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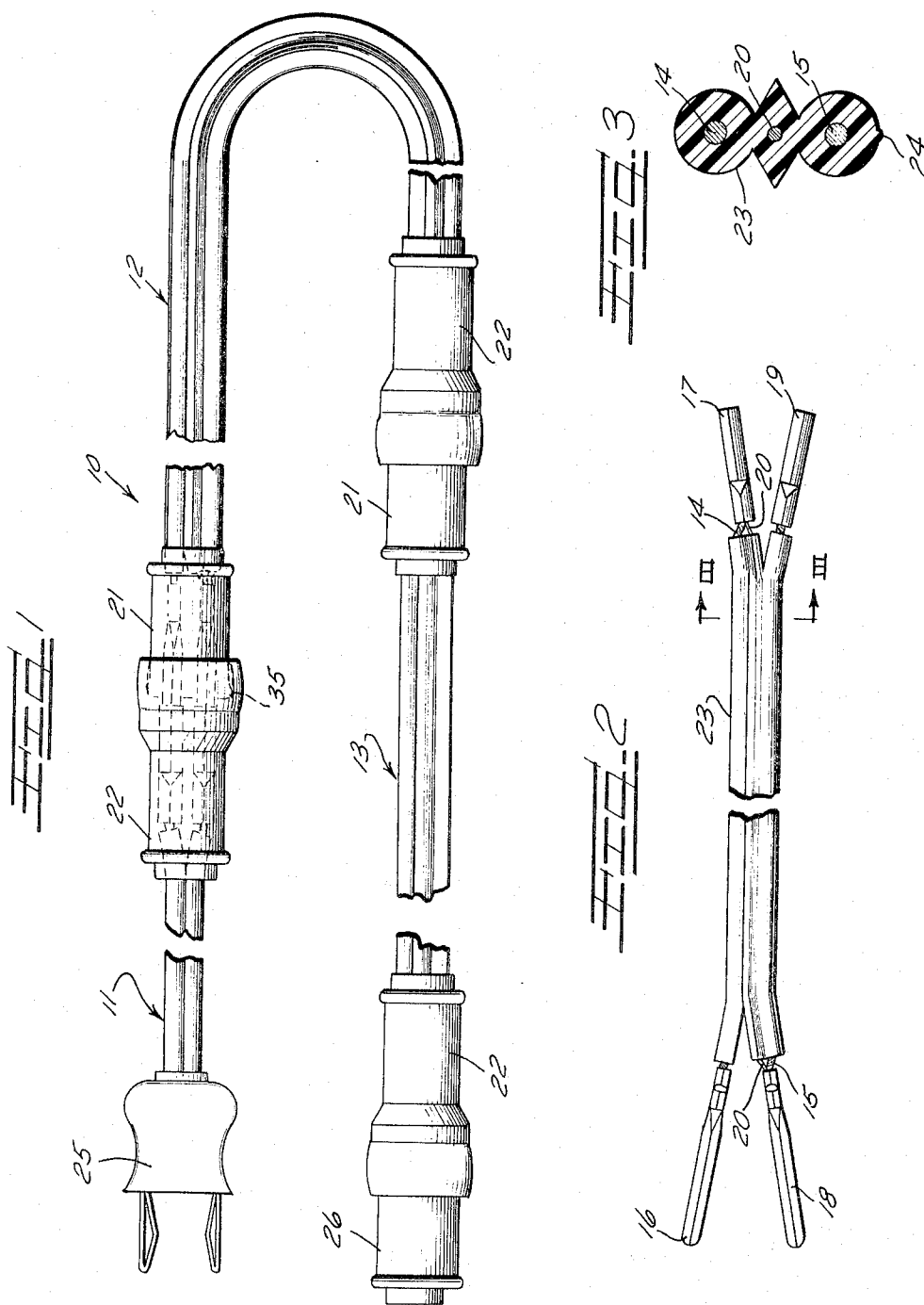
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HEATER CABLE ASSEMBLY

Filed Jan. 13, 1965

2 Sheets-Sheet 1



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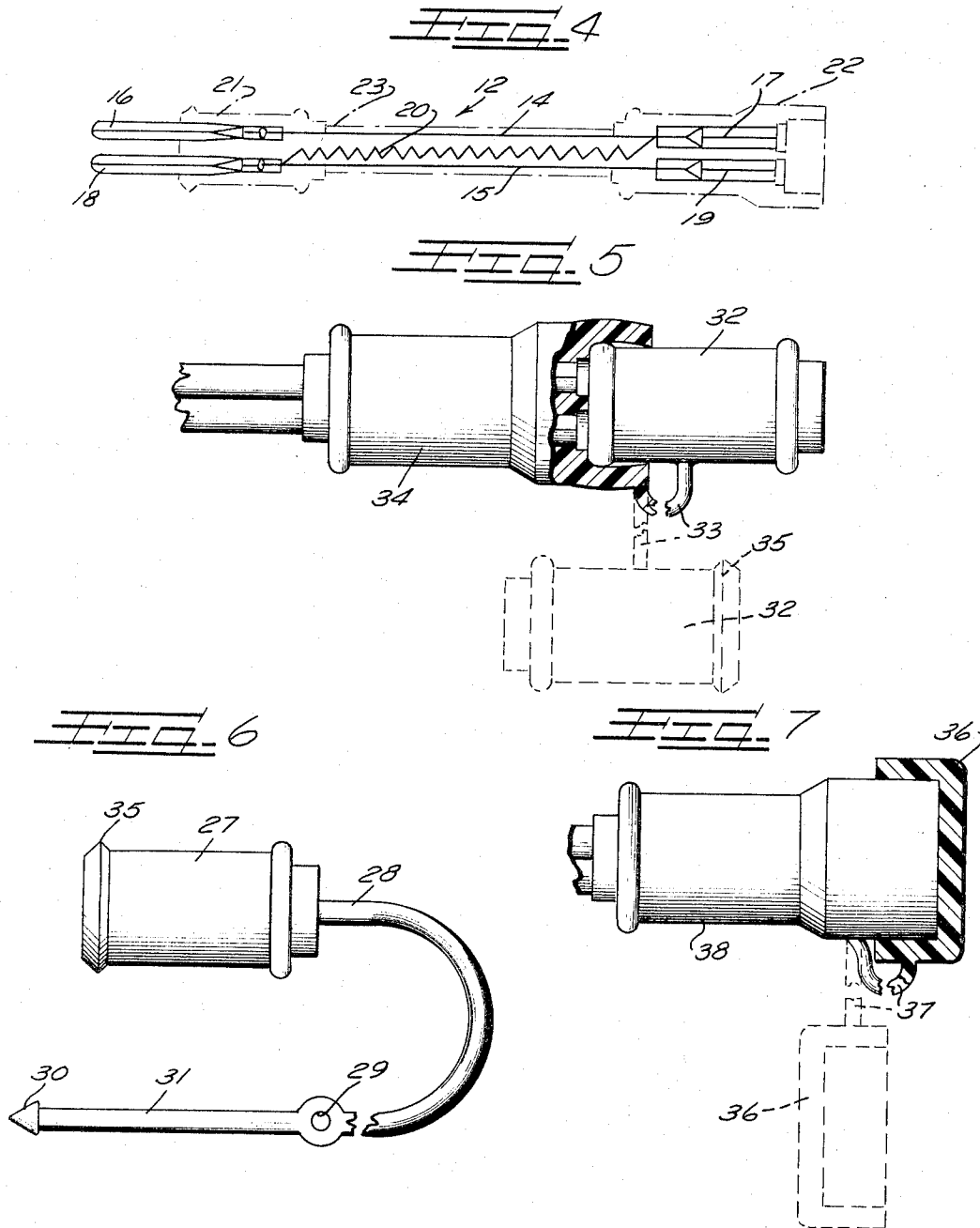
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HEATER CABLE ASSEMBLY

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ABSTRACT OF THE DISCLOSURE

A waterproof heating cable assembly having a cable segment with a pair of conductors, a waterproof connector at each end, and a heating element extending between the connectors and connected across the conductors. One of the connectors having a water tight closure for mating with the connector. The insulation of the cable and connector bodies are both vinyl plastic.

This invention relates generally to an electric heater cable assembly, and more specifically to a heater cable which is adapted, by its structure, to be used as a heater cable for gutters, eaves, downspouts, and the like.

In prior gutter cable assembly construction, it has been customary to manufacture the same to employ various lengths of heater wire, for example lengths such as 20 feet, 40 feet, and 60 feet. Each of these lengths has been disposed as a loop, thereby giving a maximum effective length which is only half as great, namely 10 feet, 20 feet, and 30 feet. As the requirements for gutter cable lengths vary considerably between users, it has been necessary heretofore for manufacturers and dealers to manufacture and stock gutter cable assemblies of various lengths. As a practical matter, it is entirely commercially impractical to have on hand those lengths for which the demand is small.

I have provided a heater cable assembly which can be manufactured in a single length of segment or module, wherein such segments may be connected together in end-to-end relation to provide such combined or total heater cable assembly lengths as the user may desire. By way of example, the basic segment may be manufactured in a 25-foot length, thus constituting a single length for manufacturing and stocking purposes, while the user may employ from one to four of these lengths to obtain effective lengths of 25, 50, 75 and 100 feet.

Accordingly, it is an object of the present invention to provide an improved heater cable assembly.

Another object of the present invention is to provide a heater cable assembly assembled from a number of modules constructed to enable end-to-end connection.

A still further object of the present invention is to provide a heater cable assembly which may be connected mechanically in series with similar assemblies, but wherein the heater elements are in fact in electrical parallel.

Another object of the present invention is to provide a heater cable assembly so constructed that the conductor and heater portion thereof may constitute segments severed from a somewhat longer supply of the same.

Many other advantages, features and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description and to the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

On the drawings:

FIG. 1 is an elevational view, partly broken away, of a heater cable assembly provided in accordance with the principles of the present invention;

FIG. 2 is an elevational view of a heater cable assembly

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as shown in FIG. 1 but wherein connectors have been omitted from the drawing;

FIG. 3 is an enlarged cross-sectional view taken along line III—III of FIG. 2;

FIG. 4 is a schematic electrical diagram of one of the heater cable assemblies or modules shown in FIG. 1;

FIGS. 5, 6 and 7 are enlarged representations of various closures to be employed with the endmost connector, the same being variations of the corresponding part shown in FIG. 1.

As shown on the drawings:

The principles of this invention are particularly useful when embodied in an electrical heater cable assembly such as illustrated in FIG. 1, generally indicated by the numeral 10. The assembly 10 includes a power cord assembly 11, and a selected number of cable segments, assemblies, or modules 12 and 13, each of which may be identical to the other.

As shown schematically in FIG. 4, each of the cable assemblies 12 or 13 includes a pair of elongated conductors 14, 15 which comprise good conducting material, and which typically may be 25 feet in length. A male terminal 16 and a female terminal 17 are connected to the opposite ends of the conductor 14, while a male terminal 18 and a female terminal 19 are connected to the opposite ends of the conductor 15. An elongated heating element 20 extends coextensively with the conductors 14, 15, and is connected at one end to the conductor 14, near the terminal 17, while the heating element 20 is connected at its other or opposite end to the conductor 15 at or near the terminal 18. The terminals 16 and 18 are embedded in water-tight relation in a connector 21, while the terminals 17 and 19 are likewise embedded in watertight relation in a connector 22. The conductors 14 and 15 and the heating element 20 are embedded in suitable insulation 23 in spaced insulated relation from each other, the insulation 23 running coextensively with the conductors 14 and 15, and the heating element 20.

When a commercial power supply is connected to the terminals 16, 18, a voltage appears across the heating element 20. A further cable assembly such as 13, identical to the cable assembly 12, may be assembled with its terminals 16 and 18 received within the terminals 17, 19. When power is applied to the first terminals 16, 18, the voltage then appears across both heating elements 20, each heating element 20 receiving the full voltage.

FIGS. 2 and 2 illustrate an actual construction of this type. Lengths of wire to constitute the power conductors 14 and 15 and the heating wire or element 20 have the insulation 23 extruded thereover to provide a supply of such material. The insulation 23 preferably comprises flexible vinyl. The insulation surrounding the conductor 15 is provided with an external bead or marker 24 which serves to identify or code the conductor 15 throughout its length. The insulation 23 adjacent to the wire that makes up the heating element 20 is provided with a distinctive shape so as to distinguish the resulting product in appearance from three-conductor cable. The insulation is trimmed back an appropriate distance from each end to expose the ends of the conductors 14 and 15 and the ends of the heating element 20, the heating element 20 being twisted about or otherwise secured to the conductor 14 at one end, and to the conductor 15 at the opposite end, after which the terminals 16-19 are applied. Thereafter, the connectors 21 and 22, which also comprise vinyl plastic, are attached.

The conductors 14, 15 are sufficiently flexible as to enable the resulting assembly to be coiled and to be disposed in a selected pattern to be heated. A wire size is employed which is sufficient to accommodate a current drawn by a preselected number of such cable assemblies

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12, 13, which typically may be four such assemblies. The wire which serves as the heating element 20 is selected so that with rated voltage applied thereto, the assembly 12 will draw about eight watts per foot. This power produces a temperature rise consistent with that which the vinyl insulation 23 can withstand. For the parameters given in this example, a wire having a resistance of about 2.67 ohms per foot is satisfactory.

The connectors 21, 22 are preferably waterproof when assembled as shown in FIG. 1. To this end, each connector is preferably circular so as to provide a uniform tension or compression in a radial direction in the respective connectors 21, 22. The power cord 11 is provided with one of the connectors 22. The other end of the power cord has a conventional connector 25 which is to be disposed a considerable distance from the connector 22 of the power cord assembly 11, at a place not needing waterproofing.

As the outboard, free or distal end of the assembly 10 terminates in an open or socket-type of connector 22, an appropriate watertight closure 26 is provided which mates therewith in a watertight manner to preclude entry of moisture to the endmost connector 22. The closure 26 is a vinyl plug which is externally similar in dimensions to the connector 21.

If desired, to prevent loss of the closure 26, a closure member 27 shown in FIG. 6 may be provided which is functionally identical to the closure 26, but which has an integral flexible connecting means 28 in which there is an aperture 29 through which a shouldered end 30 may be inserted after a portion 31 between the pointed end and the aperture 29 has been wrapped around the cable assembly between the connectors 21, 22.

FIG. 5 illustrates a further closure 32 which is identical to the closure 26, with the addition of a flexible connecting means 33 which is integral with both the closure 32 and a socket 34 which is otherwise identical to the socket 22. FIG. 5 also illustrates that the closures 26, 27 and 32 have a bead 35 on their inner end, as does the connector 21, which becomes slightly crushed by the surrounding socket, and which tends to bulge the socket portion outward by a slight amount. The degree of such bulging and compression has been exaggerated slightly in the drawings for reasons of clarity.

In place of the plug 26, a cap may be employed to close the socket 22 in a watertight manner, such a cap being illustrated at 36 in FIG. 7, the same being illustrated as being provided with integral flexible means 37 which are also integral with a socket 38 to prevent loss thereof.

Although various minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon all such embodiments as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. A heater cable assembly, comprising:

(a) a cable segment having a pair of conductors;

(b) a pair of waterproof connectors having bodies of plastic which plastic has the physical properties of vinyl, said connectors respectively disposed at the ends of said segment by which connectors the conductors of a similar segment may be joined to the connectors and conductors of said segment at either end of said segment;

(c) a heating element extending between said connectors and connected across said conductors;

(d) a power cord including a waterproof connector connectable to one of said pair of connectors; and

(e) a watertight closure directly matable with the plastic body of the other of said pair of connectors in watertight relation.

2. A heater cable assembly, comprising:

(a) a cable segment having a pair of conductors;

(b) a pair of waterproof connectors having bodies of plastic which plastic has the physical properties of vinyl, said connectors respectively disposed at the ends of said segment and each having terminals connected to said conductors;

(c) a heating element extending between said connectors and connected across said conductors; and

(d) a watertight closure detachably and directly matable with the plastic body of one of said connectors in watertight relation to enclose its terminals, said closure having flexible means integral therewith and integral with said plastic body of said one connector for retaining said closure, when detached, as a part of said assembly.

3. A heater cable assembly as claimed in claim 2 in which said closure is a cylindrical plug slidably received in said one of said connectors.

4. A heater cable as claimed in claim 2, in which said heating element is insulated by plastic having the physical properties of said plastic of said connector bodies.

5. A heater cable as claimed in claim 4 where said heating element has such electrical resistance as to draw about eight watts of power per foot at rated voltage.

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