A. M. WENTWORTH.

SHEATHED WIRE TERMINAL.

APPLICATION FILED SEPT. 25, 1918.

1,298,609. Patented Mar. 25, 1919.

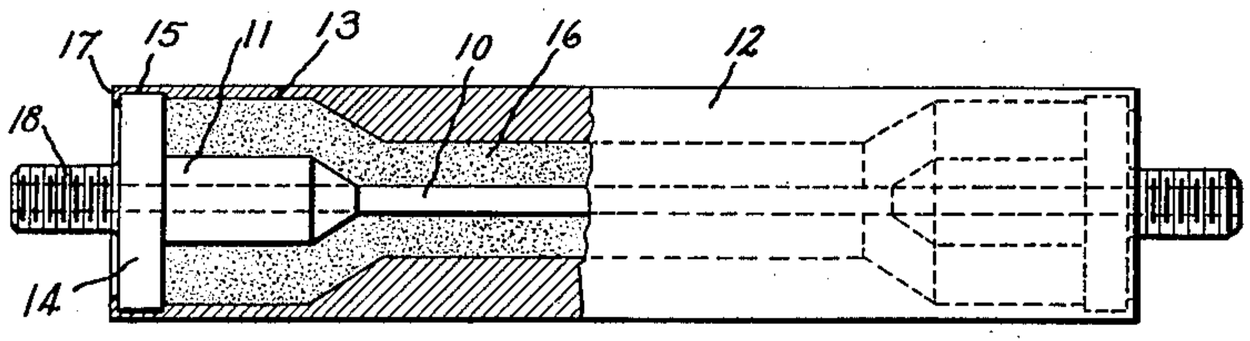

Fig. 1.

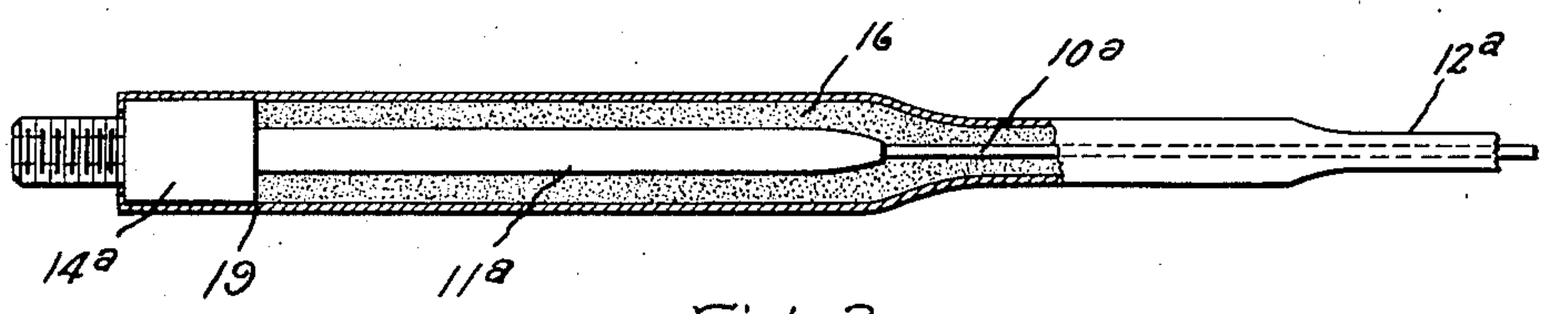

Fig. 2.

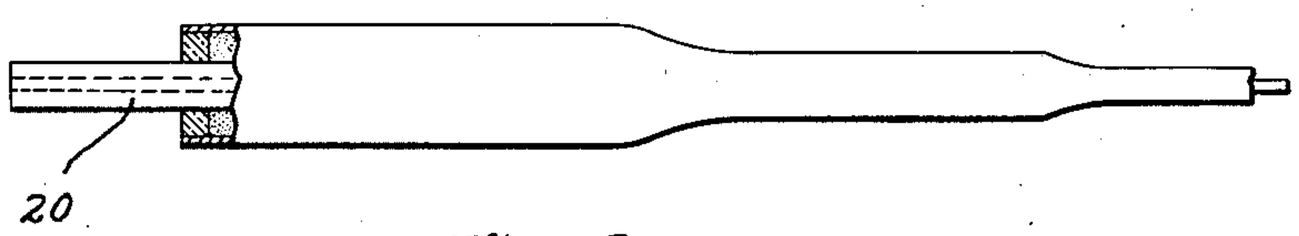

Fig. 3.

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UNITED STATES PATENT OFFICE.

ARTHUR M. WENTWORTH, OF PITTSFIELD, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

SHEATHED-WIRE TERMINAL.

1,298,609. Specification of Letters Patent. Patented Mar. 25, 1919.

Application filed September 25, 1918. Serial No. 255,631.

To all whom it may concern:

Be it known that I, ARTHUR M. WENTWORTH, a citizen of the United States, residing at Pittsfield, in the county of Berkshire, State of Massachusetts, have invented certain new and useful Improvements in Sheathed-Wire Terminals, of which the following is a specification.

My invention relates to the manufacture of wire commonly known as "sheath wire" which consists of a core wire inclosed in a metallic shell with an intervening layer of insulating material, and involves more particularly the securing of suitable terminals for the wire.

In the manufacture of sheath wire for electrical purposes the production of suitable terminals is of very great importance. Various methods have been devised for producing such terminals some of which involve the use of separate terminal members secured to the core wire, but generally the tendency has been toward an integral terminal obtained by leaving the ends of the core wire large enough for terminal purposes. Where separate terminals have been proposed they have been faulty, principally in the means employed for securing contact between the terminal and the core wire. The use of a separate member for a terminal makes it possible to use different materials for the core wire and the terminals. If the terminal is of an oxid-resisting material, the core wire need not necessarily be non-oxidizing providing the contact between the terminal and the core wire is good and the core wire is properly protected. If, on the other hand, the core is of a non-oxidizing material which is difficult to work, I may use a more workable material for the terminal.

In carrying out my invention the separate elements which are to constitute the terminals are adapted to fit snugly over the ends of the core wire, and in the arrangement which I have shown the ends of these terminal elements are large enough to form plugs which close the ends of the tube containing the core wire and the surrounding insulating material from which the wire is to be formed. The tube is formed at the end so as to leave a liberal space for insulating material between the terminal portion of the plug and the tube so that a relatively thick insulating wall will be formed around the terminals independently of the thickness of the sheath or the insulating wall of the sheath wire proper. This larger insulating wall gives more "creeping surface" insulation and dielectric strength at this point and makes it practicable to seal the finished end to protect the core wire from oxidization. The tube with the plugs in the ends is then swaged down to a certain extent thereby reducing the terminals to their finished size and forcing the terminals into intimate contact with the core wire; in fact, the contact becomes so firm that the core wire and the terminal may for all practical purposes be considered a unit. The further reductions necessary to produce the finished sheath wire are then made by rolling or swaging between the terminal enlargements. When the wire is finally reduced to its proper size the plug portion of the terminal is cut off and the sheath and insulating wall are cut away to expose the terminal to the desired length. The end of the sheath is preferably then sealed around the terminal with enamel or other suitable material.

For a more complete understanding of my invention, reference may be had to the accompanying drawings in which I have shown one way in which my invention may be carried out and in which Figure 1 is a side view, partially in section, of the assembled parts of the ingot which is formed preparatory to the reducing process; Fig. 2 is a sectional view of the ingot shown in Fig. 1, reduced to the proper size, and Fig. 3 is a side view of a section of sheathed wire, embodying my invention, after the sheath and insulating material have been stripped from one end of the wire to expose one of the terminals.

Referring now to the drawings, and first to Fig. 1, 10 is a core wire, which is made of a high resistance material when the unit is to be used for electric heating as it usually is. Each end of the core wire is provided with an enlarged member 11, which is here shown as a sleeve closely surrounding the core wire, and which, when the ingot has been reduced, becomes an enlarged terminal for the heating unit as will more fully hereinafter appear. The core wire of the ingot is inclosed in a metal sheath 12 which is counterbored at each end as at 13, so as to

form a space substantially larger between the sleeve 11 and the metal sheath 12, than that between the main part of the resistance core wire and the sheath which space, when filled with insulating material and reduced, provides the necessary dielectric strength between the terminal and the sheath. The sleeve 11 is provided with a disk 14 which is here shown as integral therewith and which fits snugly within a still further reduced portion 15 of the sheath 12 to hold the core wire concentric with the sheath and hold the insulating powder 16, which is filled between the core and the sheath, in position while the wire is being reduced. The edges of the sheath extending beyond the disks 14 are turned over as at 17 to hold the disk with its sleeve in position. The portion of the sleeve 11 projecting without the disk 14 is preferably threaded as at 18 for the purpose of attaching the ingot to the machine in which the ingot is reduced.

In preparing the ingot, one end of the core is surrounded by its sleeve, the sheath is counterbored and the core wire assembled within the sheath, the core and sheath being held in position by the disk 14 over the edge of which the end of the sheath is turned as previously explained. The space between the core and the sheath is then filled with a suitable refractory powdered insulating material such as magnesia which is a good electric insulating material and a fairly good heat conducting material. After the ingot is filled with the magnesia, or other insulating material, the sleeve is placed in position over the other end of the core wire with the disk thereon engaging the opposite end of the sheath in the same manner as that at the other end of the ingot. The entire ingot is then reduced until the sleeve 11 becomes of the size desired for the terminal when the reducing process is discontinued at the ends but continued in the intermediate portion until the core wire in the main body of the sheath has been reduced sufficiently to give to the core wire the required resistance. I have indicated in Fig. 2 the reduced parts corresponding to the core 10, sleeve 11, sheath 12 and disk 14 by the reference characters 10^a, 11^a, 12^a and 14^a, respectively.

It will be apparent that in accordance with my invention a terminal 11^a which, because of the reducing process, is substantially integral with the core is formed thereby providing intimate contact between the two. Furthermore, because of the ample space provided between the sleeve and the sheath formed by counterboring the latter, a layer of insulating material is provided between the finished terminal 11^a and the sheath which is sufficiently thick to provide high dielectric strength and prevent creepage between the core and the sheath in the finished wire.

After the wire has been brought to the condition shown in Fig. 2 by the reducing process, the ends of the entire wire are cut off at 19 just within the ends of the plugs 14^a. A section of the sheath and insulating material at each end of the wire is then stripped to expose a section of the terminal as at 20 to which electrical connection may be made in any desired manner.

It will, of course, be understood that sheathed wire made in accordance with my invention is used in the same manner as ordinary sheathed wire, the character of which is now well understood in the art.

While I have herein shown and described one form of my invention, I do not desire to be limited to the exact arrangement shown and described but seek to cover in the appended claims all those modifications which come within the true spirit and scope of my invention.

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

1. The method of forming a terminal on sheath wire which consists in placing a terminal member over the end of the core wire, reducing the terminal member until it firmly grips the core wire and then reducing the sheath between the terminals to the desired degree.

2. The method of forming a terminal on sheath wire which consists in placing a terminal member over the end of the core wire so that it is surrounded by the insulating material, compacting the insulating material and reducing the terminal member to cause the latter to firmly grip the wire and then completing the reduction between the terminals to the desired degree.

3. The method of forming a terminal on sheath wire which consists in placing a terminal member in the end of the sheath containing the core wire and insulating material so as to be surrounded by the insulating material, reducing the sheath with the insulating material confined to cause the terminal member to firmly grip the core wire and then completing the reduction between the terminals to the desired degree.

4. The method of forming a terminal on sheath wire which consists in placing a plug in the end of the sheath containing the core wire and insulating material having a reduced terminal portion which fits over the end of the core wire, reducing the sheath until the terminal portion firmly grips the core wire and the surrounding insulating material is firmly compacted and then completing the reduction between the terminal members to the desired degree.

5. The method of forming a terminal on sheath wire which consists in placing a terminal member in the end of the sheath containing the core wire and insulating material so as to be surrounded by the insulating ma-

terial, reducing the sheath with the insulating material confined to cause the terminal member to firmly grip the core wire, completing the reduction between the terminals to the desired degree, exposing the end of the terminal and then sealing the end of the tube around the terminal.

6. The method of forming a terminal on sheath wire which consists in placing a plug in the end of the sheath containing the core wire and insulating material having a reduced terminal portion which fits over the end of the core wire, reducing the sheath until the terminal portion firmly grips the core wire and the insulating material is firmly compacted, completing the reduction between the terminal members to the desired degree, cutting off the enlarged portion of the plug, exposing a portion of the terminal member and then sealing the end of the tube around the terminal.

7. A sheath wire unit comprising a core wire centrally located within a metallic sheath with intervening firmly compacted insulating material and a metallic sleeve fitted over the core wire and firmly pressed into contact with the core wire, said sleeve member being partially exposed to form a terminal.

8. A sheath wire unit comprising a core wire centrally located in a metallic sheath with intervening firmly compacted insulating material, a metallic sleeve fitted over the end of the core wire with a greater thickness of insulating material surrounding it than surrounds the core wire and firmly pressed into uniform contact with the core wire, said sleeve member being partially exposed to form a terminal.

9. A sheath wire unit comprising a core wire centrally located in a metallic sheath with intervening firmly compacted insulating material and a metallic sheath fitted over the core wire with a greater thickness of insulating material surrounding it than surrounds the core wire and firmly pressed into uniform contact with the core wire, said sleeve member being partially exposed to form a terminal, and means for sealing up the end of the sheath around the terminal.

In witness whereof, I have hereunto set my hand this 19th day of Sept. 1918.

ARTHUR M. WENTWORTH.