Jan. 6, 1925.

1,522,206

W. A. RANKIN

ELECTRIC HEATER

Filed Aug. 30, 1921

Fig. 1.

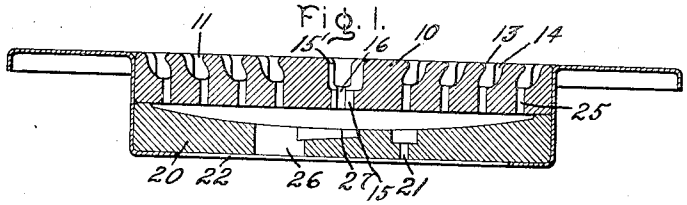


Fig. 2.

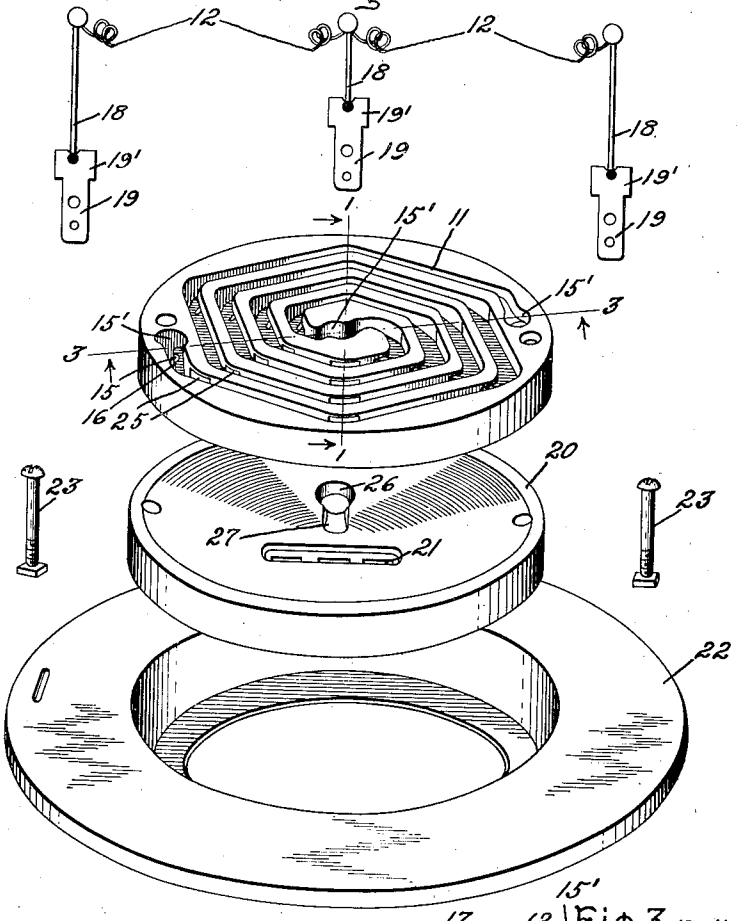


Fig. 4.

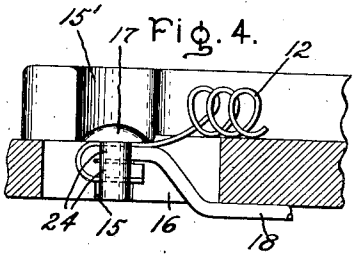
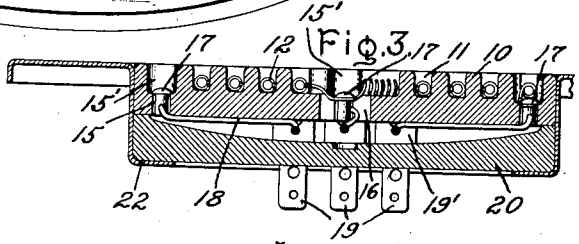


Fig. 3.



Inventor:
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His Attorney.

Patented Jan. 6, 1925.

1,522,206

UNITED STATES PATENT OFFICE.

WILLIAM A. RANKIN, OF OAK PARK, ILLINOIS, ASSIGNOR TO EDISON ELECTRIC APPLIANCE COMPANY, INC., A CORPORATION OF NEW YORK.

ELECTRIC HEATER.

Application filed August 30, 1921. Serial No. 496,854.

To all whom it may concern:

Be it known that I, WILLIAM A. RANKIN, a citizen of the United States, residing at Oak Park, in the county of Cook, State of Illinois, have invented certain new and useful Improvements in Electric Heaters, of which the following is a specification.

My invention relates to electric heaters and has for its object the provision of simple and reliable means for holding the heating element in place.

More specifically, my invention relates to heaters of the type in which the heating element is laid in a groove in a support of suitable heat refractory insulating material. It is desirable in heaters of this type to have the heating element exposed to a large extent for heat radiation, while at the same time some means must be provided for engaging the heating element to hold it in place in the groove. The previous custom has been to shape the sides of the groove so as to overhang the heating element either along the entire length of the groove or at intervals. This construction has the disadvantage that the heating element must be threaded in place in the groove or bent or distorted so as to be forced between the overhanging portions into place in the groove. Such constructions also have the disadvantage that the heating element can be removed only with considerable difficulty.

In carrying out my invention, I mount the heating element in a spiral groove in one face of a disc of heat refractory insulating material. This spiral groove instead of having the usual smooth curved configuration is polygonal in form. At the angles of the groove where the sides join I have provided overhanging portions and corresponding recesses in the opposite walls, respectively, of the groove. By means of this construction I am enabled to freely insert the heating element in place in the grooves so as to be held underneath the overhanging portions, and the unit may be easily removed at any time for renewal or repair. I have provided apertures through the insulating support for the terminals of the heating element and headed members, to which the heating element is attached, adapted to be seated in the apertures. The headed members are held in place in the apertures by means of stiff metallic leads, provided with terminals, which extend through the support and are bent against the opposite side so as to hold the headed members in place. The heating element may be formed with the terminals and leads attached ready to be put in place in the insulating support. By means of this construction I have provided a very simple and reliable electric heater in which the heating element may be easily replaced or renewed without the necessity of making soldered or brazed connections for the terminals.

Referring to the drawings, Fig. 1 is a section through the line 1, 1 of Fig. 2, looking in the direction of the arrows, showing an insulating support constructed in accordance with my invention; Fig. 2 is a view showing the various parts of the electric heater; Fig. 3 is a sectional assembly view along the line 3, 3 of Fig. 2, looking in the direction of the arrows; while Fig. 4 is a view showing a modified form of connection for the heating element.

Referring to the drawing, a disc 10 made of a suitable heat refractory insulating material is provided with a spiral U shaped groove 11 in its upper face in which the helical heating element 12 is supported. The groove is also polygonal in form, being shown in the drawing as six sided or hexagonal. At the angles, or corners, of the hexagon the inner and outer walls of the groove are provided, respectively, with overhanging portions 13 and recesses 14. In effect the groove is inclined outward at the angles or corners. By means of this construction the width of the groove is maintained substantially uniform throughout its length and depth so that the heating element can be easily slipped in place in the groove underneath the projections 13 which hold it in place. The heating element is preferably held in the groove under tension in

order to positively separate the turns from one another and cause the element to cling to the inner wall of the groove underneath the overhanging portions.

The groove is in the form of a double spiral. Apertures for the terminal leads of the heating element are provided through the disc at each end of the groove and at the center. These apertures are elongated and consist of round openings 15 and slots 16 intersecting therewith and extending longitudinally along the center of the groove. As shown in Fig. 3, headed members 17, to which the heating element 12 is permanently attached, are adapted to be seated in the round portions 15 of the apertures, the groove being enlarged at 15′ around holes 15 for the insertion of the heads of the members. Leads 18 of stiff metallic material are attached to the headed members 17 and extend through the apertures. Flat terminal blades 19 are attached to the ends of the leads. The elongated portions 16 of the apertures are adapted to permit terminals 19 to pass therethrough to effect the insertion or removal of the heating element.

An insulating disc 20 of suitable heat refractory insulating material is provided adjacent the lower face of the disc 10. The upper surface of disc 20 is concave to form an air space and to provide space for leads 18 which are bent against the lower face of disc 10 to bring terminals 19 in position to be inserted through holes 21 in disc 20, which forms a support for the terminals. The upper ends of the terminals 19 are enlarged to provide shoulders 19′ which are held tightly between disc 10 and insulating plate 20. The terminals 19 project through the insulating plate 20 for the attachment of suitable connectors for the heating circuit.

A metallic casing 22 is provided to retain the disc 10 and the insulating plate 20 in fixed relation with respect to each other. To assemble the heater the insulating disc 20 is placed in casing 22, and then the disc 10 with the heating element and terminals in proper position is put in place. It will be observed that the headed members 17 are held in place in holes 15 by the stiff leads 18 connected, respectively, thereto, the leads being bent so as to seat the headed members in holes 15. The unit may be held together by suitable bolts 23 passing through alined holes in the discs and the casing.

The heating element 12 is preferably constructed of a coiled length of resistance conductor, and it can be formed, as shown in Fig. 2, with the terminals permanently attached to each end and the middle thereof. The operation of inserting and removing the heating element can be easily accomplished. Three terminals have been disclosed for the heating element so that a plurality of operating temperatures may be obtained by suitable switching mechanism in a well known manner.

In Fig. 4 I have shown a modified form of connection between the headed members and the heating element and leads. The headed member is provided with two parallel holes 24 through which the ends of both the heating element and the lead are threaded. A brazed joint is then made. This provides a very reliable and permanent connection for the terminals of the heating element.

Small rectangular apertures 25 are provided in the insulating disc 10 directly below the projections 13. These apertures are found to be necessary to facilitate the forming of the disc. An aperture 26 is provided in the insulating plate 20, and an inclined slot 27 leads from the center of the insulating plate thereto. The aperture 26 is provided for the purpose of draining away any liquids which have been spilled through carelessness or otherwise on the upper surface of the heater and drip through apertures 25 to the insulating plate. This system of drains also facilitates the cleaning of the heating unit.

Various changes and modifications will appear to those skilled in the art. Obviously, a rigid form of heating element can be used as well as a flexible coil element since the construction of the grooves permits the ready insertion of any type of heating element. Furthermore, it is contemplated within the scope of this invention that the resistance conductor may be permanently connected directly to the terminal blades without the interposition of the headed members and conducting leads.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means.

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

1. An electric heater comprising a support provided with a groove, the side walls of said groove being provided with overhanging portions and cooperating recesses at intervals, each overhanging portion having a corresponding oppositely disposed recess, and a heating element supported in said groove and held therein by said overhanging portions.

2. An electric heater comprising a support of heat refractory insulating material provided with a groove, the side walls of said groove being provided with overhanging

portions and cooperating recesses at intervals, each overhanging portion having a corresponding oppositely disposed recess, and a coiled resistance conductor supported in said groove and held therein by said overhanging portions.

3. An electric heater comprising a support of heat refractory insulating material provided with a spiral, polygonal groove, the side walls of said groove being provided with overhanging portions and cooperating recesses at the angles thereof, and a coiled resistance conductor supported in said groove and held therein by said overhanging portions.

4. An electric heater comprising a support, provided with a groove having substantially parallel inclined side walls at intervals, and a heating element supported in said groove and held therein by said inclined side walls.

5. An electric heater comprising a support of heat refractory insulating material provided with a groove having substantially parallel inclined side walls at intervals, and a coiled resistance conductor supported in said groove and held therein by said inclined side walls.

6. An electric heater comprising a support provided with a groove, a heating element in said groove, said groove having substantially parallel side walls inclined at intervals so as to secure the heating unit in place.

7. An electric heater comprising a casing, a pair of plates of heat refractory material in said casing, one of said plates being provided with a groove, a resistance conductor supported in said groove, and terminals for said resistance conductor extending through the other plate and clamped between said plates.

8. An electric heater comprising a support of heat refractory insulating material provided with a groove and a plurality of apertures, a resistance conductor in said groove, a plate of insulating material adjacent said support provided with apertures, terminal members extending through the apertures in said plate and provided with heads clamped between the support and plate, metallic leads extending through the apertures in said support and connecting said terminal members to said resistance conductor, and means for securing said plate and support together whereby the terminal members are secured.

9. An electric heater comprising a support of heat refractory insulating material provided with a groove and a plurality of apertures, a resistance conductor supported in said groove, a plate of insulating material adjacent said support provided with apertures, and terminal members connected to said resistance conductor through the apertures in said support extending through the apertures in said plate and clamped between said support and plate, said terminal members being arranged to be passed through the apertures in said support to effect the removal of the resistance conductor and terminals together.

10. An electric heater comprising a support of heat refractory insulating material provided with a groove and a plurality of apertures, a resistance conductor supported in said groove, a plate of insulating material adjacent said support provided with apertures, terminal members seated in the apertures in said plate and provided with heads clamped between the support and plate, and leads extending through the apertures in said support permanently connecting said terminal members to said resistance conductor, said terminal members being arranged to be passed through the apertures in said support to effect the removal of said resistance conductor.

11. An electric heater comprising a support of heat refractory insulating material provided with a groove and a plurality of apertures, a resistance conductor in said groove, terminal members, a support for said terminal members, and stiff bendable leads connecting said terminal members to said resistance conductor through the apertures in said support, said leads being bent so as to secure said resistance conductor.

12. An electric heater comprising a support of heat refractory insulating material provided with a groove and a plurality of apertures, a resistance conductor supported in said groove, a plate of insulating material below said support provided with apertures, terminal members extending through the apertures in said plate clamped between the plate and support, and stiff bendable leads connecting said terminal members to said resistance conductor through the apertures in said support, said leads being bent so as to secure the ends of the resistance conductor when the terminal members are secured.

13. An electric heater comprising a support of heat refractory insulating material provided with a groove, and a plurality of apertures intersecting said groove, headed members seated in said apertures, a resistance conductor supported in said groove and connected to said headed members, stiff metallic leads connected to said headed members and extending through said apertures, terminals on said leads, and a support for said terminals, said leads being bent so as to secure said headed members in said apertures.

14. An electric heater comprising a support of heat refractory insulating material provided with a groove, and a plurality of apertures intersecting said groove, headed members seated in said apertures, a coiled resistance conductor supported in said

groove and permanently connected to said headed members, leads of stiff metallic material permanently connected to said headed members and extending through said apertures, terminals secured to said leads, and means for supporting said terminals, said leads being bent so as to hold the headed members in position in said apertures, said apertures being adapted to permit the terminals to pass therethrough to effect the removal of the heating element.

In witness whereof, I have hereunto set my hand this 24th day of August, 1921.

WILLIAM A. RANKIN.