C. C. ABBOTT.

ELECTRIC HEATING UNIT.

APPLICATION FILED OCT. 30, 1919.

1.394,518.

Patented Oct. 25, 1921.

Fig. 1.

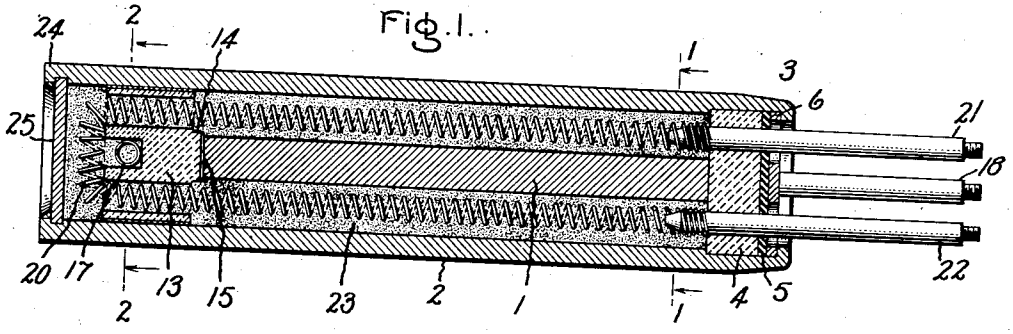


Fig. 2.

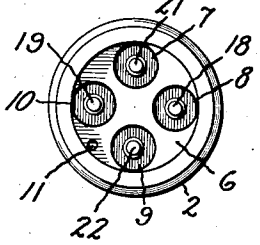


Fig. 3.

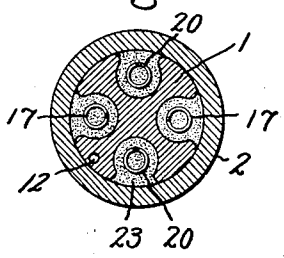


Fig. 4.

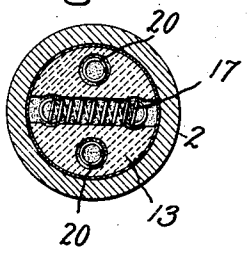
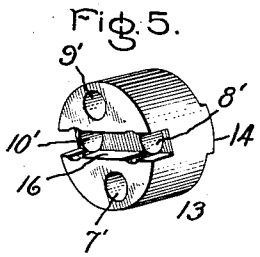


Fig. 5.



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by Albert G. Davis
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UNITED STATES PATENT OFFICE.

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ELECTRIC HEATING UNIT.

1,394,518. Specification of Letters Patent. Patented Oct. 25, 1921.

Application filed October 30, 1919. Serial No. 334,454.

To all whom it may concern:

Be it known that I, CHARLES C. ABBOTT, a citizen of the United States, residing at Pittsfield, county of Berkshire, State of Massachusetts, have invented certain new and useful Improvements in Electric Heating Units, of which the following is a specification.

My invention relates to electric heating elements of the type in which conductors are inclosed in a metallic sheath and insulated therefrom by a thin dense layer of insulating material having relatively high heat conducting properties. In my pending application for patent, Serial No. 262,722, filed November 15, 1918, I disclosed a heating element of this general character and my present invention is in the nature of an improvement upon that device. In said application, a device is shown having a metallic sheath filled with a dense mass of refractory insulating material and a single helical or sinuous conductor embedded in said mass. Obviously, with such a device, but one degree of heat is obtainable with a constant current. One of the objects of my present invention is to provide a heating unit of the character described in which different degrees of heat may be obtained, such as low, medium and maximum, with a constant current. This I accomplish by providing a plurality of helical or sinuous conductors in said unit and connecting said conductors in different combinations by any suitable switch. For example, in a two coil unit, said coils are connected in series for low heat, and in parallel for the maximum or high heat. A single coil may be used for medium heat. By such an arrangement a better heat regulation is possible. This device could be readily used in connection with a thermostatically controlled switch where it is desired to automatically control the temperature.

Further objects of my invention will appear from the following detailed description when taken in connection with the accompanying drawings, in which Figure 1 is a longitudinal section of one form of my invention; Fig. 2 is a view of the terminal end; Fig. 3 is a section taken on the line 1—1 of Fig. 1; Fig. 4 is a section taken on the line 2—2 of Fig. 1; and Fig. 5 is a perspective view of one form of lava spacer employed in my invention.

Referring to the drawings, 1 is a metal core, preferably of extruded brass, which is cross-shaped as shown in Fig. 3. This core is inserted in a sheath 2, which is made from any suitable metal capable of being swaged or drawn down, such as steel. This sheath is somewhat longer than said core so that other additional necessary members may be accommodated therein. The core 1, which is spun out at one end, is driven into said sheath, preferably from the terminal end 3, so as to tightly fit therein. Before the core has thus been fitted into the sheath the latter member is counter-bored and chamfered at the end 3 in order that this end may be more readily spun over. A lava spacer 4, an insulating washer 5, preferably mica, and a metallic disk 6, are next placed in the end 3 in the order named. The spacer 4, washer 5 and disk 6 are provided with openings through which the resistor terminals may pass. The number of openings of course depends upon the number of terminals used. In the preferred form, however, four terminals are used and four openings 7, 8, 9 and 10 are provided. I have also provided another small opening 11 in these units, and a hole 12 in the core 1. A dowel pin is driven through the openings 11 into the hole 12 to keep the openings 7, 8, 9 and 10 of the units 4, 5 and 6 in register, while the heating unit is being assembled. After the parts 4, 5 and 6 have been thus placed in the sheath 2, the end 3 is spun over. A lava spacer 13 is next placed in the other end of the tube 2, adjacent the core 1, which is provided with a number of openings 7′, 8′, 9′ and 10′, corresponding to those in the spacer 4. The spacer 13 is also provided with a tongue 14 which fits into a groove 15 of the core 1, to hold the spacer in position while the unit is being assembled, and to keep the holes 7′, 8′, 9′ and 10′ in register with the holes 7, 8, 9 and 10. The spacer 13 is also provided with a diametrical slot 16 connecting the holes 8′ and 10′ as shown in Fig. 5. 17 indicates a helical resistance element which is made of a high resistance material, such as nickel-chromium alloy. This element has been cut the proper length, and its ends are suitably secured to

terminal pins 18 and 19 passed through the openings 8 and 10 respectively with the ends of said terminal projecting beyond the sheath 2. As shown in Figs. 1 and 4, that part of the element 17 forming the loop lies in the slot 16 so as to hold it out of contact from a second resistance element during the assembly of the unit. A second resistance element 20 is secured to the terminal pins 21 and 22, in a similar manner to that described with reference to the element 17, which pins pass through the openings 7 and 9 respectively. The sheath 2 is then filled with an insulating powder 23, such as magnesia, so as to completely embed the resistance elements 17 and 20. After the sheath has been thus filled, the end 24 which is also slightly counterbored, is closed with a metallic disk 25. The edge of the sheath 2 is slightly prick-punched over to hold the disk 25 in position while the unit is being swaged. The unit is now subjected to a reducing process which consists in passing it through a swaging or rolling machine. After the unit has been swaged, the disk 25 is welded to the sheath 2 so as to make a waterproof joint.

While I have described my invention as embodied in concrete form and as operating in a specific manner in accordance with the provisions of the patent statutes, it should be understood that I do not limit my invention thereto, since various modifications will suggest themselves to those skilled in the art without departing from the spirit of my invention, the scope of which is set forth in the annexed claims.

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

1. An electric heating unit comprising a metallic sheath and a plurality of helical resistance elements embedded in pulverulent heat-refractory insulating material compacted to a dense mass around said elements within the sheath.

2. An electric heating unit comprising a metallic sheath and a plurality of helical resistance elements embedded in pulverulent heat-refractory insulating material compacted to a dense mass around said elements within the sheath, and terminal members for said elements projecting from the sheath.

3. An electric heating unit comprising a metallic sheath and a plurality of helical resistance elements, each of which is doubled forming parallel spirals with its terminals at the same end, embedded in a pulverulent heat-refractory insulating material compacted to a dense mass around said elements within the sheath.

4. An electric heating unit comprising a metallic sheath, a plurality of helical resistance elements embedded in pulverulent heat-refractory insulating material compacted to a dense mass around said elements within the sheath and terminal members with threaded ends screwed into the spirals with their opposite ends projecting from the sheath.

5. An electric heating unit comprising a metallic sheath and a plurality of helical resistance elements, each of which is doubled forming parallel helices with its terminals at the same end, embedded in a pulverulent heat-refractory insulating material compacted to a dense mass within said sheath, and terminal pins with threaded ends screwed into the helical ends of said elements with their opposite ends projecting from said sheath.

6. An electric heating unit comprising a metallic sheath, a metal core therein provided with longitudinal openings, and a plurality of helical resistance elements embedded in pulverulent heat-refractory insulating material compacted to a hard dense mass in said longitudinal openings.

7. An electric heating unit comprising a metallic sheath, a cross-shaped core therein, two spiral resistance elements each of which is doubled forming parallel spirals in the openings of said core and a pulverulent heat-refractory insulating material compacted to a hard dense mass around said elements.

8. An electric heating unit comprising a metallic sheath and a helical resistance element, which is doubled forming parallel helices with its terminals at the same end, embedded in a pulverulent heat-refractory insulating material compacted to a dense mass around said element within the sheath.

9. An electric heating unit comprising a metallic sheath, a cross-shaped core therein and a plurality of helical resistance elements embedded in pulverulent heat-refractory insulating material compacted to a hard dense mass in the openings formed by the cross-shaped core.

10. An electric heating unit comprising a metallic sheath, a metal core therein provided with longitudinal openings, a plurality of helical resistance elements embedded in pulverulent heat-refractory insulating material compacted to a hard dense mass in said longitudinal openings and terminal members with threaded ends screwed into the helices with their opposite ends projecting from the sheath.

11. An electric heating unit comprising a metallic sheath, a cross-shaped core therein, a plurality of helical resistance elements embedded in pulverulent heat-refractory insulating material compacted to a hard dense mass in the openings formed by the cross-shaped core and terminal members with threaded ends screwed into the helices with their opposite ends projecting from the sheath.

12. An electric heating unit comprising a metallic sheath, a cross-shaped core therein, an insulating spacer adjacent said core, two helical resistance elements in the longitudinal openings formed by said cross-shaped core bent over said spacer and held out of contact with each other by it, a pulverulent heat-refractory insulating material surrounding said elements and compacted to a hard dense mass and terminal members with threaded ends screwed into the helical ends of said elements with their opposite ends projecting from the sheath.

In witness whereof, I have hereunto set my hand this 28th day of October, 1919.

CHARLES C. ABBOTT.