Jan. 12, 1926. 1,569,415

J. C. WOODSON

ELECTRIC FURNACE HEATING UNIT

Filed Jan. 25, 1924

Fig. 1.

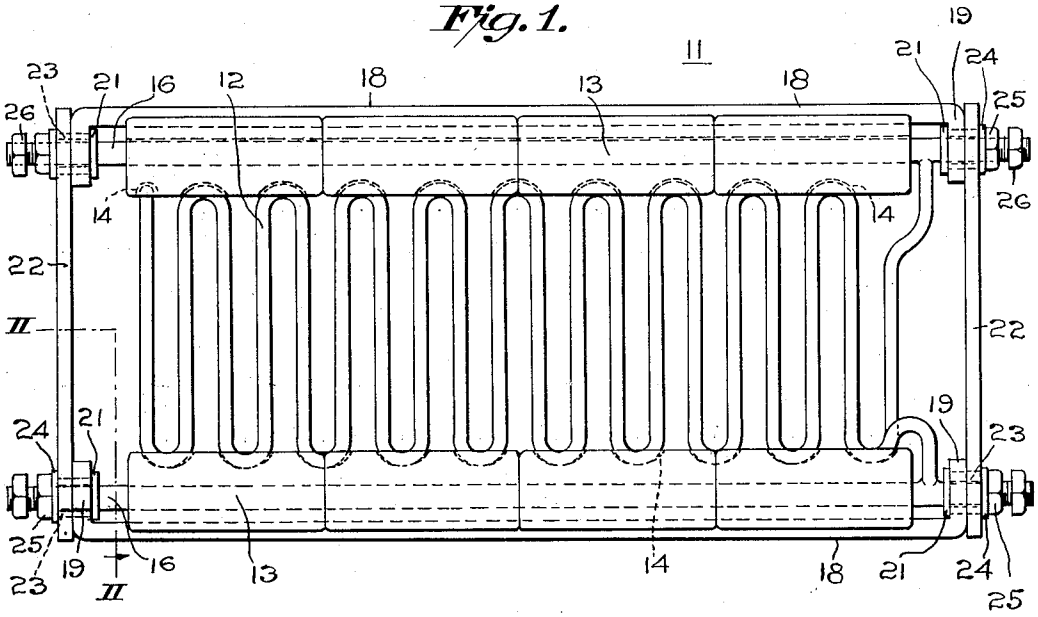
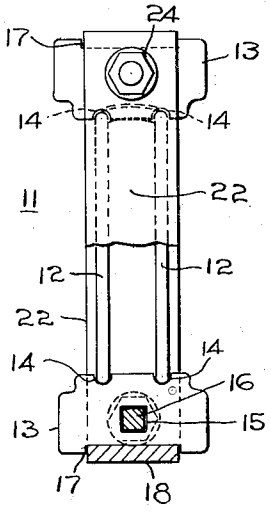


Fig. 2.



WITNESSES:

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Patented Jan. 12, 1926. 1,569,415

UNITED STATES PATENT OFFICE.

JAMES C. WOODSON, OF EAST PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

ELECTRIC-FURNACE HEATING UNIT.

Application filed January 25, 1924. Serial No. 688,377.

To all whom it may concern:

Be it known that I, JAMES C. WOODSON, a citizen of the United States, and a resident of East Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Electric-Furnace Heating Units, of which the following is a specification.

My invention relates to electric furnaces and particularly to electric heating units for electric resistance furnaces.

One object of my invention is to provide a relatively simple, compact and high-capacity heating unit that shall have both terminals located at each end thereof.

Another object of my invention is to provide a heating unit of the above indicated character that shall have a unitary terminal and supporting structure.

In practicing my invention, I provide a resistor member of relatively heavy wire or rod, preformed to comprise a plurality of parallel-extending, return bent straight portions, one-half of said portions being folded back over and lying adjacent to the other half thereof. A plurality of sets of refractory members of electric-insulating material are located on metal rods extending through a perforation therein and have a plurality of pockets in one surface thereof to receive the rounded ends of the resistor member.

Metal side bars, substantially coextensive with the metal rods, extend closely adjacent to the outer grooved surface of the refractory members and interfit with the rods adjacent to the ends thereof. End bars operatively engage the ends of the rods and of the side bars to constitute therewith the skeleton supporting frame.

The rods extending through the perforated refractory members have the respective ends of the resistor member connected thereto and thereby provide terminal members at each end of the unit.

In the single sheet of drawings,

Figure 1 is a view, in side elevation, of an electric heating unit embodying my invention, and

Fig. 2 is a view, partially in end elevation and partially in section, taken on the line II—II of Fig. 1.

An electric heating unit 11 comprises a relatively heavy resistor member 12 that is performed to comprise a plurality of S-bend portions, or what may be also termed a plurality of straight, substantially parallel-extending return-bent portions. The resistor member 12, preferably of a suitable resistor material, such as nichrome, is preformed to such shape that all of the straight return-bent portions lie in a single plane.

One half of the straight return-bent portions is folded over against the other half thereof and is located in a plane spaced from and cosely adjacent to the plane of the first half. This bending may be done by twisting one or two adjacent straight portions or by bending one of the rounded end portions.

A plurality of refractory supporting members 13, of electric-insulating material, are each provided with a plurality of sets of spaced pockets 14 therein, the pockets extending longitudinally of the members 13 in the inner face thereof. The rounded portions of the reistor member 12 fit into the respective pockets 14, the spacing of the resistor member and of the pockets being such as to permit of this relative location.

The length of the return-bent portions of the resistor member 12 is slightly less than the distance between the bottom portions of the respective pockets 14 in the spaced apart sets of refractory members 13 to permit of expansion of the straight portions when heated during operation.

Each of the refractory members 13 is provided with a substantially polygonal opening 15 extending longitudnially and substantially axially therethrough. I prefer to make the openings 15 substantially square in lateral section, and I dispose therein a rod 16, the intermediate portion of which is also substantially square in lateral section and only the end portions of which are rounded.

The rod 16 and the respective members 13 of refractory material located thereon are therefore interfitting and any lateral turning movement of the members 13 on the rod 16 is effectively precluded by such interfitting.

The outer longitudinal surfaces of each of the members 13 is provided with a relatively wide groove or depression 17 and a bar 18 of relatively thin, flat metal, is located therein to further strengthen the structure and to still further prevent relative movement of the members 13 on the bar 16 and to hold the members 13 thereon, even if any of the members 13 should break

or crack. The end portions of the bars 18 are bent at substantially right angles to the main portion and are each provided with an opening 19 therethrough within which is located a bushing 21 of a suitable refractory electric-insulating material, through which the rounded end portions of the rods 16 extend.

End bars 22, of metal, have openings 23 extending laterally therethrough, through which the bushings 21 may extend, the bars 22 being so located as to operatively engage the turned-over end portions of the bars 18. Washers 24 and nuts 25 are provided for each end of the rod 16 to permit of securely clamping the bars 22 against the turned-over end portions of the respective bars 18, substantially as illustrated in Fig. 1 of the drawings, thereby providing a supporting structure of skeleton form and of substantially rectangular contour.

The hereinbefore described method of preforming the resistor member 12 brings both end portions of the resistor member at one end of the heating unit, substantially as illustrated in Fig. 1 of the drawing, and the clearance allowed between the outside end of the end members 13 and the inside of the bushings 21 is sufficient at that end of the heating unit to permit of properly securing the ends of the resistor member to the respective rods 16.

As the rods 16 extend along the side of the assembled heating unit and beyond the skeleton frame structure, and as the rods 16 constitute terminal members for the heating unit, both terminals of the heating unit extend therebeyond at both ends thereof.

Extra nuts 26 are provided on the outer end of each of the rods 16 to permit of suitably securing the ends of supply circuit conductors (not shown) to the respective terminal rod members 16.

The device embodying my invention thus provides a relatively simple and compact heating unit having a double layer winding of resistor material, whereby the capacity thereof is substantially doubled relatively to a heating unit having only a single layer winding. The hereinbefore described construction further provides a heating unit embodying a relatively simple and yet strong skeleton frame for holding all of the parts in proper operative positions relatively to each other, and one in which both terminal members for the heating unit are provided at both ends thereof.

Various modifications and changes may be made without departing from the spirit and scope of the invention. I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art or are set forth in the appended claims.

I claim as my invention:

1. In an electric heating unit, in combination, a relatively heavy resistor member, preformed to comprise a plurality of substantially parallel-extending, return-bent, straight portions, a plurality of spaced sets of refractory members, of electric-insulating material, each having a plurality of spaced pockets in one face thereof for receiving the return-bent parts of said resistor member and having an opening extending longitudinally therethrough, and a rod extending through the openings in the refractory members of each set for supporting them in proper operative positions.

2. In an electric heating unit, in combination, a relatively heavy resistor member, preformed to comprise a plurality of substantially parallel-extending, return-bent, straight portions, a plurality of spaced sets of refractory members, of electric-insulating material, each having a plurality of spaced pockets in one face thereof for receiving the return-bent parts of said resistor member and having an opening extending longitudinally therethrough, and a rod extending through the openings in the refractory members of each set for supporting them in proper operative positions, each of said rods having one end of said resistor member connected thereto and serving as a terminal member for said heating unit.

3. In an electric heating unit, in combination, a relatively heavy resistor member, preformed to comprise a plurality of substantially parallel-extending, return-bent, straight portions, a plurality of spaced sets of refractory members, of electric-insulating material, each having a plurality of spaced pockets in one face thereof for receiving the return-bent parts of said resistor member and having an opening extending longitudinally therethrough, a rod extending through the openings in the refractory members of each set for supporting them in proper operative positions and a skeleton frame, of metal, operatively engaging the ends of said rods to hold them in proper operative positions.

4. In an electric heating unit, in combination, a relatively heavy resistor member, preformed to comprise a plurality of substantially parallel-extending, return-bent, straight portions, a plurality of spaced sets of refractory members, of electric-insulating material, each having a plurality of spaced pockets in one face thereof for receiving the return-bent parts of said resistor member and having an opening extending longitudinally therethrough, a rod extending through the openings in the refractory members of each set for supporting them in proper operative positions, and a skeleton metal frame having side members operatively engaging said refractory members and the ends of said rods for holding them in proper operative positions.

5. In an electric heating unit, in combination, a relatively heavy resistor member, preformed to comprise a plurality of substantially parallel-extending, return-bent, straight portions, a plurality of spaced sets of refractory members, of electric-insulating material, each having a plurality of spaced pockets in one face thereof for receiving the return-bent parts of said resistor member and having an opening extending longitudinally therethrough, a rod extending through the openings in the refractory members of each set for supporting them in proper operative positions and a skeleton metal frame having side members interfitting with said refractory members and operatively engaging said rods to hold them in proper operative positions.

6. In an electric heating unit, in combination, a relatively heavy resistor member, preformed to comprise a plurality of substantially parallel-extending, return-bent, straight portions, a plurality of spaced sets of refractory members, of electric-insulating material, each having a plurality of spaced pockets in one face thereof for receiving the return-bent parts of said resistor member and having an opening extending longitudinally therethrough, and a rod, of polygonal cross-section, extending through the openings in the refractory members of each set for supporting them in abutting, alined position and for preventing a turning movement thereof on said rod.

7. In an electric heating unit, in combination, a relatively heavy resistor member, preformed to comprise a plurality of substantially parallel-extending, return-bent, straight portions, a plurality of spaced sets of refractory members, of electric-insulating material, each having a plurality of spaced pockets in one face thereof for receiving the return-bent parts of said resistor member and having an opening extending longitudinally therethrough, and a plurality of substantially co-extensive members respectively extending through, and closely adjacent to, each set of refractory members to hold them in proper operative positions.

8. In an electric heating unit, in combination, a relatively heavy resistor member, preformed to comprise a plurality of substantially parallel-extending, return-bent, straight portions, a plurality of spaced sets of refractory members, of electric-insulating material, each having a plurality of spaced pockets in one face thereof for receiving the return-bent parts of said resistor member and having an opening extending longitudinally therethrough, and a plurality of substantially co-extensive elongated metal members, having interfitting ends, and respectively extending through and closely adjacent to, each set of refractory members to hold them in proper operative positions.

9. In an electric heating unit, in combination, a relatively heavy resistor member, preformed to comprise a plurality of substantially parallel-extending, return-bent, straight portions, a plurality of spaced sets of refractory members, of electric-insulating material, each having a plurality of spaced pockets in one face thereof for receiving the return-bent parts of said resistor member and having an opening extending longitudinally therethrough, a plurality of elongated metal members having interfitting ends and respectively extending through and closely adjacent to, each set of refractory members, and end bar members operatively engaging said elongated members adjacent to the ends thereof to constitute therewith a skeleton supporting frame, for said refractory members and said resistor member.

10. In an electric heating unit, the combination with a resistor member preformed to have a plurality of return-bent portions, of a refractory insulating member having a longitudinal opening therein and pockets in one face thereof for the upper return-bent portions of the resistor, a similar refractory insulating member for the lower return-bent portions of the resistor, and a rod extending through each of the refractory insulating members constituting a terminal and supporting member for the unit.

In testimony whereof, I have hereunto subscribed my name this 21st day of January 1924.

JAMES C. WOODSON.