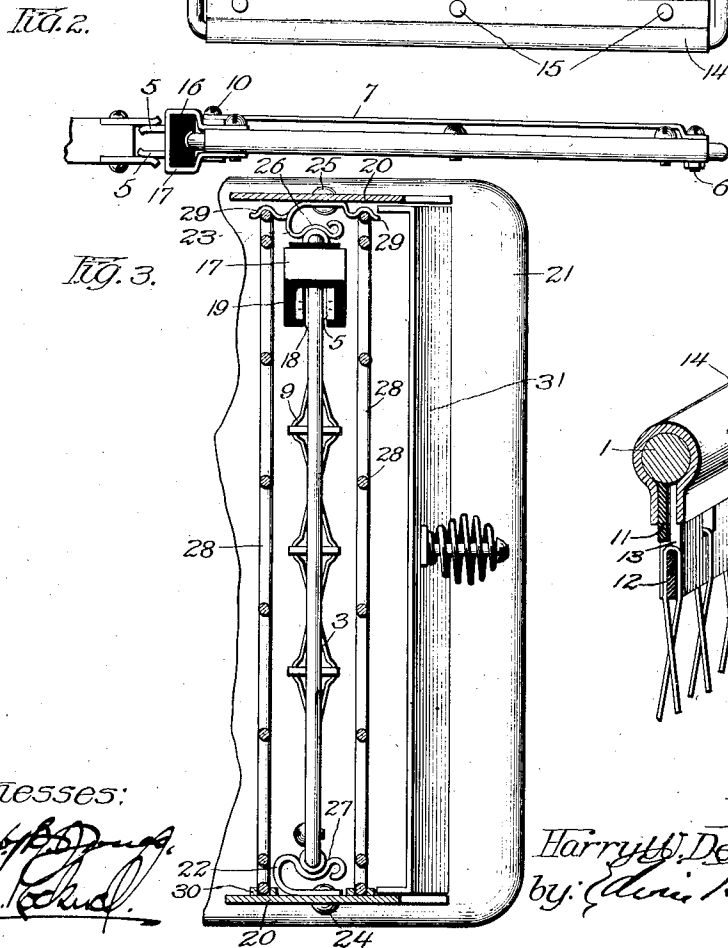
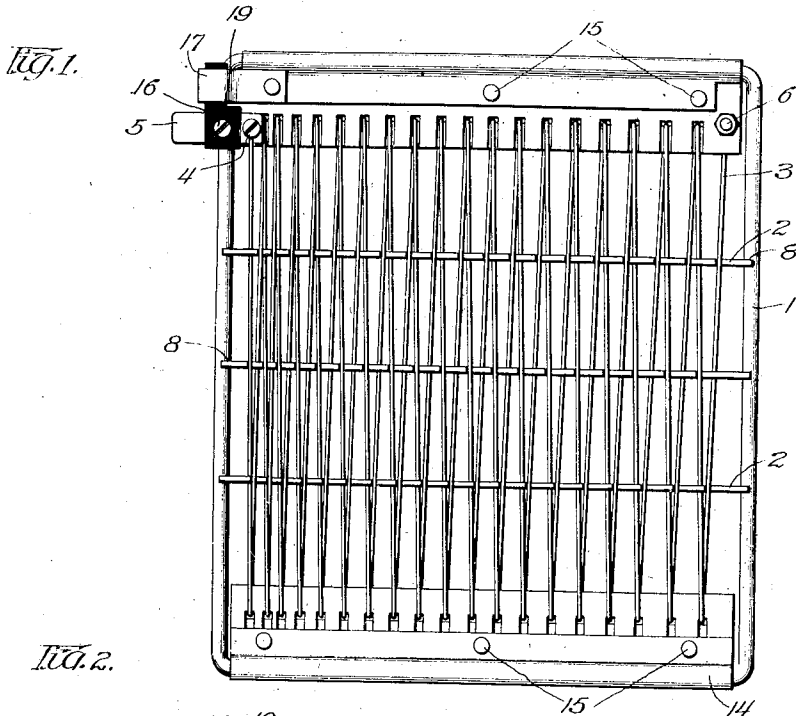


H. W. DENHARD.
ELECTRIC RESISTANCE UNIT.
APPLICATION FILED OCT. 31, 1911.

1,102,393.

Patented July 7, 1914.



Witnesses:

Leif P. Jones
W. H. Reed

Inventor:
Harry W. Denhard
by *Chas. H. Jones*
Atty.

UNITED STATES PATENT OFFICE.

HARRY W. DENHARD, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO THE CUTLER-HAMMER MFG. CO., OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

ELECTRIC RESISTANCE UNIT.

1,102,393.

Specification of Letters Patent.

Patented July 7, 1914.

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To all whom it may concern:

Be it known that I, HARRY W. DENHARD, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented new and useful Improvements in Electric Resistance Units, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to electric resistance units.

It has among its objects to provide an improved electric resistance unit.

A further object of my invention is to provide an improved electric resistance unit which may be readily snapped into place, and which is so constructed and arranged as to be highly efficient.

A further object of my invention is to provide improved means for receiving the unit.

Other objects and advantages of my improved construction will hereinafter appear.

In the accompanying drawings I have, for purposes of illustration, shown one form which my invention may assume in practice. My invention is not, however, limited to this form, but may assume other forms.

In the views of these drawings: Figure 1 shows a side elevation of this form of unit. Fig. 2 shows an end elevation of the same in connection with a terminal plug. Fig. 3 shows the unit in position in a heating device. Fig. 4 shows a detail view of a portion of the unit.

In the construction shown for purposes of illustration in the accompanying drawings, I have illustrated a unit inclosed in a frame 1, carrying a plurality of spacing strips 2; an electric resistance material 3 being wound spirally across between the sides of the frame and on opposite sides of the spacing members 2. One of the ends of the resistance material 3 is brought out at a binding screw 4 on a terminal member 5, while the other end is brought out at a binding screw 6 on the opposite side of the frame and passes down through a conducting strip 7 to the other terminal member 5.

The frame 1 is preferably substantially rectangular in shape and formed of a single round metal rod. The spacing members 2 are preferably formed of insulating mate-

rial. If desired, I may use mica as this insulating material. The ends of the strips 2 are preferably notched as at 8, to permit them to grip the opposite sides of the frame 1. Between their ends the strips 2 are also notched or slotted on each edge, the slots on one edge being offset with respect to the slots on the other, so that the resistance material 3 may be wound spirally back and forth between the sides of the frame successively on opposite sides of the spacing strips, the convolutions, in a preferred form, being brought closer together at their bottom. In a preferred form the resistance material 3 is formed of a resistance wire and the wire is provided with a crimped or bent portion 9 at the points where it passes through the slots in the spacing members, in order that it may not readily be displaced and that any strain may not result in twisting the spacing members. In a preferred form the resistance material 3 is in the form of a single length of wire, one end of which is connected to one of the terminals 5 through the binding post 4 preferably located near the bottom of the unit, and preferably carried upon the end of one of the terminal members 5. The other end of the resistance material is preferably connected to a binding screw 6 on the opposite side of the unit, which extends through to the other surface of the unit and serves to hold in place a conducting strip 7, which may extend downward along the edge of the unit to a point adjacent to the terminal members and is bent upward between its ends so that it may not make contact with the resistance material. In a preferred form the lower end of the strip 7 is connected by a suitable screw or other means 10 to one of the terminal members 5.

In Figs. 1 and 4 I have illustrated a preferred means of connecting the resistance material at the edge of a unit. As illustrated in these figures I preferably provide a plurality of sheets of insulating material 11 and 12, which are provided with slots 13 extending substantially half way across the same. Sheets 11 and 12 are preferably arranged as shown in Fig. 4, so that the slots 13 in the member 12 extend in the opposite direction to the slots 13 in the member 11, the two slots registering near their inner edge to a sufficient degree to permit the resistance wire to be brought in over the sheet

12, down through its slot 13 and out through the slot 13 in the sheet 11. In a preferred form both of the edges of the unit are provided with this form of connection. In a preferred form the two sheets of insulation 11 and 12 are clamped between a bent metal clamping or gripping member 14, which is bent around the end of the frame 1, and whose inner edges are brought together firmly upon the outer surfaces of the strips 11 and 12, to which these edges are secured by means of suitable attachment devices 15. If desired, rivets or screws may be used to attach the member 14 to the insulating sheets 11 and 12. In a preferred form an insulating member or block 16, formed of suitable insulating material, is attached to the frame 1 at a point adjacent to the terminals 5. If desired, this insulating member may be attached by means of a bent metal strip 17 attached at opposite sides to the flat edges of member 14 by any suitable means and extending around the insulating member, as shown in Fig. 2. In a preferred form this insulating member is provided with a central slot 18, through which the terminal members 5 extend, and the terminal members are held, spaced apart from each other and on opposite sides of this slot, by means of suitable screws 19, passing through the opposite sides of the insulating member.

In Fig. 3 I have illustrated my improved resistance unit adapted to use in connection with an electric heating device such as a toaster, broiler or the like. In this construction the frame 1 is snapped into position in the frame 20 of a heating device, the terminal members for the unit in this instance preferably extending through a suitable perforation in the base 21 of the device. In order to enable the unit to be snapped into the frame, I preferably provide this frame with one or more resilient members 22 and 23, fixed to the opposite sides of the frame by suitable rivets or other devices 24 and 25, and having laterally extending spring clips 26 and 27 arranged to receive the rounded edges of the unit frame. When it is desired to insert the unit of the construction shown, in a heating device of the construction shown in Fig. 3, the bottom of the unit is preferably placed opposite the opening in the base of the heating device so that the terminals 5 will slide through the opening in the base, and the upper end of the unit frame is then brought forward, the rounded edges of the same snapping into the clips 26 and 27 when the unit is in a vertical position and the terminals assuming their proper position in the base. When it is desired to remove the unit, all that it is necessary to do is to push the top of the unit backward and remove the same. If desired, I may use other devices than the spring clips for holding the unit in

place, the holding means consisting of several projections on the frame of the heating device. Where it is desired to use the resistance unit as the heating element for a heating device such as a toaster, broiler or the like, it is preferable to use grid members 28 on the opposite sides of the same. In a preferred form I so construct one or more of the holding clips 23 that these grid members may be snapped into position in substantially the same manner as the unit. As shown in Fig. 3, the member 23 is preferably provided with resilient extensions 29 arranged to receive the rounded side members of the grids 28. I thus provide means for snapping a resistance unit and the grid members in position by the use of a single resilient member, which may be stamped from a single piece of metal, if desired. If desired, one of the sides of the grids may be placed in position between studs 30, formed on or attached to one of the side walls of the frame 20 of the heating device, one of the ends of the grid members being placed between these studs and the other end being snapped into engagement with the clips 29. If desired, however, both ends of the frame may be provided with resilient means for holding the grid. It is of course obvious that one or more suitable protecting shields or doors 31 may be provided, suitably attached to the frame 20 or base 21 in such a manner that it may be brought up to inclose the article to be heated between the same and the grids.

By my improved construction I have provided a resistance unit of high efficiency which may be adapted to a wide range of usage, and which may be readily snapped into position or removed, as desired. By the improved arrangement of the unit frame and the spacing strips I am able to provide a rugged unit which is well calculated to withstand rough usage. By the improved arrangement of the resistance material upon the same I am able to provide a unit having a large surface of effective resistance material and one well adapted to withstand high temperatures. Further, by my improved manner of winding the resistance material, I am able to provide, if desired, a unit which develops the greatest amount of heat at the bottom, thus making it especially adapted to use in heating devices of the toaster or broiler type. Further, the conducting parts of the unit are effectually insulated from each other so that there is no danger of short-circuiting. By my improved means for receiving the unit I am able to provide an extremely simple construction which may be manufactured at small expense and adapted to a wide range of uses. Further, by the provision of the combined clip both for the unit and the grid members, I am able to provide an exceed-

ingly convenient device which may be readily used, and in which the resistance unit may be readily removed or replaced as desired. Further, by my improved construction I have provided a device which may be manufactured at small expense.

While I have in this application specifically described one form which my invention may assume in practice, I do not wish to be limited to this specific form chosen for purposes of illustration, but wish rather to include within the scope of this application all of those various forms and uses of my invention falling within its spirit.

What I claim as new and desire to secure by Letters Patent is:—

1. In an electric resistance unit, a frame, a plurality of insulating spacing strips carried thereby, and a resistance material carried by said frame and passing alternately on opposite sides of adjacent strips.

2. In an electric resistance unit, a frame, a plurality of strips of insulating material carried thereby having notches on their opposite edges, a resistance material wound between the sides of said frame and passing alternately through notches on opposite sides of said insulating strips.

3. In an electric resistance unit, a frame having rounded edges, a plurality of spaced strips of resistance material having notched ends engaging said frame and a resistance material wound spirally upon said strips between the sides of said frame and passing alternately on opposite sides of said strips.

4. In an electric resistance unit, a frame, a plurality of strips of insulating material carried thereby and a resistance material wound across said frame passing alternately on opposite sides of adjacent strips, the convolutions of said resistance material being arranged more closely together near a portion of said frame.

5. In an electric resistance unit, a frame, a resistance material carried thereby, a holding member carried by a portion of said frame having its inner ends lying in substantially parallel planes, and a slotted strip of insulating material inclosed between said ends arranged to receive the ends of the convolutions of said resistance material.

6. In an electric resistance unit, a frame, a resistance material carried thereby, a holding member inclosing a certain portion of said frame and having its inner ends lying in substantially parallel planes and a plurality of strips of insulating material having oppositely disposed slots arranged to receive the ends of said resistance material.

7. In an electric resistance unit, a frame, a plurality of spaced insulating strips, a resistance material wound thereon, a clamping member inclosing the sides of said frame and having its inner ends lying in substantially parallel planes, and insulating means

inclosed between said inner ends and arranged to receive the ends of the convolutions of said resistance material.

8. In an electric resistance unit, a frame, a plurality of spaced insulating strips, a resistance material wound thereon, holding members carried by the sides of said frame having their inner ends lying in substantially parallel planes and slotted strips of insulating material inclosed between their inner ends and arranged to receive the ends of the convolutions of said resistance material.

9. In an electric resistance unit, a frame of substantially rectangular form, a plurality of spaced insulating strips carried by said frame, a resistance material wound alternately on opposite sides of said strips and means carried by the sides of said frame for holding the ends of the convolutions of said resistance material.

10. In an electric resistance unit, a frame of substantially rectangular shape formed of a bent rod having a rounded outer edge throughout a portion of its length, a plurality of insulating spacing strips having notches in their ends positioning the same between the sides of said frame and having notches on their edges, and a resistance material wound upon said strip between the sides of said frame and passing through said notches.

11. In an electric resistance unit, a frame, a resistance material wound thereon in convolutions extending across the frame, the ends of the convolutions of said resistance material being carried by said frame, means for electrically connecting the extremities of said resistance material and bringing them out at adjacent points, the terminal members carried by said frame.

12. In an electric resistance unit, a frame, an electric resistance material wound in spiral form thereon, the ends of the convolutions of said resistance material being attached to said frame, one of the extremities of said resistance material being brought out at one side of the frame and the other being brought out at the other side, a conducting strip extending between the points where said extremities are brought out, and terminal members carried by said frame adjacent to one end of said conducting strip and one of the ends of said resistance material.

13. In combination, an electric heating device, protecting members therefor and means permitting said protecting members to be snapped into position upon said heater.

14. In combination, a heating device, a grid member therefor, and means permitting said grid member to be snapped in position upon said heating device.

15. In combination a support, a heating unit arranged to be snapped therein, a pro-

protecting member therefor and means for permitting said protecting member to be snapped in position in said support.

16. In an electric heating device, a support, a spring clip carried thereby having a plurality of resilient arms, an electric resistance unit arranged to be snapped into position in one of said arms, and a protecting member for said unit arranged to be

snapped in position in the other of said arms.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

HARRY W. DENHARD.

Witnesses:

A. L. ROCKWELL,
GEO. B. JONES.
