a moisture-tight seal between the surface of the body around the cavity and the end of the bushing, said resiliently deformable tubular plug being formed of insulating material and electrically insulating said terminal lead from said body in the vicinity of said cavity, and in

6

which the sheath terminates short of the exterior surface of the body adjacent the cavity.

8. An electric cooking utensil having a metal body in which is embodied a sheathed heating element having a terminal lead extending beyond the exterior of the body through an open cavity in the body for connection to a terminal contact pin: the improvement which comprises terminal means for creating a moistureproof seal with and between the terminal lead and the wall margin of the cavity of the body, said terminal means comprising a resiliently deformable tubular plug through which said terminal extends, said plug having an end portion fitting and located in said cavity; a bushing having an aperture through which said terminal lead extends, said bushing having an end provided with a recess within which the other end portion of the plug is fitted and positioned; and a terminal contact fastened to the end of said lead, said plug being under axial compression between the bushing and the body to cause radial expansion thereof forming a moisture-tight seal with the walls of the cavity, the portion of the plug between the bushing and the body bulging laterally to form a flange providing a moisture-tight seal between the surface of the body around the cavity and the end of the bushing, said resiliently deformable tubular plug being formed of insulating material and electrically insulating said terminal lead from said body in the vicinity of said cavity, and in which the bushing has a recess formed in its other end and a washer of heat resistant, deformable material is positioned therein whereby a seal between the contact and the bushing is effectuated.

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