Feb. 4, 1958 H. H. GOLDSTAUB 2,822,460

ELECTRICAL HEATING DEVICES

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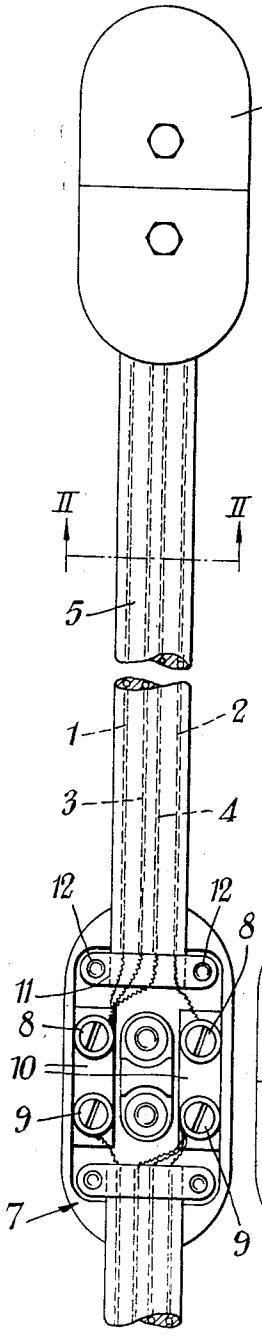


FIG. 1.

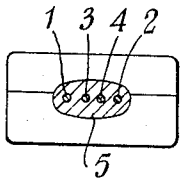


FIG. 2.

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ELECTRICAL HEATING DEVICES

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5 Claims. (Cl. 219—46)

This invention relates to electrical heating cables and is concerned with cables intended for contact heating produced by winding the cable or otherwise physically applying the device to the object to be heated.

It is frequently required that objects such as pipe-lines, should be warmed or heated, and it is convenient to use an electrical heater than can be wrapped around the pipeline. It is an object of the invention to devise a flexible heating cable which can be wrapped around objects to be heated and which can be readily joined to similar heating cables or otherwise readily modified to meet various arising needs.

In accordance with the invention there is provided a flexible electrical heating cable including two continuously extending conductors and at least one heating resistance wire, the conductors and the resistance wire being electrically insulated from each other. The two conductors act as bus bars, the conductors being connected at one end to the mains or to a similar flexible electrical heating device and the heating resistance wire being connected between the bus bars.

For a better understanding of the invention one embodiment thereof will now be described in greater detail with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a flexible electrical heating cable joined to two connectors, one of the connectors being shown with its cover removed, and,

Figure 2 is a section on the line 2—2 of Figure 1.

As will be apparent from Figure 2, this embodiment of the heating cable takes the form of a moulded cable of flattened cross-section. The cable is flexible to enable it to be wrapped around an object to be heated and extending throughout the length of the cable are two conducting wires 1 and 2. Between the conductors 1 and 2 are heating resistance wires 3 and 4. Both the conductors 1 and 2 and the resistance wires 3 and 4 are moulded into the insulation 5 of the cable, such insulation 5 being chosen so as to withstand the temperatures at which the heating device is operated. Various plastic materials have been found suitable in regard to their flexibility, electrical insulation properties, their mechanical and chemical suitability and heat resistance at the particular temperature at which a cable might be desired to operate. The heating device has the insulation at each end removed to reveal the two conductors 1 and 2 and the heating resistance wires 3 and 4. At one end of the heating device the conductors 1 and 2 and the resistance wires 3 and 4 are joined to a conductor 6, whilst at the other end they are joined to a connector 7. The connector 7 is similar in construction to the connector 6 and for the sake of simplicity only the detailed construction of the connector 7 is shown in Figure 1.

The connector 7 has two pairs of terminals 8 and 9, each terminal in one pair being permanently connected to a terminal in the other pair by a bar 10. The conductor 2 is secured to one of the terminals 8, whilst the conductor 1 and the resistance wires 3 and 4 are connected to the other terminal 8. The wires and the conductors are held securely in position by a fixing bar 11 which is carried on two screws 12, it being possible to tighten the bar 11 by means of the screws 12. A similar fixing bar is associated with the other pair of terminals 9.

In Figure 1 the top of the connector 7 is shown as removed from the base thereof, so as to disclose the construction of the connector, but the top of the connector can be secured to the base by means of bolts passing through the holes 13. Figure 1 also shows one end of another similar flexible electrical heating device, in which one of the conductors is secured by itself to the terminal 9 which is permanently connected by a bar 10 to the terminal 8 to which the resistance wires 3 and 4 are connected. The two resistance wires and the other conductor of this further heating device, are connected to the terminal 9 to which the terminal 8 having only the conductor 2 connected thereto is permanently connected by one of the bars 10. In other words, the conductors and the resistance wires of this further heating device are connected to the terminals 9 in the reverse arrangement to which the conductor and the resistance wires of the first-mentioned heating device are connected to the terminals 8. A similar reverse arrangement of the unshown ends of the conductors and the resistance wires of the first-mentioned heating device is effected in the connector 6, but is not shown in the drawings for the sake of simplicity.

It will be apparent that the two conductors 1 and 2 act as bus bars and the resistance wires 3 and 4 are connected in parallel therebetween. It will also be seen that the resistance wires in the flexible heating device between the connectors 6 and 7 are connected in parallel with the resistance wire of the heating device which is shown as being fixed to the terminals 9 of the connector 7.

It will be obvious that by appropriately connecting the two resistance wires between the two conductors the two resistance wires can be brought into series and that, by employing a number of similar flexible electrical heating devices, the ends of one of which are connected to the mains, various local heating effects may be obtained. It will also be clear that by increasing the number of resistance wires in one of the heating devices, the different possibilities of parallel and series connection thereof between the bus bars will be increased.

I claim:

1. In combination a first conductor, a second conductor co-extensive therewith, a first heating resistance wire, the resistance wire being co-extensive with the first and second conductors, insulation separately enclosing the first and second conductors and the first heating resistance wire to form a first heating cable, a first terminal located at one end of said first heating cable and secured to said first heating resistance wire and said first conductor, a second terminal located at said one end and secured to said second conductor, a third conductor, a fourth conductor co-extensive therewith, a second heating resistance wire, the latter resistance wire being co-extensive with the third and fourth conductors, insulation separately enclosing the third and fourth conductors and the second heating resistance wire to form a second heating cable, a third terminal located at one end of said second heating cable and secured to said second resistance wire and to said third conductor, a fourth terminal located at said one end of said second heating cable and secured to said fourth conductor, a first connection between said first terminal and said fourth terminal, and a second connection between said second terminal and said third terminal.

2. In combination, a first conductor, a second conductor co-extensive therewith, a first heating resistance wire co-extensive with the first and second conductors, insulation separately enclosing the first and second conductors and the first heating resistance wire to form a first heating cable, a third conductor connected in end-to-end rela-

tionship with the first conductor to form therewith a first bus bar, a fourth conductor co-extensive with the third conductor and similarly connected in end-to-end relationship with the second conductor to form therewith a second bus bar, a second heating resistance wire co-extensive with the third and fourth conductors, insulation separately enclosing the third and fourth conductors and the second heating resistance wire to form a second heating cable, and electrical connections between the resistance wires and conductors such that the wires are effectively connected in parallel with one another across the bus bars.

3. The combination according to claim 2, wherein in each cable the conductors and wire are all embedded in a single mass of thermoplastic insulating material which spaces the conductors and wire apart throughout the length of the cable.

4. A flexible electrical heating cable, comprising two co-extensive low-resistance conductors, at least one higher-resistance, co-extensive conductor serving as a heating resistance element, a single mass of thermoplastic insulating material in which all the conductors are embedded and spaced apart throughout the length of the cable, a first terminal secured to one end of one of the low-resistance conductors and the adjacent end of the higher-resistance conductor, a second terminal secured to the adjacent end of the other low-resistance conductor, and an electrical connection between the higher-resistance conductor and said other low-resistance conductor situated at the end remote from the aforementioned ends.

5. A flexible electrical heating cable, comprising two co-extensive low-resistance conductors, at least one higher-resistance, co-extensive conductor serving as a heating resistance element, a single mass of thermoplastic insulating material in which all the conductors are embedded and spaced apart throughout the length of the cable, a first terminal secured to one end of one of the low-resistance conductors and the adjacent end of said higher-resistance conductor, a second terminal secured to the adjacent end of the other low-resistance conductor, an electrical connection between the higher-resistance conductor and said other low-resistance conductor situated at the other end of the cable, a third terminal, a connection between said first terminal and said third terminal, a fourth terminal, and a connection between said fourth terminal and said second terminal.

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