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A. W. WALKER ET AL

1,905,770

ELECTRIC HEATING UNIT AND METHOD OF MANUFACTURING SAME

Filed July 3, 1929

2 Sheets-Sheet 1

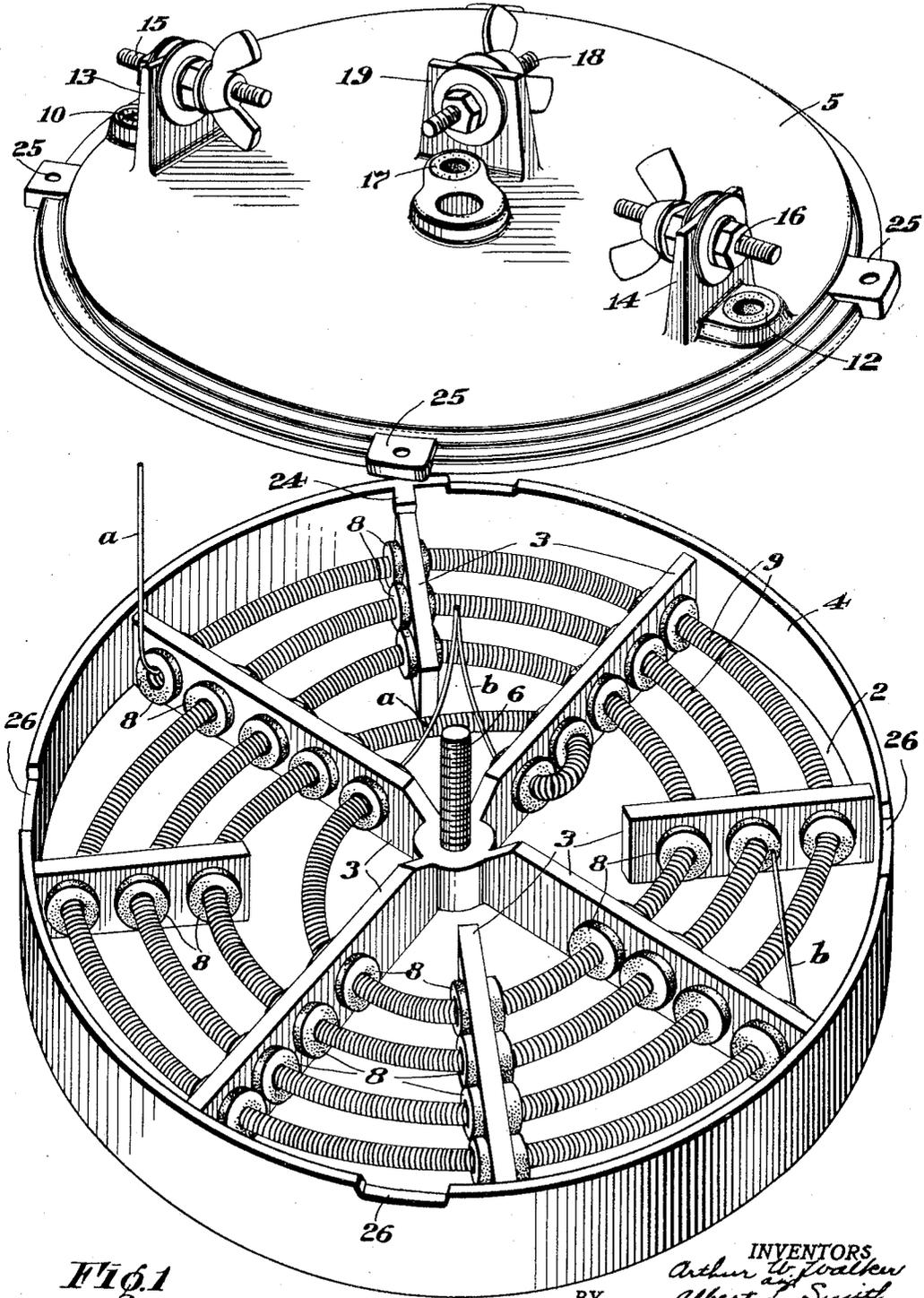


FIG. 1

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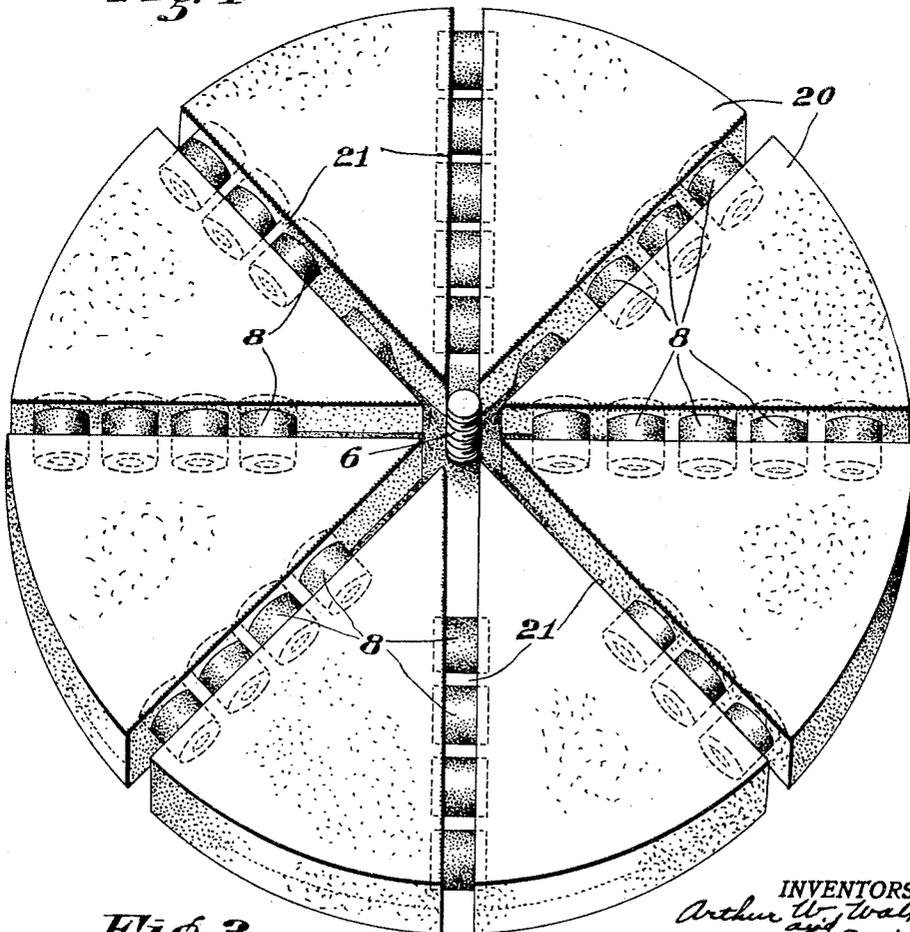
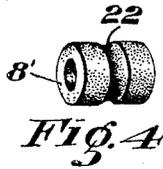
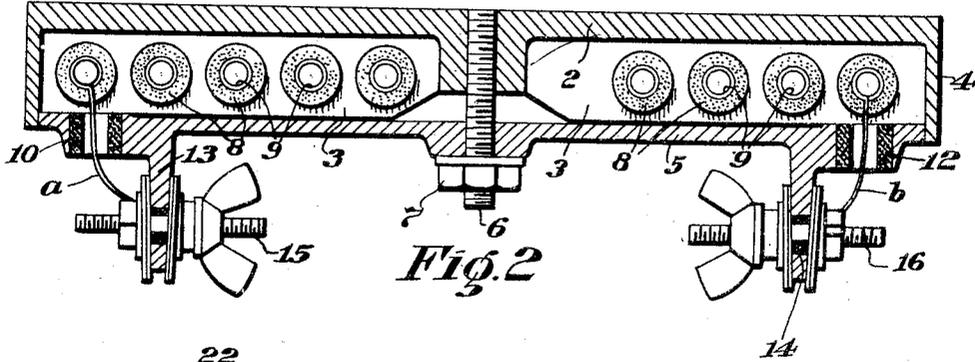


Fig. 3

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UNITED STATES PATENT OFFICE

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ELECTRIC HEATING UNIT AND METHOD OF MANUFACTURING SAME

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This invention relates to electric heating units and to the manufacture of apparatus of this character. The invention will be herein disclosed as embodied in a heating unit designed especially for use in electric ranges, although it is contemplated that the invention may also be used in other forms of apparatus.

It is the chief object of the invention to devise an exceptionally sturdy and reliable device of this character, to provide for the convenient replacement of the heating conductor, and to simplify the methods of manufacture of apparatus of this type. The invention aims especially to improve the mounting in their supporting structure of the insulating bushings which carry the electric heating conductor.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

In the drawings,

Figure 1 is a perspective view of a heating unit constructed in accordance with this invention, the unit being shown upside down;

Fig. 2 is a vertical central sectional view of the unit shown in Fig. 1;

Fig. 3 is a perspective view illustrating a step in the method of manufacture of the unit; and

Fig. 4 is a perspective view of one form of insulating bushing which may be used in the unit.

The particular unit shown is designed for use in electric ranges and includes a top plate 2 having a series of webs or flanges 3 integral therewith and extending from the lower side thereof. This top plate is of circular form and it includes an integral marginal flange or rim 4 projecting from its edge and surrounding the other parts of the unit. A bottom plate 5 fits into the lower end of the rim 4 and normally is secured to the plate 5 by a screw threaded stud 6 and nut 7. The flanges 3 carry a series of insulating bushings made of some refractory insulating material such as lava, soapstone, steatite, or the

like, and the electric heating conductor 9 is threaded through these bushings and is supported in its operative position by them. These flanges thus form, in effect, a supporting grid for holding the heating conductor in its operative position between the upper and lower plates. In the particular construction shown in Fig. 1 the conductor is divided into two sections, the terminals of one section being shown at *a-a* and those of the other at *b-b*. Preferably the conductor consists of some refractory wire, such as those commonly used for this purpose, the wire being coiled so that a relatively long length is disposed in the comparatively small space provided in the top plate. The two leads *a* and *b* near the perimeter of the unit are led through insulating bushings 10 and 12, respectively, in the bottom plate 5, and are mechanically secured to, but insulated from, lugs 13 and 14, respectively, which are cast integral with the plate, these lugs being provided with clamping bolts 15 and 16, respectively, for this purpose. The two leads *a* and *b* which are located adjacent to the central part of the unit are both led through an insulating bushing 17 secured in the bottom plate 5 and are fastened to a bolt 18 which is secured in, but insulated from, a lug 19 integral with the plate, in the same manner that the other leads are fastened to the bolts 15 and 16, respectively. The current supply wires also are secured to these same bolts, the arrangement usually being such that the two sections of the heating conductor or coil may be connected in parallel or series, as desired. In assembling the bottom plate to the top plate the position of the former plate is determined by a lug 24, Fig. 1, which enters a notch (not shown) in the edge of the bottom plate 5. Ears 25 project from the edge of the bottom plate and are located in notches 26 formed to receive them in the edge of the rim 4, each of these ears being drilled and tapped to receive screws by means of which the unit may be secured to additional parts of a range.

The mounting of the insulating bushings 8 constitutes an important feature of this invention. Preferably this is accomplished by

making the top plate 2 and the ribs or flanges 3 integral with each other by a metal casting process and supporting the bushings in the mold in such a manner that they will be cast into the flanges 3 and subsequently held securely in this position by the shrinking of the metal around them. This may be done in several ways, but a convenient method consists in supporting the bushings in a sand core, such as that shown at 20, Fig. 3. This core may be made in the same way as those commonly used in casting, suitable slots or spaces, such as those shown at 21, being left for the flow of the metal. The ends of the bushings are protected by the core so that metal cannot flow into them or cover them, and the threaded stud 6 may or may not be supported in the core, as desired. The method of making a core of this construction will be obvious to those skilled in the art of metal casting. This core after being baked with the bushings in it is placed in the sand in a casting "flask", a suitable cavity being made in the sand by means of a pattern to provide for the casting of the top plate 2 with its ribs 3 and peripheral flange 4. The melted metal flows around the bushings, completely encircling them, and as it cools it shrinks and anchors the bushings securely in the flanges. The core disintegrates in the casting operation, or the binder holding the sand particles together is destroyed, so that any remnants of the core are easily disposed of.

The bushings 10, 12 and 17 in the bottom plate 5 preferably are cast into this plate in the same general way. The mounting of these bushings for the casting operation will be obvious to those skilled in the art of casting.

This method provides an economical way of handling the relatively large number of bushings required in a unit of this kind, and produces a final structure which is very sturdy and reliable and which requires relatively little labor in assembling. A slow depreciation of the coil or heating conductor occurs in use so that it becomes necessary after a time to renew it. This can readily be done by taking the unit out of the range, removing the bottom plate, taking out the worn out coil and threading in a new one. The construction is of further advantage in affording very complete protection for the coil, while at the same time providing a smooth top surface on the unit for the support of cooking utensils.

In some cases it may be desirable to roughen, groove, or recess the central portions of the bushings, as shown for example at 22, Fig. 4, so as to give the casting metal additional anchorage in the bushings and to prevent any possibility of endwise movement of the bushings relatively to their support without destroying them. This, however, is not usually necessary.

While we have herein shown and de-

scribed a preferred embodiment of our invention and a typical method of making it, it will be understood that the invention may be embodied in other forms without departing from the spirit or scope thereof.

Having thus described our invention, what we desire to claim as new is:

1. In an electric heating unit, the combination of an electric heating conductor, a plurality of insulating bushings arranged in spaced relation through which said conductor extends and in which it is supported, and a metal support carrying said bushings and shrunk on them, thereby to hold the bushings in place.

2. An electric heating unit comprising a cast metal plate having integral flanges projecting from one side thereof, insulating bushings cast in said flanges and held in position by the shrinking of the metal on them, and an electric heating conductor extending through said bushings and supported by them in its operative position.

3. An electric heating unit comprising two metal plates secured together in substantially parallel spaced relationship, a cast metal grid between said plates, refractory insulating bushings mounted in said grid and held therein by the shrinking of the metal of the grids on them, and an electric heating conductor threaded through said bushings and supported by them.

4. That improvement in methods of making electric heating units which consists in supporting a plurality of refractory insulating bushings in position for casting, and casting a metal part for one of said units around said bushings but leaving the ends of the bushings exposed, whereby the shrinking of the metal upon cooling will lock said bushings securely in said part, and thereafter placing an electric heating conductor through said bushings.

5. That improvement in methods of making electric heating units which consists in making a casting core with a plurality of insulating refractory bushings supported in it, and casting a metal part for one of said units on said core and around said bushings, whereby the shrinking of the metal around the bushings when it cools will hold the bushings securely in said part, and thereafter placing an electric heating conductor through said bushings.

6. That improvement in methods of making electric heating units which consists in making a casting core with a plurality of refractory insulating bushings supported in it in such positions that the ends of the bushings are protected by the core, casting on said core a metal part for one of said units, and during said casting operation causing the metal to flow completely around said bushings except at their ends, whereby the subsequent shrinking of the metal upon cool-

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ing will lock said bushings securely in said part, and thereafter placing an electric heating conductor through said bushings.

7. In an electric heating unit, the combination of an insulating bushing and a flanged metal support cast therearound, said bushing extending through a flange of said support and held rigidly therein by the shrinking of the cast metal around the bushing.

8. In an electric heating unit the combination of an electric conductor, a series of insulating bushings arranged in spaced relation and supporting said conductor, and a metal support cast around said bushings, said bushings extending through and being held rigidly in said support by the shrinking of the cast metal around them.

9. In an electric heating unit the combination of an insulating bushing for supporting an electric heating conductor, and a metal support in which said bushing is mounted, the metal of said support being cast around said bushing and holding it securely in place, said bushing having a recessed outer surface in contact with the cast metal, whereby the cast metal entering said recessed surface serves to resist endwise movement of the bushing relatively to said support.

10. An electric heating unit comprising a cast metal plate having integral flanges projecting from one side thereof, insulating bushings cast in said flanges and held in position by the cooling and shrinking of the cast metal on them, said bushings extending through the flanges, and an electric heating conductor extending through the bushings and supported thereby in operative position.

11. An electric heating unit comprising a top metal plate, a series of metal flanges at the lower side of said plate, bushings of refractory insulating material extending through said flanges, the metal of said flanges being shrunk on the bushings and serving to hold them securely therein, and an electric heating conductor threaded through said bushings and supported thereby in operative position.

12. An electric heating unit comprising two metal plates secured together in substantially parallel spaced relationship, a cast metal grid between said plates, refractory insulating bushings mounted in said grid and held therein by the casting of the metal of the grid about them, and an electric heating conductor threaded through said bushing and supported thereby.

13. An electric heating unit comprising top and bottom metal plates, a plurality of metal flanges integral with one of said plates and projecting into the space between them, bushings of refractory insulating material mounted in said flanges, the metal of said flanges being cast about the bushings and serving to hold them securely in place, an electric

heating conductor threaded through said bushings and supported thereby in operative position, means for removably securing said plates together, and a rim carried by one of said plates and encircling said conductor, said rim and plates serving to substantially enclose said conductor.

14. That improvement in methods of making electric heating units which consists in supporting a plurality of refractory insulating bushings in position for casting, and casting a metal grid for one of said units around said bushings, while leaving the ends of the bushings exposed, whereby the shrinking of the metal upon cooling will lock the bushings securely in said grid; and thereafter mounting an electric conductor in said grid supported bushings.

15. That improvement in methods of making electric heating units which consists in making a casting core with a plurality of insulating refractory bushings supported in it, and casting a metal grid for one of said units on said core and around said bushings whereby the shrinking of the metal around the bushings when it cools will hold the bushings securely in said grid; and thereafter mounting an electric conductor in said grid supported bushings.

16. That improvement in methods of making electric heating units which consists in making a casting core with a plurality of refractory insulating bushings supported in it in such positions that the ends of the bushings are protected by the core, casting on said core a metal grid for one of said units, and during said casting operation causing the metal to flow completely around said bushings except at their ends, whereby the metal upon cooling will lock the bushings securely in said cast grid, and thereafter mounting an electric conductor in said grid supported bushings.

In testimony whereof we have hereunto signed our names to this specification.

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ALBERT L. SMITH.