

UNITED STATES PATENT OFFICE

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HEATING UNIT

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The invention relates to electric heaters of the type embodying a metallic resistance element.

The principal object of the invention, generally stated, is to provide a heating unit designed particularly, though not necessarily, for use in connection with and to form part of heaters such as those employed in the cars of urban and interurban railway lines.

Another object of the invention is to provide a heating unit particularly adapted for use in and to form part of the car heating device disclosed in our co-pending application for patent for car heaters, filed June 17, 1927, Serial No. 199,574, the unit being, however, capable of employment for other purposes which may as yet be unforeseen.

A more specific object is to provide a heating unit embodying a peculiarly wound resistance coil embedded within suitable material confined within a supporting case whereby to be fully protected at all times against damage by external forces and to be prevented from the injurious effects of vibration which would occur if the embedding and encasing feature were omitted.

A still further object of the invention is the provision of a heating unit of such construction as to be capable of being molded into a heat radiating shell or body or to have such body cast directly thereabout and thereon, the unit itself being of such construction as to be able to withstand the heat of the molten metal during casting without suffering injury.

A still further object of the invention is to provide a heating unit in which the resistance coil is so wound as to be supported upon a core of heat resistant insulating material, the usual straight center length of resistance element being avoided with the attendant advantage of eliminating subjecting such straight stretch or length of the resistance element to the concentrated and combined heat generated by its own resistance and that radiating from the surrounding coils.

Still another object is to provide a heating unit of this character embodying various improved structural features in point of

terminal arrangement and other details of a more or less mechanical nature.

An additional object is the provision of a device of this character which will be simple and inexpensive to manufacture, positive in action, efficient and durable in service, and a general improvement in the art.

With the above and other objects and advantages in view, the invention preferably consists in the details of construction and the arrangement and combination of parts to be hereinafter more fully described and claimed, and illustrated in the accompanying drawing in which:

Figure 1 is a longitudinal section through a unit constructed in accordance with the invention,

Figure 2 is a detail view partly in elevation and partly in section showing the terminal construction, and

Figure 3 is a detail cross section taken on the line 3-3 of Figure 1.

Referring more particularly to the drawing, we have shown the unit as comprising an elongated tubular body 1 of some suitable metal and preferably circular in cross section and of any length desired depending upon the particular use to which the device is to be put. This tubular body constitutes a casing which serves as a protection for the resistance element to be described. At one end this tubular body is represented as provided with a cuff 2 which constitutes a housing for terminal means to be described and which may also serve as means whereby the assembly may be mounted with respect to a radiating shell or the like as clearly indicated in our copending application filed June 17, 1927, Serial No. 199,574.

The structure further includes a cylindrical core 3 of heat resistant insulating material such, for instance, as lava, this core serving as a support for a resistance coil 4 of a suitable metal, the coil being wound upon the core and being free from any central or other straight portion as is generally the case. Actually, the wire to form the coil is initially doubled at 5 upon itself and then wound upon the core in the form of a double helix, the wire or portions thereof at the two sides

of the bend being wound in the same direction but the convolutions 6 of each side alternating with those 7 of the other as clearly indicated in the drawing. The ends 8 of the two portions of the wire have engaged thereon terminal sleeves 9 of suitable metal within which are also engaged the ends of insulated cables 10, the ends 8 being in abutting relation to the cables 10 and the terminal members 9 being swaged or pressed into intimate contact with the wires and cables for the purpose of insuring permanent and proper connection.

At that end of the tubular body which extends within the cuff 2 there is provided an insulator 11 of plug-like form and which constitutes a closure for this end of the body. This insulator may conveniently be constructed of lava or its equivalent and may be held in place in any desired manner though it is here represented as having an outstanding peripheral flange or rib 12 seated within a corresponding recess or groove 13 in the inner periphery of the tubular body. Whether the body is spun onto or about the insulator or whether the insulator is molded in place is immaterial. This insulator is provided with spaced openings 14 through which the terminals extend. The extremity of the cuff 2 is here disclosed as externally threaded for connection with a support or for engagement thereon of a cable protector, not disclosed in the present instance but clearly illustrated in our co-pending application filed June 17, 1927, Serial No. 199,577. If desired, the end of the cuff 2 may be closed by an additional insulator 15 and the space within the cuff is intended to be filled with a sealing and insulating compound. This filling is not illustrated as it is of no particular consequence and as its application will be so readily understood.

The entire tubular body 1 is filled with a packing 16 of some suitable material, preferably magnesium oxide which is filled into the tube and pressed, swaged or otherwise treated to convert it into a solid mass firmly embedding the resistance coil and its core. The end of the tubular member may be closed in any suitable manner as for instance by means of a metal disk 17 pressed into place within a peripheral groove 18 or otherwise secured in place.

Assuming that the unit has been constructed and assembled as shown and described, it will be apparent that the resistance coil itself is not subject to any vibration inasmuch as it is interiorly supported by the core 3 and exteriorly supported by the pulverulent mass within which it is embedded. Owing to the peculiar winding it is apparent that there is no central straight length of wire in which the heat is ordinarily concentrated owing to the fact that such straight length, if present, is subjected to the action of the heat radiat-

ing from the coils in addition to the heating effect produced by its resistance to the flow of current. Furthermore, the elimination of such a straight central length makes it possible to wind the coil upon a supporting core instead of leaving it open. Furthermore, the embedding of the coil within the mass of material prevents access of air and consequently too rapid oxidation and eventual deterioration. All the parts are so mounted and related as to insure maximum strength and durability so that the entire unit will be capable of prolonged satisfactory use. Of course, the heating action itself is substantially the same as with other devices of this general class, the improvements relating to the structural features rather than to broad principles of design. It is really believed that the construction, operation and advantages will be readily apparent to one skilled in the art without further explanation especially when it is realized that the device lends itself most readily to incorporation in heating apparatus or devices in and on vehicles such as railroad and electric cars or other places where the structure must be capable of withstanding constant vibration.

While we have shown and described the preferred embodiment of the invention and certain detailed features thereof it should be understood that the disclosure is merely for purposes of illustration and that the right is reserved to make all such changes and modifications as will not depart from the spirit of the invention or the scope of the claims hereunto appended.

Having thus described the invention, we claim:

1. A heating unit of the character described embodying a coil of resistance wire wound upon a supporting core of insulating material and a mass of insulating material embedding and surrounding the coil and extending beyond both ends of the core, the coil being doubled upon itself intermediate its ends and having its terminals both at the other end, the point of doubling being located beyond one end of the core.

2. A resistance coil comprising a length of wire doubled upon itself intermediate its ends with the resultant portions wound helically in spaced relation, and a supporting core of insulating material located within the confines of the coil.

3. A heating unit of the character described comprising an elongated metal casing, a metal cuff upon one end thereof adapted to serve as mounting means for the casing, an insulator within said end of the casing, spaced rigid terminal members extending through the insulator and terminating within the cuff for connection of conducting cables thereto, a resistance coil carried by a core and located within the casing with its ends connected with said terminal members, a mass of compacted

pulverulent insulating material filling the casing and embedding the coil and core, and a closure permanently sealed within the other end of the casing.

5 4. A heating unit comprising a solid cylindrical core of insulating material and a coil of bare resistance wire wound upon said core, the wire forming the coil being doubled intermediate its ends with said resultant bight portion located beyond one end of the core to
10 serve as retaining means to prevent the latter from slipping out in one direction, and the resultant ends of the wire being wound in opposite directions upon the core with the
15 successive convolutions spaced apart.

5. A heating unit of the character described comprising an elongated metal casing, a metal cuff secured upon one end thereof and adapted to serve as mounting means for the
20 casing, an insulator permanently mounted within one end of the casing, spaced rigid terminal members extending through said insulator and terminating within the confines of the cuff for connection of conducting cables
25 thereto, a resistance coil mounted on a core and located within the casing with its ends connected with said terminal members, a mass of insulating material filling the casing and embedding the core and coil, a closure for the
30 other end of the casing, an insulator closing the cuff and through which said cables extend, the space between said first and second named insulators being adapted to be filled with insulating compound for embedding said
35 terminal members and covering the connections of the cables therewith.

In testimony whereof we affix our signatures.

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