

UNITED STATES PATENT OFFICE.

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METHOD OF MAKING ELECTRICAL RESISTANCE UNITS AND THE LIKE.

No Drawing.

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To all whom it may concern:

Be it known that I, LINWOOD T. RICHARDSON, a citizen of the United States, residing at New Brunswick, in the county of Middlesex and State of New Jersey, have invented new and useful Improvements in Methods of Making Electrical Resistance Units and the like, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

This invention relates to a method of making electrical resistance units and the like having vitreous or other fired coatings.

The type of resistance unit to which the present invention is particularly applicable is that wherein an insulating base, which may comprise porcelain or other more or less readily fusible material either with or without a metallic nucleus, and of circular or other cross section, is exteriorly wound with numerous turns of resistor such as wire, such turns being insulated from one another through suitable spacing or otherwise and being ordinarily connected with suitable terminals fixed to the base.

It is customary, and in most cases absolutely essential, that such turns of the resistor be exteriorly protected and firmly retained in suitable position by means of an insulating coating adhering thereto and to the base and where such coating is of a character requiring fusion at relatively elevated temperatures great difficulty has heretofore been encountered in successfully applying such coating to this type of articles.

When substantially homogeneous bases of porcelain or the like are employed the cause of much difficulty has been found to reside in the fact that the resistors ordinarily employed for such purposes have a much higher coefficient of expansion than that of the material of the base whereby during heat treatment the various turns of the resistor expand to a greater or lesser extent and become loose upon the base although tightly wound thereon at ordinary temperatures.

Thus if the coating be applied in plastic condition to the wound unit, the same though adhering at ordinary temperatures nevertheless under the high temperatures required for fusion is apt to become loosened and more or less separated from the base

due to the aforementioned expansion of the encircling resistor. Moreover, the turns of the resistor being thus released from their retention in intimate contact with the base tend to adjust themselves for their own increased length by lateral shifting whereby the turns of the resistor are often left exposed or in such close proximity as to cause short-circuiting.

The present invention has among its objects that of overcoming the foregoing difficulties and disadvantages in the production of articles of the aforementioned character.

Other objects and advantages will hereinafter appear.

According to the present invention it is proposed to confine the unit during the heat treatment necessary for fusion of the coating thereof and to effect such confinement by embedding the unit in a medium which is substantially inert as regards the constituents of the coating undergoing treatment at least at the temperatures involved, such medium being moreover of sufficient density to resist the aforementioned tendency of the resistor to shift under the influence of the applied heat. It has been found in practice that ordinary sand of about 40 mesh constitutes an excellent material in which to embed such units during heat treatment thereof.

A preferred manner of carrying out the present method may be stated as follows. The resistor being wound or otherwise applied to the insulating base in accordance with known methods, a low melting point glass is prepared in any one of a plurality of known ways and is thereafter finely ground, mixed with water or other medium for the formation of a paste and applied to the wound unit by dipping, pouring or otherwise.

The unit as thus coated is thereafter dried to expel the water or other substance used in forming the paste.

After drying the unit is firmly embedded in a quantity of ordinary sand preferably about 40 mesh and placed in a kiln such for instance as that employed in glazing pottery, whereby the temperature of the unit is raised to a point sufficient for effecting fusion of the glass with which it is coated. As soon as such coating is thoroughly fused,

the unit still embedded in the sand is removed and permitted to cool. The unit may be removed from the sand at any time following cooling thereof to a temperature sufficiently low to permit setting of the coating.

Such embedding of the unit prior to heat treatment provides against disintegration or other injury of the unfused insulating coating due to displacement of the turns of the surrounding conductor or to other of the aforementioned causes.

Moreover, the presence of the sand surrounding the unit serves to obviate any tendency of the fusible portions thereof to flow during heat treatment, whereby a suitable thickness of insulating material about the several turns of the conductor is maintained. Further, the presence of the surrounding sand serves to retard both the heating and the cooling of the unit thereby obviating the danger of cracking of the base due to sudden temperature changes.

In practice the sand is preferably contained in a relatively large tray of cast iron or other suitable material and of a size sufficient to accommodate a relatively large number of ordinary units, the latter being packed in the sand relatively close to one another. However, a suitable intervening layer of sand is maintained at all points to insure the necessary spacing between adjacent units. The tray so charged may then be introduced into and removed from the kiln without regard to numerous of the precautions heretofore required in handling the single units.

By the foregoing method the output of the kiln or furnace is greatly increased over that possible by prior methods, the quality of the product being very markedly improved and the number of pieces damaged during heat treatment being minimized.

What I claim as new and desire to secure by Letters Patent is:

1. The method of heat treating resistance units and the like, which comprises embedding such units, prior to treatment, in a dense body or medium which is chemically inactive under the conditions imposed by the treatment, and effecting heat treatment of such units while so embedded.

2. The method of heat treating resistance units and the like which comprises embedding such units in sand and effecting heat treatment of the units while so embedded.

3. The method of firing an electrical resistance unit having a resistor encircling a base, the resistor to be bonded to the base by a fusible coating, which comprises embedding such unit in a dense body or medium which is chemically inactive with respect to such coating and then heat treating the unit while so embedded.

4. The method of firing an electrical resistance unit having an insulating base, a surrounding resistor of higher heat expansion coefficient than said base and a coating to be fired, which comprises embedding such unit in a body of sand and effecting heat treatment of the unit while so embedded.

In witness whereof, I have hereunto subscribed my name.

LINWOOD T. RICHARDSON.