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HEATING TAPE AND METHOD OF MAKING SAME

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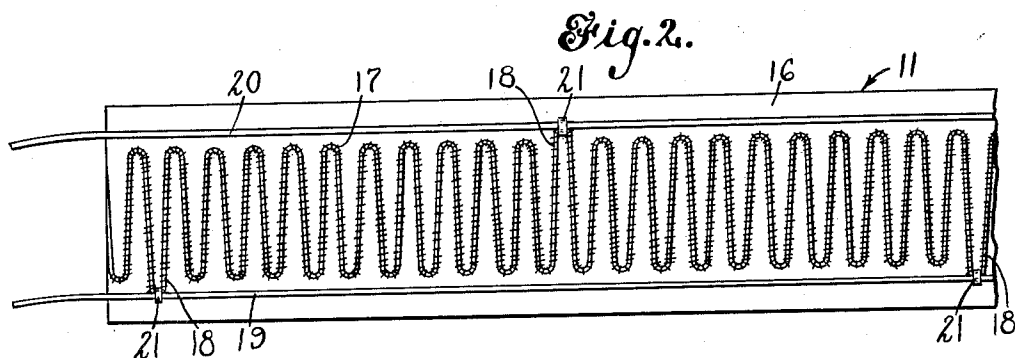
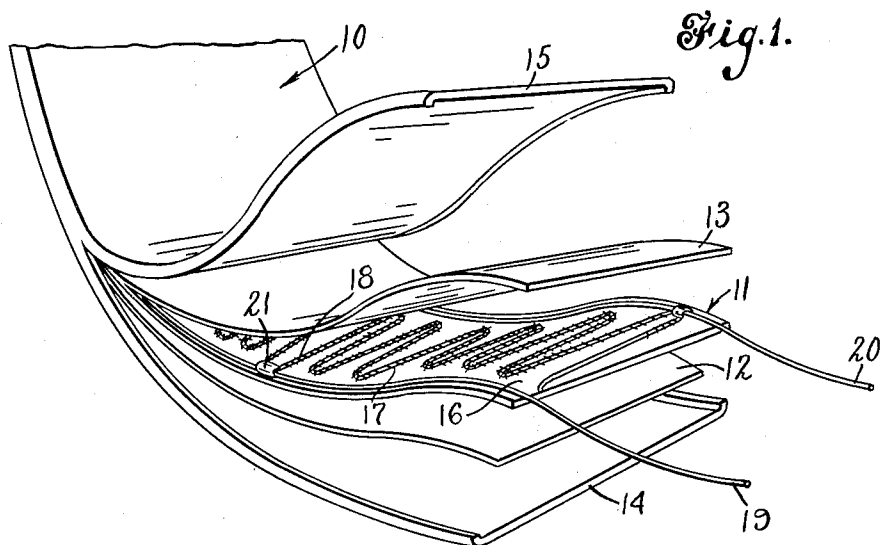
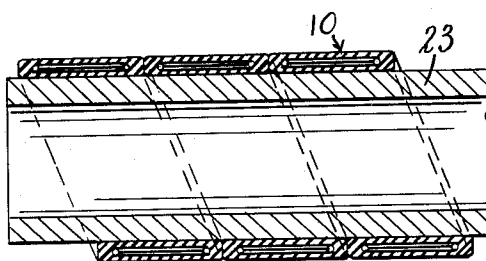
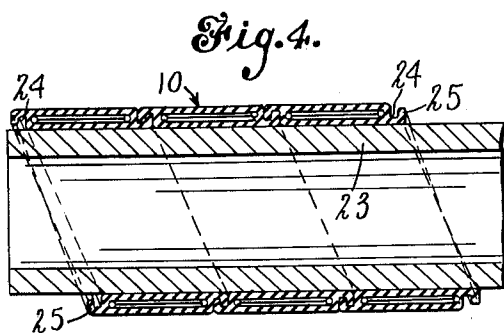


Fig. 3.



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HEATING TAPE AND METHOD OF MAKING SAME

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This invention relates to a heating tape and a method of making the same, and more particularly to a heating tape which comprises a heating unit adapted to be connected to an electrical current in order to be heated by the resistance which the unit offers to the current passing therethrough.

It is common practice at the present time to heat objects such as pipes, for example, by wrapping an electrical heating unit or a heating tape helically about the pipe and then passing a current through the resistance unit in the tape. This procedure is not necessarily applied to pipes alone but may be applied to any object. It is, of course, desirable to provide a heating unit or tape which is the exact length desired, and for this reason it has heretofore been necessary to make the tapes in the lengths which were required for the particular application in which the tape was to be used. That is, it was not practicable to make the tape in continuous lengths and then cut such lengths into sections of the required dimensions as this would interfere with the carrying of the current by the heating unit and would not provide leads to which the current could be connected.

It is contemplated by the present invention to correct the disadvantages above referred to and to construct a heating tape which may be made in a continuous strip and after its manufacture could be cut into the length desired for any practical use. As illustrated in the drawing, this is effected by providing a resistance wire or ribbon in a ladder-type arrangement upon an insulated support so that the resistance wire will be carried back and forth toward and from the lateral edges of the tape. A current-carrying wire is provided extending longitudinally of the tape adjacent each edge thereof and connected to the bight portions of the resistance wire at intervals so that the main current-carrying wires will be cross-connected by the resistance wires in a parallel arrangement.

In the preferred form of the invention the bight portions of the resistance wires are extended at intervals beyond the adjacent portions so that this connection with the longitudinally extending current-carrying wires may be readily effected. Thus the current-carrying wires, which, at one end of the tape, will be connected to current-carrying leads, will be connected by a series of loops of the resistance wire in parallel. In this way the tape may be cut into any desired lengths, and the leads at one end of the tape connected to a source of current, and the current will be transmitted through the resistance wire to heat the latter and thereby heat the tape.

The current-carrying leads may be attached to a constant potential source, and constant wattage per unit area, with increased wattage upon extent of area, is attained by increased current flow at constant voltage through the leads, rather than as is normally the case, an increase in the applied voltage.

One object of the invention is to provide a new and improved electrical heating tape.

A further object of the invention is to provide a tape

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of the character described which may be manufactured in a continuous strip and then cut into appropriate lengths in which it is desired to be used.

Still another object of the invention is to provide a new and improved method of making a heating tape of the character described whereby the tape may be made quickly and economically in a continuous strip and thereafter cut into desired lengths without interfering with the electrical connections to the heating unit of the strip.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawing:

Fig. 1 is an exploded view of a heating tape embodying my invention;

Fig. 2 is a plan view of the heating unit of the strip and the associated parts;

Fig. 3 is a sectional view of the heating tape wound upon a tubular member; and

Fig. 4 is a view similar to Fig. 3 showing a heating tape of slightly modified form.

To illustrate a preferred embodiment of my invention, I have shown in Fig. 1 of the drawing a heating tape designated generally by the numeral 10, the tape being in the form of a flat elongated strip so that it may be wrapped about an object to be heated. The tape includes a central core 11 which, as will be explained hereinafter, comprises the heating element itself and the support or backing upon which this heating element is mounted in order to insulate the loops of the element from each other.

In addition to this central core the tape may also include a layer or strip of insulating material such as glass fiber upon each side of the central core, these layers being designated by the numerals 12 and 13, the central core being sandwiched between these two layers. Also, as illustrated, the tape is provided with outside covering strips 14 and 15 which may be conveniently made of synthetic rubber, for example. It will be understood that it is a matter of choice as to the use of the covering members 12, 13, 14 and 15. That is to say, the central core may be covered by the rubber coatings 14 and 15 without the use of the fiber glass 12 and 13, if desired, the main consideration being to provide a suitable insulating and protecting cover for the central core.

The core 11 is shown in top plan view in Fig. 2 of the drawings and consists of a rubber supporting strip 16 upon which is supported or in which is embedded a resistance element 17. This resistance element may be of any suitable character but it has been found that a suitable element may be made by the use of Nichrome wire coiled upon a rayon cord. Such a resistance element may be made to give a resistance of 880 ohms per foot, and the coils of the wire will be suitably spaced upon the rayon cord so as to be insulated from each other.

This resistance element 17 is arranged in a series of loops extending back and forth toward and from the edges of the tape, as shown in Fig. 3, the wire being wound upon a jig so as to hold the loops in the position shown. Preferably certain of the loops will be extended beyond the remainder, as shown at 18 in Fig. 2, the loops which are extended toward one edge being alternated with those which are extended toward the other edge. As shown, these extensions occur every eleven loops, but this can be varied if desired according to the length of the sections into which it may be desired to cut the completed strip.

A lead wire or current-carrying wire in the form of a flat Nichrome ribbon is disposed upon each side of the resistance element, as shown at 19 and 20, these wires

being spaced apart so as to lie adjacent the edges of the tape and to lie without the loops of the resistance element except the extended loops 18. The latter extend to and are electrically connected with the lead wires, as shown at 21.

With this arrangement it will be seen that the lead wires are connected in parallel by a series of sections of the heating element and that the tape thus constructed may be cut into lengths which are multiples of the lengths between the extended loops 18. These loops, as stated, may be extended at any desired intervals so that a tape may be cut into lengths which are the multiples of any given number. For example, if a loop 18 which is extended toward one edge of the tape lies three inches from the next adjacent loop extended toward the other edge of the tape, the tape may be cut into multiples of three inches and the entire length of the cut strip will be heated when current is applied to the lead wires 19 and 20. It will be noted that the wattage density remains a constant regardless of the lengths in which the tape is cut.

In constructing the tape the resistance wire 17 consisting of the Nichrome wire coiled on a fabric or rayon core is formed into the loops shown in Fig. 2 upon a jig, the jig being provided with pins or like elements to hold the loops of the wires in place. These elements are so formed that at intervals the loops are extended toward alternate edges of the tape, as shown in Fig. 2. A rubber strip 16 may then be molded upon the heating element thus made after the lead wires are connected to the loops 18 of the resistance element, and the heating element comprising the resistance wire and the lead wires will be embedded in the rubber strip. This forms the central core shown in Fig. 2 which may then have applied thereto a desired insulating covering. As shown and described above, the core may be sandwiched between plies of woven glass fiber and then covered upon the outside with synthetic rubber.

As shown in Fig. 3, a tape constructed as above described may be wound helically about a pipe or conduit 23 so as to heat the latter when current is passed through the tape. As stated, the tape is constructed in a continuous strip and then cut into the length required to cover the pipe 23.

The outer cover may be such as to provide a plane flat shape such as shown in Fig. 3 or, if desired, a groove may be provided along each edge of the cover, the grooves facing in opposite directions so as to form an interlock between adjacent coils when the tape is wrapped in a helical manner around a pipe or like member. These grooves are shown at 24 leaving a tongue 25, and it will be noted that the groove at one edge of the tape faces in the opposite direction from that at the other edge so that the tongue 25 of one coil will fit into and interlock with the groove 24 in the adjacent coil.

While I have shown and described some preferred embodiments of my invention and some preferred methods of making the same, it is understood that the invention is not to be limited to the details shown and is capable of modification and variation within the spirit of the invention and within the scope of the appended claims.

What I claim is:

1. A heating tape comprising a flat strip of moldable insulating material, and a resistance element therefor comprising an elongated coil of conducting wire arranged in loops on, and embedded in, said strip to extend back and forth across the same and to extend substantially throughout the length of the strip, a conductor extending along each edge of the strip, and said resistance element being connected at spaced points with each of said conductors, the connections of the resistance element with the conductor at one edge of the strip alternating with the connections of the heating element with the conductor at the other edge of the strip to form a series of heating elements connected in parallel relation across said conductors, and a cover of a moldable insulating material upon each side of said strip.

2. A heating tape as in claim 1 wherein the strip of insulating material with the resistance element secured thereon is sandwiched between outer covers of a synthetic rubber insulating material.

3. A heating tape as in claim 2 wherein a ply of woven glass fiber is placed between each outer cover and the strip of insulating material with the resistance element thereon.

4. The method of making a heating element which comprises forming a resistance element into a series of loops arranged in a single plane with the bight portions of certain of said loops, at intervals, extending beyond the bight portions of the intermediate loops, extending a lead conductor element along each edge of the loops, electrically connecting such conductors to said extended loops, molding on said elements a sheet of molding insulating material, thereby embedding said element in the sheet to hold the element in place and form a conductive core for a heating tape and covering the core so formed with an outer cover of moldable insulating material.

5. The method of forming a heating element as in claim 4 which includes the further steps of placing a sheet of fiber glass insulating material on each side of the core so formed and covering each of said sheets with an outer cover of a moldable insulating material.

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