J. C. WOODSON.

HEAT CARTRIDGE.

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1,433,691.

Patented Oct. 31, 1922.

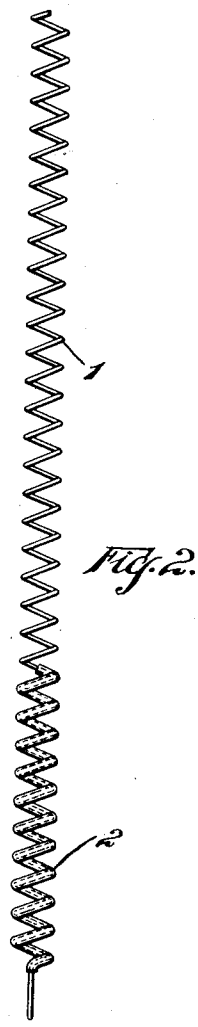

Fig. 2.

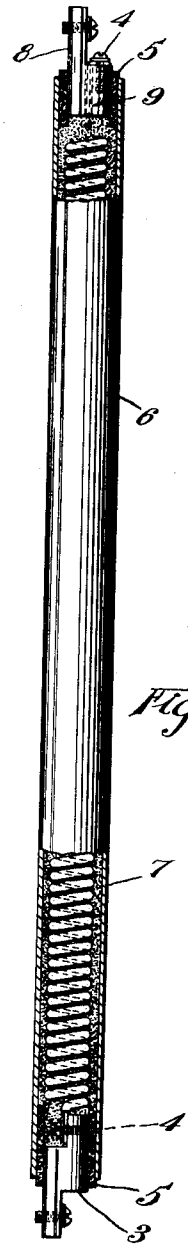

Fig. 1.

WITNESSES:

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UNITED STATES PATENT OFFICE.

JAMES C. WOODSON, OF MANSFIELD, OHIO, ASSIGNOR TO WESTINGHOUSE ELECTRIC PRODUCTS COMPANY, A CORPORATION OF MICHIGAN.

HEAT CARTRIDGE.

Application filed November 20, 1920. Serial No. 425,441.

To all whom it may concern:

Be it known that I, JAMES C. WOODSON, a citizen of the United States, and a resident of Mansfield, in the county of Richland and State of Ohio, have invented a new and useful Improvement in Heat Cartridges, of which the following is a specification.

My invention relates to electrically heated apparatus and particularly to electric heating elements, and it has for its object to provide an enclosed heating element or heat cartridge of compact form and of simple and durable construction.

In practising my invention, I form a resistor wire into a helix of relatively small diameter, then dip the formed helix in moistened powdered alundum, and after drying the coated helix place it inside a metal tube and fill the space inside of the helix and between it and the tube with dried, powdered alundum.

A suitable insulated terminal member is located at each end of the metal tube to serve as a circuit connector and also as a stopper.

In the single sheet of drawings,

Figure 1 is a view, partly in side elevation and partly in section, of a heater cartridge embodying my invention, and

Fig. 2 is a view, in side elevation, of a portion of the resistor wire used in the heater cartridge, the distances between the successive turns of wire being exaggerated for the sake of clearness.

A resistor wire 1, of suitable material and dimensions, is wound to form a single-layer helix, the diameter of which is relatively small, as compared with the total length thereof. The helix may be so wound that there are relatively small spaces between the adjacent turns of wire or it may be so wound that the spaces between the adjacent turns are relatively large, as compared with the diameter of the wire.

The complete helix is dipped in moistened alundum a sufficient number of times to provide a suitable coating 2 of that material upon the entire surface of the wire, as is shown at the lower end of the helix in Fig. 2. The spaces between the successive turns of wire, as indicated in Fig. 2, are greatly exaggerated, inasmuch as, in actual practise, after the helix has been dipped in moistened alundum the requisite number of times, the spaces between turns are substantially filled so that when thoroughly dried, the device is self-sustaining.

A terminal member 3 is connected to one end of the resistor wire 1 by means of a screw 4 and is provided with an insulating sleeve 5 the outer diameter of which is such that it will closely fit the interior of a metal tube 6. The internal diameter of the tube 6 is somewhat larger than the external diameter of the coated helix, for a purpose to be hereinafter set forth.

The helix may be placed in its operative position inside of the metal tube 6 by holding the tube in a substantially vertical position and then feeding the helix, with the terminal member 3 at the upper end thereof, vertically downward into the tube until the helix and the terminal member 3 occupy their proper operative positions therein, the tube being then reversed to the position shown in Figure 1.

As the coated helix constitutes a self-sustaining tubular member, it occupies substantially the position shown in Figure 1, that is, it is substantially co-axial with the tube.

Dried powdered alundum 7 is poured into the upper open end of the tube until all of the space not occupied by the helix is filled therewith.

A terminal member 8, having an insulating sleeve 5 is provided with an axial opening 9, through which the corresponding end of the resistor wire 1 may be threaded. A screw 4 is provided in the terminal member 8 to securely clamp the end of the resistor wire thereto after the terminal member and its insulating sleeve 5 have been forced into the open end of the tube 6 to hold the terminal member in proper operative position in the said tube and to act as a stopper therefor.

The entire heated cartridge may now be dried sufficiently to insure removal of all moisture from the alundum filling.

It may be noted that my method of primarily insulating the bare wire of the helix results in a resistor element of substantially tubular shape which is practically self-supporting and which may be placed in a tubular metal container without danger of deformation. The helically wound resistor wire is thus located centrally in the metal

container, and, therefore, the breakdown distance from the resistor wire to the metal container is uniform.

It may be noted further that the use of dry powdered alundum, as a filling material, ensures both adequate electrical insulation and a satisfactory heat conduction.

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

I claim as my invention:

1. An electrical heating element comprising a container, a substantially self-sustaining resistor in said container, and a filling of alundum surrounding said resistor.

2. An electrical heating element comprising a containing member, a helically-wound resistor, a primary coating of pulverulent insulating material surrounding said resistor wire and constituting therewith a member of substantially tubular shape, a filling of pulverulent insulating material in said containing member and terminal members for said resistor located at the ends of said containing member.

3. The method of making an electrical heating element which comprises winding a resistor wire into a helix, dipping the same in moistened alundum, drying same, placing it in a containing member, and filling the containing member with dry alundum powder.

4. The method of making an electrical heating element which comprises winding a resistor wire into a helix, dipping the same in moistened alundum, drying it, connecting a terminal member to one end of said helical resistor wire, placing the helix in a tubular metal container with the terminal member located in one end of said tube, filling the tube with dry alundum, placing a second terminal member in the other end of said tube and drying the complete heating element.

5. The method of making an electrical heating element which comprises winding a resistor wire in the form of a helix of relatively small diameter, dipping the same in moistened alundum until a member of substantially tubular form is obtained, drying it, connecting a terminal to one end of said wire, placing the helix in a metal tube with the terminal member closing one end of said tube, filling the space inside of said metal tube, inside and outside of said helix with dry alundum, placing a second terminal member in the other end of said metal tube, and drying the complete heating element.

6. A heating element comprising a metal tube, a helically-wound resistor wire therein, a coating of alundum surrounding said resistor wire to form therewith a member of substantially tubular shape, an insulating member of substantially tubular shape located in said metal tube at each end thereof, a terminal member in each of said insulating members adapted to plug the end of said metal tube, and a filling of alundum in said metal tube.

7. A heating element comprising a metal tube, a helically-wound resistor wire in said tube, a coating of alundum on said wire forming therewith a member of substantially tubular shape, insulated terminal members connected to the ends of said resistor wire, located in the ends of said metal tube and adapted to close the said ends, and a filling of alundum in said metal tube.

8. An electric heating element comprising a metal tube, a helically wound resistor wire located in said tube, a primary coating of pulverulent insulating material surrounding said wire and constituting therewith a member of substantially tubular shape, and a filling of pulverulent insulating material in said tube within and without said helically wound resistor.

9. An electrical heating element comprising a container, a resistor in said container, a coating of initially moistened pulverulent electrical-insulating material on said resistor, and a filling of dry pulverulent insulating material within said container.

10. An electrical heating element comprising a tubular container, a resistor in said container, a coating of an adhesive pulverulent electrical-insulating material on said resistor and a filling of dry pulverulent electrical-insulating material in said container.

11. An electrical heating element comprising a container, a resistor in said container, a coating of initially moistened pulverulent electrical-insulating material on said resistor and a mass of the same pulverulent material in a dry condition filling said container.

In testimony whereof, I have hereunto subscribed my name this 15th day of Nov. 1920.

JAMES C. WOODSON.