March 19, 1929. E. L. WIEGAND 1,706,017

ELECTRIC HEATING DEVICE

Original Filed Nov. 24, 1925

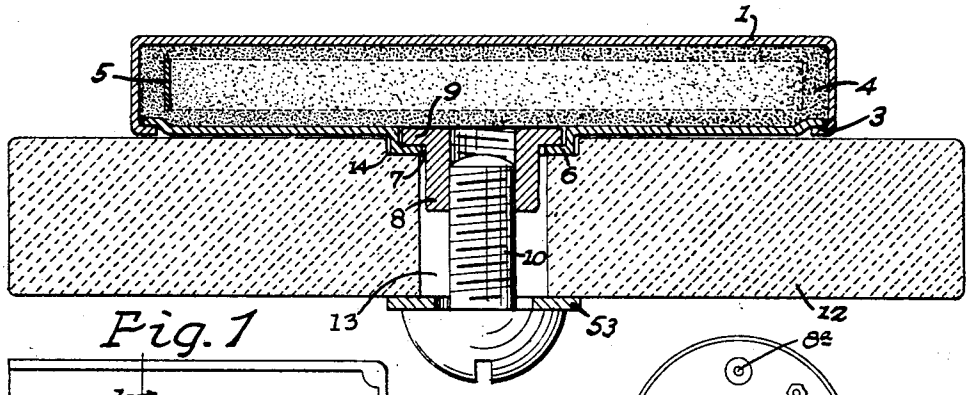


Fig. 1

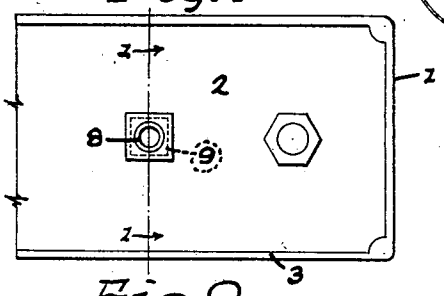


Fig. 2

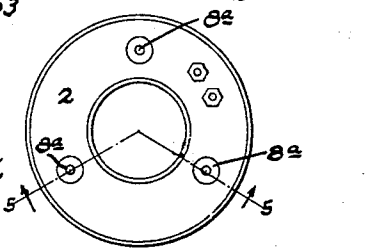


Fig. 4

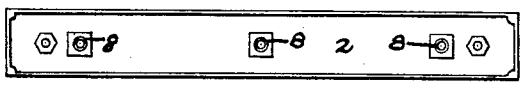


Fig. 3

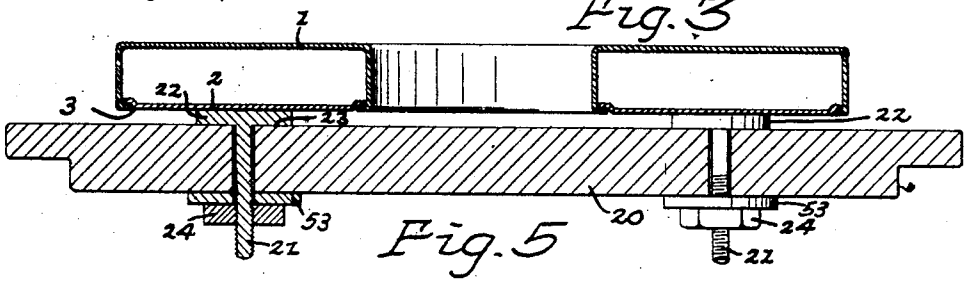


Fig. 5

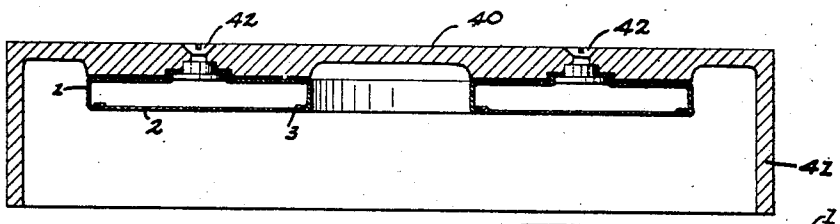


Fig. 7

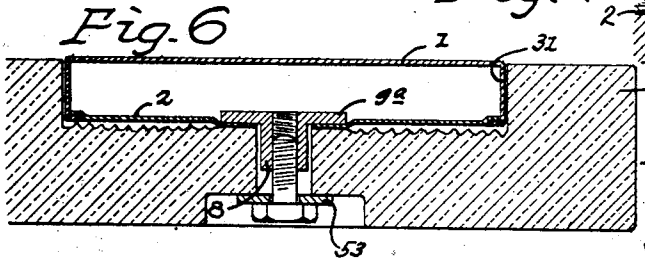


Fig. 6

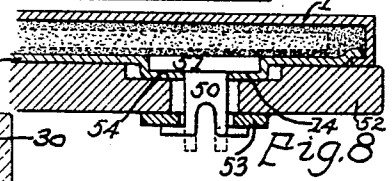


Fig. 8

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UNITED STATES PATENT OFFICE.

EDWIN L. WIEGAND, OF DORMONT, PENNSYLVANIA, ASSIGNOR TO EDWIN L. WIEGAND COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

ELECTRIC HEATING DEVICE.

Application filed November 24, 1925, Serial No. 71,071. Renewed January 21, 1929.

This invention relates to electric heating devices and has for its object the provision of improved securing means for the peculiar sheathed elements which comprise the electrical portions thereof, which shall hold the elements tightly to the supporting member but without danger of disarranging the parts of the element or puncturing the sheath, and which shall lend itself to economy of heat.

In my prior applications Serial Nos. 660,294, 697,446 and 743,663 filed respectively August 31, 1923, March 7, 1924, and October 15, 1924, I have disclosed certain new and very valuable electric heating units consisting of wire resistance elements submerged in refractory insulating material which in turn is closely embedded in a flat faced metal sheath. This sheath is made of a metal which will withstand the working temperature desired and is generally made leak tight to prevent the ingress of water, grease, or other decomposable and electrically conducting substances, and is generally made rather thin in one dimension although its shape varies greatly according to the use desired, being straight or curved, long or short, broad or narrow, annular, serpentine, disk-like, or polygonal at pleasure. It is important, however, that means be provided whereby these can be secured to a support or applied to the working surface by means which shall not injure the insulation or draw the sheath away therefrom. Obviously nothing ought to pass through the body of the unit since it would tend to create leakage and would require special arrangement of the resistance unit to prevent short circuiting; while provision should be made for expansion and contraction in the plane of the device.

In the drawings accompanying and forming a part of this application I have shown certain physical forms in which my inventive idea can be embodied although it will be understood that these are intended to be merely illustrative of the general principles of my invention and the specific construction may vary considerably without departing therefrom. Fig. 1 is a sectional view of a unit and its support corresponding to the line 1—1 of Fig. 2 and drawn to heroic scale; Fig. 2 is a bottom plan view of the portion of one of my improved heating units adjacent one end; Figs. 3 and 4 are bottom plan views of two widely dissimilar shapes of units equipped with my invention; Fig. 5 illustrates a ring unit attached to a stove lid by my invention, the section of the unit corresponding to the line 5—5 in Fig. 4; Fig. 6 shows another form of unit and support; Fig. 7 shows a heating unit fastened by way of its heating face; and Fig. 8 is a sectional view of another modification.

My improved heating units consist essentially of thin walled metal members 1 and 2 seamed together longitudinally at 3 and tightly embracing the insulating material 4 in which the resistance element 5 is submerged. These members are preferably made oblong in cross section and thin relatively to their width so that the heat evolved in the resistance element may reach the object to be heated with a minimum of impediment, and for the same reason I prefer to use the least practicable thickness of insulating material between the resistance element and the sheath.

In order to secure such a unit to a support I preferably secure to one face thereof a shanked member which is also provided with a shoulder so disposed as to engage the support in advance of any other part of the unit. In Figs. 1 and 2 I have shown the member 2 as embossed at 6 about an aperture 7, the aperture receiving the shank 8 and the embossed recess receiving the head 9 of the fastening member, this head being here made polygonal so as not to turn. (See Fig. 2.) In this way the head is located inside the sheath while the embossing serves the double function of affording room for the head without touching the unit 5 and of preventing the head from turning. The shank 8 is here shown as hollow and internally threaded for reception of a screw 10 although it can be externally threaded as shown in Fig. 5 if desired, and in Fig. 8 I have shown the shank as constituting part of a rivet.

In Fig. 1 I have shown the unit as fastened to a heat insulating slab 12 such as soapstone, the same having an aperture 13 for the shank 8, and a shallow counterbore 14 surrounding said aperture where it traverses the receiving face 15. Care should be taken that this recess,

when used, be sufficiently shallow that the face of the boss 6 may engage the bottom thereof before any other part of the unit touches the face 15 lest the sheath (which is generally made of sheet metal) be drawn away from the insulation. My invention is equally present in case the recess is omitted as shown in Fig. 5.

I have chosen for illustration in Fig. 1 a straight strip unit as illustrated in Figs. 2 and 3 although the same can be made of any desired shape to and including the complete circle shown in Fig. 4, and the number of fastenings may be as great or as small as desired or as necessitated by the size and weight of the parts. In case of a ring unit, however, I preferably employ three fastenings, equally spaced as shown in Fig. 4.

In Fig. 5 I have shown such a ring unit as carried by a metal plate 20. I have here shown the fastenings as externally threaded bolts 21 having their heads 22 welded or brazed to the outer face of the member 2 but provided with shoulders 23 to take the strain of the nuts 24. It will be understood that this welding or brazing can be employed only in cases wherein the working temperature is restrained to a suitable point, either by a suitable restriction upon the rate of heat generation or a suitably rapid rate of heat dissipation. The employment of a metal supporting plate 20 in contact therewith is an example, since the heat is conducted away from this part sufficiently rapidly to minimize the danger of separation. In any event it will be understood that the metal of the members 1, 2, and also of the fastening members must be chosen with respect to the temperatures employed.

In Fig. 6 I have shown a support 30 made of ceramic material such as porcelain, having its face recessed for the reception of the entire unit and the bottom of the groove being ribbed or ridged to modify the rate of heat transfer; this device and indeed all the modifications heretofore discussed exhibiting the safety features of my application filed August 24, 1925, Serial No. 51,982.

In Fig. 7 I have shown another modification wherein the fastening member is applied to the working face of the unit instead of to the reverse face. Ordinarily the member 1 is formed of a flat portion bounded by two laterally bent flanges or side walls, the face of the flat portion constituting the working surface, while the member 2 which is seamed to the edges of the side walls is considered the back or bottom as being generally rougher and less capable of making good contact. Ordinarily the unit is best supported from the bottom but it is equally possible to fasten its working face to the members to be heated, as in Fig. 7 where I have shown part of a corn popping machine comprising a circular plate 40 having a marginal skirt 41 and one of my ring units fastened to the plate by screws 42 engaging members carried by the working face.

In Fig. 8 I have shown a modified form of fastening embodying a rivet 50, preferably made of an alloy capable of resisting high temperatures, and having its head 51 received in an embossed recess 14 formed by embossing outwardly the metal sheath. The shank of the rivet is preferably bifurcated to facilitate its securing and the head is preferably large and flat to distribute the pressure of clinching the same so as to minimize disintegration of the refractory. This mode of attachment is especially important in securing my sheathed units to metallic supports such as shown at 52 in Fig. 8, which are generally rather thin in section. Whenever there is any substantial inequality between the expansion of the heating unit and the support the holes 13 and recesses 14 are made of greater width than the fastening members which occupy the same as shown in Figs. 1, 5, 6, and 8, and the fastening device is provided with a flat washer 53 to enable ready sliding of the parts.

It will be understood that a great many other modifications in detail are possible to be made within the scope of my inventive idea and are intended to be covered by my claims.

Having thus described my invention what I claim is:

1. In electric heating devices, in combination, a supporting member, a unit comprising a resistance element surrounded by electrical insulating material and a sheet metal sheath embracing said material, said sheath having substantially flat opposed walls in close contact with such insulating material, and a fastening device secured to one of said walls and projecting outwardly therefrom away from the other wall.

2. In electric heating devices, in combination, a rigid supporting member, a unit comprising a resistance element surrounded by electrical insulating material and a metallic sheath embracing said material, said sheath having substantially flat opposed walls in close contact with such insulating material, and a fastening device secured to one of said walls and projecting outwardly therefrom away from the other wall, said device having an abutment portion adapted to come into tension resisting relation with the supporting member before any other part of said unit contacts said member.

3. In electric heating devices, in combination, a unit comprising a resistance element surrounded by electrical insulating material and a metallic sheath embracing said material, said sheath having substantially flat opposed walls in close contact with such insulating material and said resistance element being distributed substantially uniformly

throughout the entire chamber defined by said sheath, and a straight-shanked fastening device secured to one of the walls of said sheath and projecting away from said resistance element.

4. In electric heating devices, in combination, a unit comprising a resistance element surrounded by electrical insulating material and a metallic sheath embracing said material, said sheath having substantially flat opposed walls in close contact with such insulating material, and a fastening device having a tension resisting shank and an enlarged head, said head being fastened to one of the flat walls of said sheath and said shank projecting away from said unit upon the side which is away from the opposite wall thereof.

5. In electric heating devices, the combination with rigid support for a heating unit, of a heating unit comprising a hollow metal sheath having a pair of substantially flat opposed faces, one of which is located in proximity to said support and an electric resistance element and an electrical insulating substance inside said sheath, said sheath making close contact with said substance, and a fastening device secured to the face of said sheath which is nearest said support, said support being apertured for the reception of said fastening device and said fastening device including means for applying tension thereto, and a shoulder engaging said support for resisting said tension, independently of the stiffness of said sheath.

6. In electric heating devices, the combination with a supporting member of rigid material having a plurality of spaced apertures, of a heating unit comprising a hollow metal sheath having a pair of substantially flat opposed faces and an electric resistance element and an insulating substance inside said sheath, said sheath making close contact with said substance, one face of said sheath located in proximity to the surface of said support, and a plurality of fastening members secured to said last named face and traversing said apertures, said members being of smaller diameter than said apertures.

7. In electric heating devices, in combination, a heating unit comprising a hollow metal sheath having a pair of substantially flat opposed faces, and an electric resistance element and an electrical insulating substance inside said sheath, said sheath being embossed to define a recess between it and such insulating substance and such boss having a hole therein, and a fastening device having a head in said boss and a shank projecting through said hole, said shank adapted to enter a hole in a supporting device.

8. In electric heating devices, the combination with a support, of a hollow metal sheath having a hole in one wall only, a fastening device having a shank traversing said hole and secured to said support and also having a head inside said sheath, refractory electrically insulating material tightly compacted inside said sheath and against said head, and a resistor element submerged in said material and overlying said head, said shank projecting in a direction away from the other wall of said sheath.

9. In electrical heating devices, the combination of an electrically insulated metal sheathed resistor unit, and a bifurcated rivet having its head operatively secured to the metal sheath, the shank of said rivet projecting outwardly of said unit away from said sheath.

10. In electric heating devices, the combination of a sheet metal sheathed resistor unit, and a fastening member having a head and a shank, said head being operatively secured to one wall of said sheath and said shank projecting outwardly of said unit away from that wall of the sheath to which it is secured and adapted to secure said sheath to a support adjacent to that wall to which said head is secured.

11. In electrical heating devices, the combination with a support of an electrically insulated metal sheathed resistor unit in juxtaposition therewith, a fastening member having a head and a shank, said head operatively secured to that wall of the metal sheath which is next to said support and said shank secured to said support so as to secure said resistor unit thereto.

12. In an electrical heating device, the combination of a resistor, a hollow metal sheath enveloping said resistor and spaced therefrom, refractory material of electrically insulating and heat conducting nature filling the space between said resistor and sheath, and a plurality of fastening devices secured to said sheath at spaced points and adapted to fasten the same to a support.

13. In an electrical heating device, the combination with an electric heating unit comprising a resistor, a hollow metal sheath, and electrically insulating material interposed between said resistor and sheath, of a support, and a plurality of fastening devices attached to said units at spaced points and securing the same loosely to said support whereby relative thermal expansion and contraction are permitted.

14. In an electrical heating device, the combination with an electric heating unit comprising a resistor, a hollow metal sheath, and electrically insulating material interposed between said resistor and sheath, of a plurality of metallic fastening devices each having a head and a shank, the heads being fastened to one wall of said sheath at spaced points and the shanks projecting away from said sheath without traversing the same.

15. In an electrical heating device, the combination with an electric heating unit comprising a resistor, a hollow metal sheath, and

electrically insulating material interposed between said resistor and sheath, of a plurality of flexible metal fastening devices each having a head and bifurcated shank, the heads being fastened to one wall of said sheath at spaced points and the shanks projecting away from said sheath without traversing the same.

16. In an electrical heating device, the combination with an electric heating unit comprising a resistor, a hollow metal sheath, and electrically insulating material interposed between said resistor and sheath, of a support adjacent to one face of said sheath and having a plurality of spaced holes therein, a plurality of fastening devices, one for each hole, each of said fastening devices secured to the wall of said sheath adjacent to said support and said support being spaced slightly from said sheath at all points except adjacent to said fastening devices.

17. In an electrical heating device, the combination with an electric heating unit comprising a resistor, a hollow metal sheath, and electrically insulating material interposed between said resistor and sheath, of a support of heat conducting material adjacent to one face of said support having a plurality of holes therein, and fastening devices, one for each hole, secured to the adjacent face of said sheath and engaging said support in sliding relation, said support being spaced from the adjacent wall of said sheath except near said fastening devices.

In testimony whereof I hereunto affix my signature.

EDWIN L. WIEGAND.