Sept. 13, 1927. 1,642,223

V. A. BOKER

HEATING ELEMENT AND METHOD OF MAKING THE SAME

Filed Aug. 18, 1924

Fig. 1

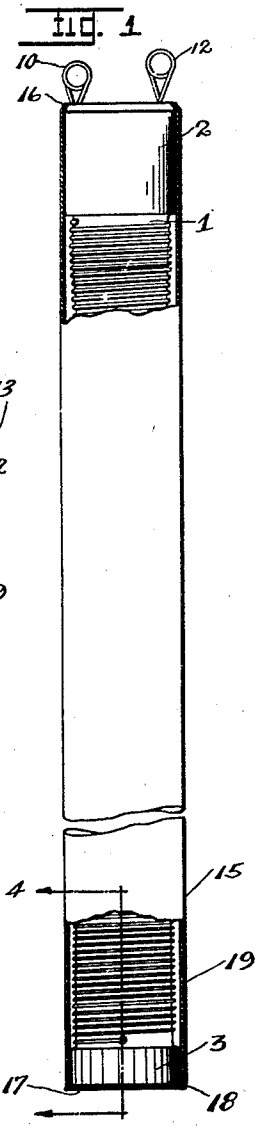



Fig. 2

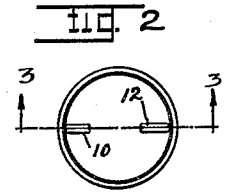



Fig. 3

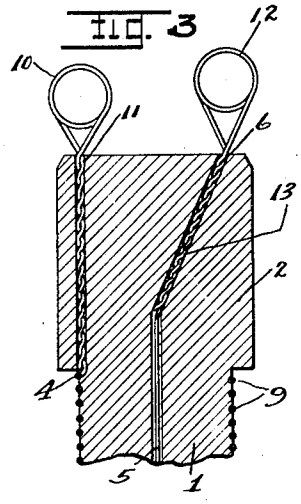
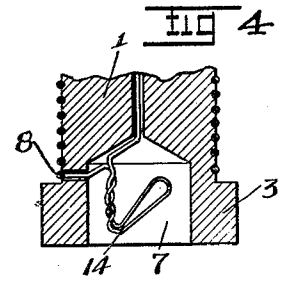



Fig. 4




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# UNITED STATES PATENT OFFICE.

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## HEATING ELEMENT AND METHOD OF MAKING THE SAME.

Application filed August 18, 1924. Serial No. 732,728.

One object of my invention is to provide a strong rigid type of heat element that will stand a maximum of abuse.

Another object is to provide a heating element in which the heat coil and terminals are formed of a single continuous piece of wire.

Another object is to provide in a heating element, a core of such type that a metal shell may be solidly joined thereto and the conductor perfectly insulated therefrom.

Another object is to provide an improved method of forming the terminals and conductor of a heating element of a single piece of wire with no resultant slack wire.

With these and incidental objects in view, the invention consists of certain novel features and combination of parts, the essential elements of which are hereinafter described with reference to the drawing accompanying the specification and also a certain new method of producing the device described herein.

In the drawing, Figure 1 is a side elevation of my improved heating element with portions of the outer shell broken away. Figure 2 is a top view of the same. Figure 3 is a section taken on the line 3—3, Figure 2, and Figure 4 is a section taken on the line 4—4, Figure 1.

As shown in the drawing, the core has heads 2 and 3 at either end thereof, the portion between the heads being reduced in cross sectional area.

An aperture 4 is drilled through the head 2 parallel with the axis of the core to allow the bringing out of one end of the wire through the aperture to form the terminal, as will later be described.

The axial aperture 5 runs through substantially the entire length of the core, but is met in the head 2 by the inclined aperture 6, which serves to bring out the other terminal. A well or pocket 7 is left in the head 3 for purposes hereinafter described and a radial aperture 8 permits the wire being brought from the exterior of the core to the pocket 7.

This core 2 may be made of any suitable material, but I have in general preferred to use soapstone, turning the core as shown and cutting shallow threads along its surface at 9 to receive therein the convolutions of the resistor.

In applying the conductor to the core, I prefer to form a double loop 10, twisting the free end of the wire back as at 11 and insert the twisted portion into the aperture 4, bringing the conductor to the threads 9, in which the resistor is then wound to the opposite end of the core where it is passed through the radial aperture 8 into the pocket 7.

From the pocket 7 the free end of the wire is fed through the axial aperture 5 and inclined aperture 6 and then the second terminal loop 12 is formed and the free end of the wire twisted back as at 13.

This twisted portion is then drawn back into the aperture 6 by pulling the slack into the pocket 7 and the slack is then disposed of by looping and twisting the wire as indicated at 14, Figure 4.

When the resistor has been thus wound and the terminals thus firmly positioned by drawing the twisted portions of the wire into the apertures 4 and 6 and taking up the slack as shown at 14, the resistor is firmly and solidly mounted on the core and without outside protection would stand a very considerable amount of abuse.

However, to thoroughly protect the resistor, I provided the shell 15, which closely fits over the heads 2 and 3, as shown in Figure 1 and this shell is spun over the head 2, as shown at 16, Figure 1, and a disc 17 is dropped over the end of the head 3 and the end of the shell at 18 is then spun around this disc and also brazed or welded thereto.

This insures the core with its mounted conductor being solidly incased in the shell and prevents any damage from the exterior.

To further insure the protection of the resistor, I sometimes fill the space 19 between the core and the shell and between the heads 2 and 3 with a comminuted refractory insulating substance, for which I sometimes employ the turnings obtained from the forming of the core itself.

When this space is well packed with such a material the resultant element is absolutely solid, rigid and will stand an almost unlimited amount of abuse.

While I have described my invention and illustrated it in one particular style and method, I do not wish it understood that I limit myself to this particular embodiment as it is evident the invention may be varied in many ways within the scope of the following claims:

I claim:

1. In a heating element, the combination of a core having integrally formed heads at the ends thereof, one of said heads having a pocket therein and said core having an aperture extending from said pocket and out through the other head, said other head also having a lateral aperture extending from the end thereof to the periphery of the core proper, and a resistor wound on the core intermediate said heads, one end of said resistor extending through said lateral aperture and the other extending into said pocket and from thence into and through said first mentioned aperture.

2. In a heating element, the combination of a core having heads on either end thereof and threads cut on the intermediate portion thereof and an aperture passing through said head parallel with the axis of said core, an axial aperture, and an inclined aperture meeting said axial aperture and having a pocket formed at one end thereof, of a resistor wound on the intermediate portion of said core and having the ends thereof passing through said apertures and formed into reinforced terminals, a portion of said resistor being deposited in the pocket positioned at one end of said core.

3. In a heating element, the combination with a core having a body portion and two head portions of a resistor wound around the body portion of said core and passing through apertures in said core out of one end of said core, the ends of said resistor being formed into reinforced terminal loops, a part of said reinforcement extending into the apertures in said core.

4. In a heating element, the combination with a core which is reduced intermediate its two ends and threaded over said reduced portion, one end of the core having a lateral aperture opening to the nearer end of the threaded portion, and said core having a long aperture extending substantially throughout its length to connect the said end of the core with the farther end of the threaded portion, a resistor wound upon said threaded portion and having its ends extending through the respective apertures and paired, as terminals, beyond said end of the core, the extreme end portions of the resistor being twisted back upon themselves to reinforce the terminals formed thereby, said twisted portions of the resistor being contained within said apertures.

5. The structure set forth in claim 4 in which said core has a pocket, in the end opposite from the terminals, for enclosing a slack portion of the resistor which is redrawn from the long aperture.

6. In a heating element the combination of a core, the major portion of which is threaded, said core having an aperture extending from one end thereof to the nearer end of the threaded portion of the core, said core having a pocket in the other end thereof and a long aperture extending from said pocket through the core and to the opposite end thereof, said pocket communicating with the threaded portion of the core adjacent thereto, a resistor wound upon said threaded portion and having one end projected through said first mentioned aperture, the other end of the resistor being projected through the pocket and said long aperture and out of the core near the first mentioned end of the resistor, said resistor ends being formed into terminals by being looped and twisted upon themselves, the twisted portions being within said apertures so as to reinforce the terminals.

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