Oct. 14, 1958 R. L. HARTMAN 2,856,500

HEATER AND HEATING ELEMENT INSULATOR

Filed Jan. 27, 1956

FIG. 1.

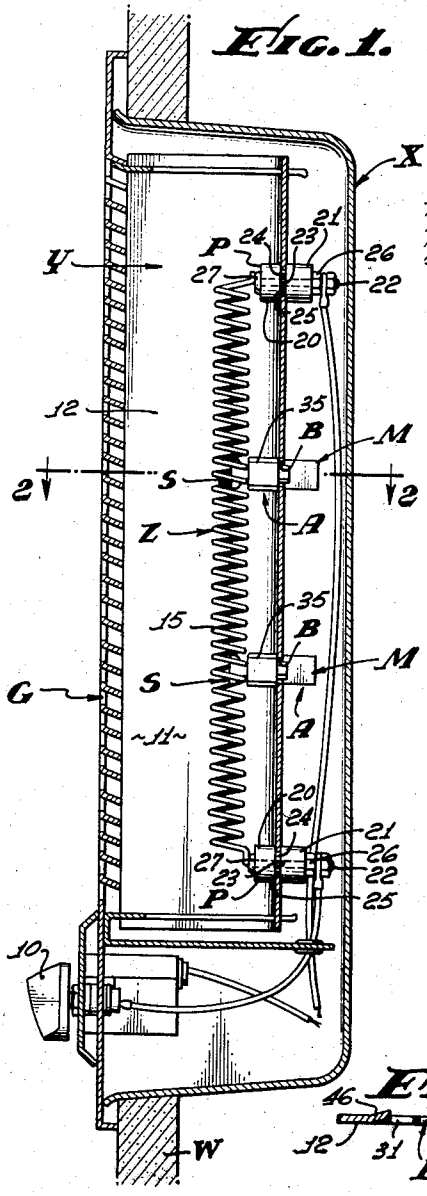


FIG. 2.

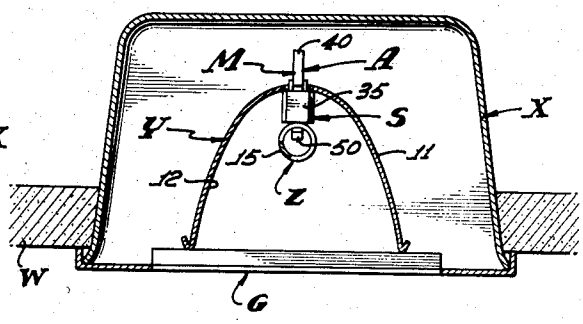


FIG. 3.

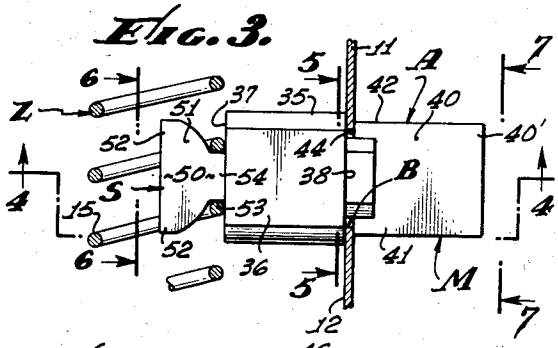


FIG. 4.

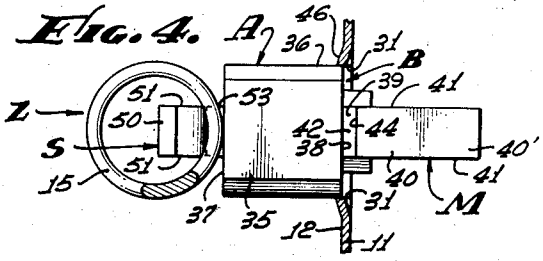


FIG. 5.

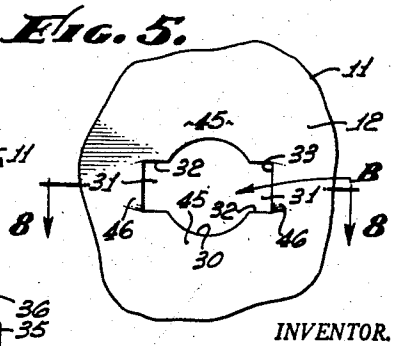


FIG. 8.

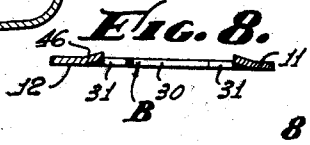


FIG. 6.

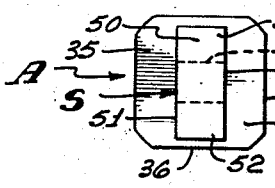
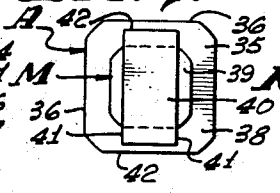


FIG. 7.



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HEATER AND HEATING ELEMENT INSULATOR

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4 Claims. (Cl. 219—19)

This invention has to do with an electrical heater construction and is particularly concerned with a heating element insulator for use in said heater construction. It is a general object of this invention to provide an extremely simple and inexpensive insulator for supporting a heating element or coil and which is strong and durable and dependable in operation.

Electrical heaters, such for example, as wall heaters, employ rather lengthy heating elements or coils. The coils are of selected material that is heated by electrical current passed therethrough. The temperature reached by the coils is rather high, and, therefore, supporting of the coils so that they are properly insulated thermally and electrically becomes a problem. Various means have been provided in the form of posts, but certain disadvantages have prevailed. Such means usually require fasteners of metal accompanied by the danger of short circuits. Such means often involve several parts and they are often difficult to assemble and difficult to insert into operating position. In other words, ordinary insulators are not altogether satisfactory since they involve a multiplicity of parts that require assembly, and since they involve metal parts they are subject to short circuits.

It is an object of this invention to provide a heater construction involving a reflector and insulator that combine to handle a heating element in the form of a coil so that the said element is properly supported and electrically insulated in a position to direct heat is a most advantageous manner.

An object of this invention is to provide an insulator of the character referred to that can be manufactured as a single integral part, so that there are no assembly problems and so that fasteners are eliminated which would otherwise make short circuits possible.

It is another object of this invention to provide an insulator of the character referred to that is keyed into operating position and which supports the coils of a heating element so that the coils are vertically and positively held in spaced relationship with the other parts of the structure.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of my invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a vertical sectional view taken through a heater and showing the insulator that I have provided. Fig. 2 is a transverse sectional view taken as indicated by line 2—2 on Fig. 1. Fig. 3 is an enlarged detailed view of one of the insulators that I have provided and the parts which are directly related thereto. Fig. 4 is a view similar to Fig. 3 and taken as indicated by line 4—4 on Fig. 3. Fig. 5 is an enlarged detailed view of the opening that I have provided to receive the insulator. Figs. 6 and 7 are enlarged end view of the insulator taken as indicated by lines 6—6 and 7—7 on Fig. 3, and Fig. 8 is a view of the opening taken as indicated by line 8—8 on Fig. 5.

The heater involved in the present invention is an electrical heater, the construction of which may vary widely as circumstances require. The heater illustrated is a wall heater comprising a housing X, a reflector Y, and a heating element Z. The housing X is a box-like part closed on all sides except the front thereof by continuous walls of sheet material such as metal. The housing X is an elongate vertically disposed part carried in a wall such as a plaster wall W and the open front is in the plane of the said wall. A suitable grill G is provided to cover and decorate the front of the housing X and in practice the heater is provided with a thermostat or control switch 10 which may be carried in the grill G at the lower end portion thereof, as shown.

The reflector Y is carried in the housing X and as in the case illustrated when the heating element Z is a straight elongate vertically disposed element the reflector Y is an elongate vertically disposed part substantially coextensive with the housing X. As shown in Fig. 2 of the drawings, the reflector Y is arcuate in cross section and is adapted to receive heat radiated from the element Z and to reflect said heat forwardly from the front of the housing. The reflector Y is formed of a single sheet 11 of metal having a concave front face 12 adapted to focus on the element Z and adapted to reflect radiant heat forwardly in the manner desired.

The heating element Z in accordance with the invention is a spring-like coil of resistance wire carried in front of the reflector Y and on a vertically disposed axis parallel with the front face 12 of the reflector. The heating element Z is carried at the focal point of the reflector and is substantially coextensive with the housing X and reflector Y. The element Z is made up of a continuous series of like convolutions 15 that are spread apart somewhat forming a uniform helix. That is, the convolutions 15 are substantially equally spaced.

The ends of the element Z are carried by like terminal posts P that carry the ends of the element and insulate them from the reflector Y. The posts P do not particularly form a part of the present invention and may be of any suitable construction as circumstances require. As shown, the posts P involve an insulating post 20, an insulating cap 21 engaged with the post, and a terminal post 22 extending through the post 20 and cap 21. The post 20 and cap 21 are preferably of ceramic insulating material, the post 20 being carried at the front of the sheet 11 and the terminal post 22 extending or passing through the post and cap and through an opening in the sheet 11.

The post 20 is preferably round in cross section and is characterized by a central bore for passing the terminal post 22. The front end of the post 20 may be flat and in a plane normal to the axis of the parts and the inner end portion of the post 20 is of reduced diameter forming a rearwardly facing shoulder 23 and an extension 24 that projects through the opening in the sheet 11. There is an opening at both the upper and lower ends of the sheet 11 on the center line thereof for receiving the two ports P for supporting the heating element Z.

The insulating cap 21 is also shown round in cross section and is characterized by a central bore for passing the terminal post 22. The front end of the cap 21 is recessed to receive the extension 24 of the post 20 and has a front face 25 for engaging the back side of the sheet 11. The rear end of the cap 21 may be flat and in a plane normal to the axis of the parts.

The terminal post 22 passes through the posts 20 and 21 there being a head 27 at the front end of the terminal post 22 to engage the front end of the post 20. The rear end of the terminal post 22 is threaded and projects from the cap 21. A nut 26 is threaded onto the rear end of the terminal post 22 to secure the ports

together with the head 27 tight against the front end of the post 20. The head 27 receives and is secured to the end convolution 15 of the heating element Z as by welding or the like. It will be apparent that suitable electrical connection is made with the terminal post 22 by electrical leads from the switch 10.

In accordance with the invention, I have provided insulator A for supporting the heating element Z intermediate the terminal posts P. In practice, the heating element Z is mechanically weak especially when heated and requires additional support between the ends thereof. The insulators A that I have provided are located in a series and in line with the posts P one or more insulators being employed as circumstances require. As shown, there may be two insulators A and each is carried in an opening B provided therefor in the sheet 11.

The heating element insulators A act to support and electrically insulate the heating element Z and are adapted to be positioned and carried by the reflector Y to engage and support the convolutions 15 of the element Z. The insulators A are alike and each involves, in general, a mounting means M and an element supporting means S, and is characterized by a single integral body of material having suitable dielectric qualities. In practice, the insulator A is preferably made of fine textured vitreous ceramic material, for example, a magnesium oxide and silicone dioxide ($MgOSiO_2$) and it is molded or otherwise formed in accordance with the best available manufacturing methods.

The mounting means M cooperates with the opening B in the sheet 11 to secure and orient the insulator A in proper working position. In accordance with the invention, the opening B is a key-shaped opening having a round central bore 30 and diametrically opposite and radially projecting notches 31. When the reflector Y is vertically disposed and when the posts P and insulators A are in a vertical series, the notches 31 are in a horizontal plane. The notches 31 have parallel horizontally disposed sides 32 and vertically disposed bottoms 33 and are of sufficient size to receive and freely pass the mounting means M, as hereinafter described.

The insulator A involves a central body portion 35 of substantially the same height as the post 20 of the terminals P, the mounting means M being formed integrally with the rear portion thereof, and the supporting means S being formed integrally with the front portion thereof. The body portion 35 may be of any suitable cross sectional configuration and is preferably square having four equally shaped sides 36. The pairs of sides 36 are parallel and terminate at flat top and bottom ends 37 and 38, respectively. The top and bottom 37 and 38 are in planes normal to the axis of the body and the corners of the body may be beveled or chamfered, as shown.

The mounting means M involves an axially disposed key-like projection 40 that extends rearwardly from the bottom 38 of the body. The projection 40 is polygonal in cross section, preferably rectangular, having spaced parallel sides 41 adapted to clear the sides 32 of the notches 31 and having spaced edges 42 adapted to clear the bottoms 33 of the notches 31. The projection 40 is substantially elongate and involves an extension 40' in order to provide for convenient manipulation of the insulator by tools or the fingers of the person handling the same.

The edges 42 are notches or undercuts at the rear end 38 of the body 35 to present forwardly facing seats 44 spaced axially from and facing the bottom 38. The edges 42 are notched deep enough to clear the bore 30 of the opening B, the projection 40 being of substantially greater lateral extent between the edges 42 than the bore 30. In practice, a central bore 30 projects rearwardly from the end 38 and acts to center the mounting means M in the bore 30. It will be apparent how the projection 40 is passed through the notches 31 and then turned in the bore 30 so that the seats 44 engage the back side of the sheet 11 thereby securing the insulator A in working position.

It is a feature of the present invention to upset the sheet 11, as shown in Fig. 8 of the drawings, at the opening B in order to lock the insulator A in proper rotative position. Portions 45 of the sheet 11 adjacent the top and bottom of the bore 30 are left in the plane of the sheet 11, while a tab 46 is deflected rearwardly from the plane of the sheet 11 at the bottom of one of the notches 31 to the end that a side 36 of the body portion 35 is engaged as shown in Fig. 4 of the drawings. Thus, rotation between the reflector Y and insulator A is eliminated when the insulator is in working position.

The supporting means S for receiving the heating element Z involves an axially disposed projection 50 that extends forwardly from the body 35. The projection 50 is polygonal in cross section, preferably rectangular, having spaced parallel sides 51 adapted to pass between the convolutions 15 of the element Z, and having laterally projecting ears 52 adapted to overlie the convolutions 15. The projection 50 is characterized by a neck portion 53 inwardly of the ears 52 and adjacent the forward end 37 of the body 35. The neck portion 53 is substantially uniform in cross section. That is, the neck is square having parallel edges 54 spaced substantially the same as the sides 51 and spaced to occur between the convolutions without spreading them apart.

As shown, the ears 52 are spaced forwardly from the forward end 37 of the body and project laterally and outwardly to overlie the convolutions 15. The ears 52 are oppositely projecting parts and extend in the plane of the key-like projection 40 at the other end of the body so that when the body 40 is turned to occur in a vertical plane the projection 50 and ears 52 are also turned to occur in a vertical plane. Since the convolutions of the heating element 35 are substantially horizontally disposed, the ears 52 overlie adjacent convolutions thereby securing the heating element in proper relationship to the face 12 of the reflector Y.

From the foregoing, it will be apparent that the insulator of the present invention provides for simple and reliable means for installing and supporting a heating element in proper working position. The insulator that I have provided is made of a single integral body of material, thus eliminating assembly problems and minimizing the time and effort required in order to install the body. Furthermore, no fasteners of any kind are required and the body forming the insulator is of dielectric material with the result that there is no possibility of short circuits which might otherwise occur if metal fasteners were employed in order to hold the parts together in working position.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. An insulator for supporting an elongate heating element having a series of helical convolutions, including, a single body of dielectric material having an elongate body portion, mounting means at one end of the body portion, and an element supporting means at the other end of the body portion, and including, an elongate projection extending from the body portion and freely engageable between adjacent convolutions of the element and laterally projecting ears at the outer end of the projection and adapted to establish hooked engagement with said adjacent convolutions upon rotation of the insulator.

2. An insulator for supporting an elongate heating element having a series of helical convolutions, including, a single body of dielectric material having an elongate body

portion with a plate end adapted to engage the outer periphery of the element, mounting means at one end of the body portion, and an element supporting means at the other end of the body portion, and including a projection extending from the body portion and with a neck freely engageable between adjacent convolutions of the element and with a pair of oppositely disposed ears overlying the inner peripheries of said adjacent convolutions of the element, said ears adapted to be shifted into and out of engagement with said convolutions upon 90° rotation of the insulator.

3. In combination, a supporting element having a wall with front and rear surfaces and an opening therethrough, said opening having a central bore and diametrically disposed notches with straight sides and a flat bottom with forward offset tabs, an elongate electrical heating element having a series of helical convolutions spaced forwardly from said wall, and an insulator for supporting said heating on said wall including, a unitary body of dielectric material having an elongate body portion with flat, front and rear ends and flat table engaging sides, said front end of the body portion adapted to engage the outer periphery of said helical element, said rear end of the body portion adapted to engage the front surface of the wall about the opening therein, a mounting means at the rear end of the body portion and including a flat rectangular projection with flat sides to slidably engage the sides of the notches in the wall and edges to slidably engage the bottoms of the notches in the walls, forwardly disposed seats on the projection spaced from and opposing the rear end of the body and engageable with the rear surface of the wall adjacent the bore of the opening therein when the insulator is rotated on the projection and is out of register with the notches, a supporting means at the front end of the body portion and including a second projection extending forwardly from the body portion with a neck of reduced diametric extent freely engageable between adjacent convolutions of the element and a pair of diametrically opposed and laterally outwardly projecting ears spaced from the front end of said body portion and adapted to overlie the inner peripheries of adjacent convolutions of the element when the insulator is rotated, said forwardly offset tabs adapted to engage the flats on the body portion of the insulator and to normally prevent rotation of the insulator relative to the wall and said element.

4. In combination, a supporting element having a wall with front and rear surfaces and an opening therethrough, said opening having a central bore and diametrically disposed notches with straight sides and a flat bottom with forward offset tabs, an elongate electrical heating element having a series of helical convolutions spaced forwardly from said wall, and an insulator for supporting said heating on said wall including, a unitary body of dielectric material having an elongate body portion with flat front and rear ends and flat table engaging sides, said front end of the body portion adapted to engage the outer periphery of said helical element, said rear end of the body portion adapted to engage the front surface of the wall about the opening therein, a mounting means at the rear end of the body portion and including a flat rectangular projection with flat sides to slidably engage the sides of the notches in the wall and edges to slidably engage the bottoms of the notches in the walls, forwardly disposed seats on the projection spaced from and opposing the rear end of the body and engageable with the rear surface of the wall adjacent the bore of the opening therein when the insulator is rotated on the projection and is out of register with the notches, a supporting means at the front end of the body portion and including a second projection adapted to project between and establish hooked engagement with adjacent convolutions of the element when the insulator is rotated and said forwardly offset tabs adapted to engage the flats on the body portion of the insulator and to normally prevent rotation of the insulator relative to the wall and said element.

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