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H. A. PEULET

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METHOD FOR MANUFACTURE OF ELECTRICAL RESISTANCES.

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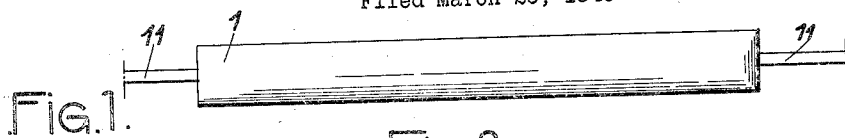
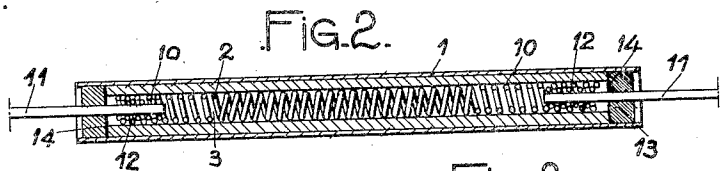
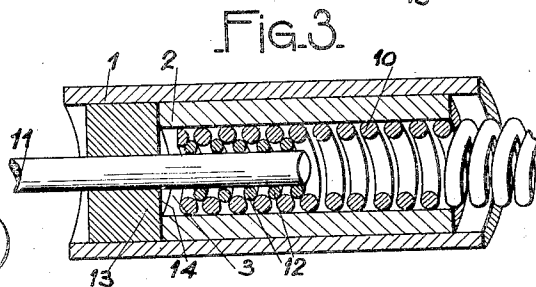
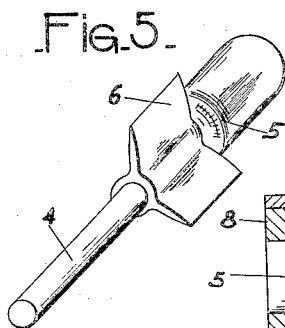
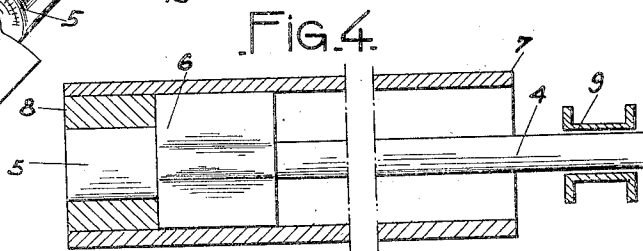
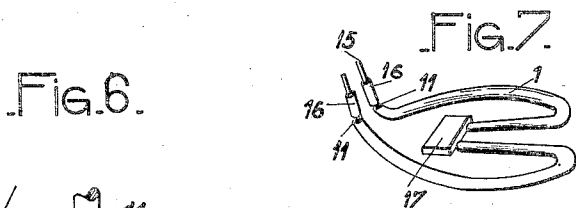
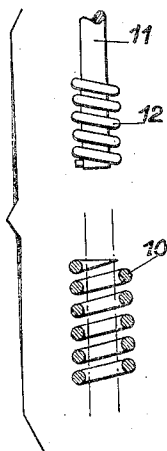
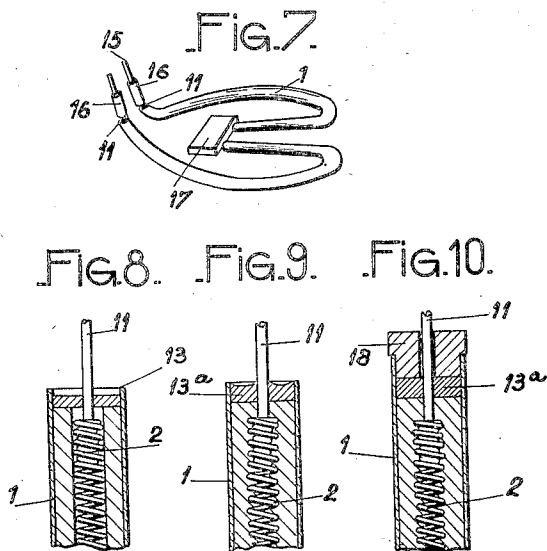
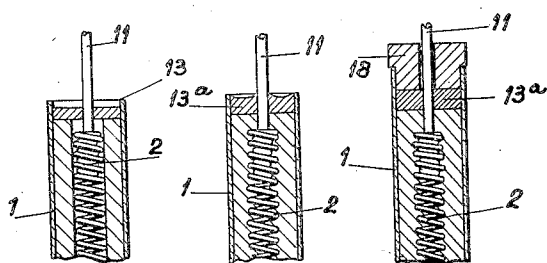


Fig. 8. Fig. 9. Fig. 10.



Inventor
H. A. Peulet
By *Clarence Downing* *Att'y.*

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METHOD FOR MANUFACTURE OF
ELECTRICAL RESISTANCES

Henri André Peulet, Parc Saint-Maur, France

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This invention relates to incased electrical resistances, of the type more particularly adaptable to all forms of electric heating and wherein a wire or resistor is arranged within a tubular metallic sheath or casing and held in position therein by means of a packing or filling of insulating and refractory material.

The invention has for its main object to provide a method for manufacturing resistances of such type, which will be strong and hermetically sealed, and moreover cheap in manufacture.

Another object of the invention is to provide such a method which comprises the step of providing a calibrated passage which is to receive the resistor, in an insulating filling, by means of a rod having at or adjacent, to one end thereof a calibrated head and a star shaped guide-member, said rod being first introduced in the tubular metallic sheath, and then removed together with its head and star-member after introduction of the plastic insulating filling.

Another object of the invention is to provide such a method which comprises the step of electrically connecting together the resistor and the feeding wires by fitting to the end of each of said wires a metallic coil having a plurality of convolutions, and then screwing said coil in the end of said resistor in such a manner that the end of each feeding wire be extended into said resistor and the end of said resistor be extended over the whole length of said coil. Such form of connection has the considerable advantage of being free from any risk of damagement such as by bending during the further steps of manufacture.

The accompanying drawings illustrate by way of example only a form of embodiment and an application of the invention.

Figs. 1 and 2 respectively show an outer view and an axial sectional view of an incased resistance manufactured according to the method of the invention prior to drawing.

Fig. 3 illustrates at an enlarged scale an isometric view of a detail of Fig. 2.

Figs. 4 and 5 illustrate a detail of the resistance during assembly.

Fig. 6 shows certain elements used during assembly of the resistance.

Fig. 7 shows a way of using the incased resistance.

Figs. 8 and 9 are fragmentary axial sectional views of an improved incased resistance, made according to another embodiment respectively prior to the drawing operation and after completion.

Fig. 10 is a similar view of an incased resistance made according to a further modification.

In the form of embodiment contemplated, the incased resistance comprises in the first place (Figs. 1, 2 and 3) a tube or casing 1 made of

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a suitable metal (copper, brass, steel or other alloys) and having a suitable shape in cross-section (circular in the example described). Said tube is inwardly lined with a powdered refractory insulating composition 2 for example a composition fundamentally consisting of magnesia, talc, alumina, or similar products, while at the same time providing a calibrated axial channel 3. To that end, and according to a feature of the invention, one operates as follows:

A rod 4 having at one end a calibrated head 5 and a star-shaped guide-member 6 is inserted into the tube 1 through one end 7 thereof and is pushed to a point nearly at the opposite end 8 of the tube, said end 8 comprising provisional sealing means (not represented in the drawing).

The rod 4 is moreover guided outwardly of the tube by a slide member 9.

The introduction of the insulating composition 2, in the form of a suitably wetted powder is effected through the opening 7 of the tube and it is then pushed home as far as the opposite end 8 by means of suitable pressure means (not shown) such as a pump or a worm.

The calibrated channel is formed by moving the head 5 from the end 8 back to the end 7 of the tube 1, the insulating material being thereby forced between the branches of the star-member 6 as such movement proceeds, and pressed home between the head 5 and the side walls of the tube, said pressure means then being removed.

The tube having thus been lined is dried in an oven at a temperature of between 200 and 300° C. so as to remove the moisture contained in the insulating composition.

Thereafter there is positioned within the calibrated channel 3 the wire 10 forming the resistor, which is wound into a helix having an outer diameter equal to the inner diameter of the channel, and the ends of said helix are connected to the outer electrical-conductors 11 of any suitable type (such as rods or wire braid) by means of a certain number of helical convolutions 12 secured to and for instance forced over the wire 11 (Fig. 6) while making a corresponding impression on the latter.

The outer diameter of the coil or helix 12 is slightly greater than the inner diameter of the coil or helix 10 and the relative pitch of said coil 12 is determined so as to make it possible to threadingly engage said coil 12 into the end of said coil 10. Satisfactory electrical contact is thus assured between the conductors to be connected such contact being ultimately improved during the drawing operation, as will be described below.

Both the resistance and the insulating mass are immobilized during drawing by means of an insulating washer 13 which is inserted at each end

of tube 1 after having been threaded over the corresponding conductor 11.

According to the invention the incased resistance is sealed or made fluid-tight by means of an enamel coating 14 which is applied to the inner face of each washer 13 before the latter is introduced into the tube 11, said enamel coating being later vitrified during the ultimate baking step.

The incased unit is brought to the required diameter and length according to prior art practice, by means of a series of drawing operations after the casing has been rendered malleable by annealing at a suitable temperature.

According to a further modification of the filling process, there is introduced under pressure into the tube a paste comprising as above a powdered insulating composition humidified with a suitable liquid (such as water, alcohol, or the like) in suitable proportions depending on the diameter of the canal desired, and the tube thus filled is then subjected to a vigorous radial centrifugation preferably at 25,000 to 35,000 R. P. M.

The insulating powder then segregates from the humidifying liquid, and uniformly concentrates against the side walls of the tube thereby providing an axial channel in which the liquid collects.

The tube is thereafter placed in a stove to remove the ultimate traces of moisture.

According to another form of embodiment (Figs. 8 and 9) in order to provide for a tight sealing of the incased unit, the above mentioned washer 13 is made of a powder comprising vitrifiable material such as powdered enamel borax, a derivative thereof, powdered glass or the like such powder being supported in a carrier or armature conveniently formed of crude asbestos or spun glass cloth, or the like.

Such washer 13 is arranged at the filling end 2 (Fig. 8) and, after rolling and baking there is produced a vitrified plug or seal 13a (Fig. 9) tightly adhering to the tube 1 and the connecting lead or rod 11, said armature being in particular effective to keep the vitrifiable substance from flowing during the baking treatment.

The end portion of the incased resistance may be yet further improved by arranging (Fig. 10) against the washer 13, and prior the baking, an insulating bead 18 threaded over the lead of rod 11. Said bead is bonded to the vitrified mass 13a and in particular provides for an improved guiding of rod 11.

The incased resistances or units according to the invention are applicable to all instances where electric resistance heating may be used. Fig. 7 illustrates their application to electric flat-irons. In this application of the invention, the outer connections or conductors 11 are constituted by rods made of alloy steel adapted to receive ends thereof with screw-threaded portions adapted to receive male connecting-plugs. Such rods are bent at the suitable locations to conform with the direction of the exit openings provided in the shoe of the iron, and are outwardly provided with insulating sleeves 16.

An adjustable thermostat 17 is preferably provided in the circuit of the resistance to cut off the supply current when the temperature exceeds a preselected limit.

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

1. In a process for the manufacture of incased electric resistances comprising a resistor constituted by a helically coiled resistant wire inserted

within a metal tubular casing partly lined by a tubular heat insulating packing the steps of disposing within said casing a rod terminating in a suitable head member and a star-shaped guiding member, of forcing under pressure into said casing an insulating material previously suitably brought to a plastic condition, of removing said pressure, of extracting said rod terminating in the head member and the star-shaped member, thereby to form a central channel the diameter of which corresponds to the outer diameter of said resistor, of drying in an oven said casing thus packed with an insulating lining at a temperature between about 200° C. and 300° C., of putting into place within said casing said resistor, of electrically connecting outer conductors with the ends of said resistor, of putting into place intermediate the ends of said casing means for tightly hermetically sealing the whole structure, and of subjecting said structure to a suitable heat treatment and a rolling operation whereby to impart to the resistance its final shape and texture.

2. In a process for the manufacture of an incased electric resistance comprising a resistor constituted by a helically coiled resistant wire inserted within a metal tubular casing partly lined by a tubular heat insulating packing and a pair of outer feeding conductors, the steps of disposing within said casing a rod terminating in a suitable head member and a star-shaped guiding member, of forcing under pressure into said casing an insulating material previously suitably brought to a plastic condition, of removing said pressure, of extracting said rod terminating in the end member and the star-shaped member, thereby to form a central channel the diameter of which corresponds to the outer diameter of said resistor, of drying in an oven said casing thus packed with an insulating lining at a temperature between about 200° C. and 300° C., of putting into place said resistor within said casing, of mounting junction pieces formed with helical ribs on the end of each of said conductors, of screwing said resistor on said ribs, of putting into place intermediate the ends of said casing means for tightly hermetically sealing the whole structure and of subjecting said structure to a suitable heat treatment and to a rolling operation, whereby to impart to the resistance its final shape and texture without any risk of damaging the connection between said resistor and said conductors.

3. In a process as in claim 2, the steps of mounting an helical coil on the end of said conductors and of screwing said resistor on said coil, whereby during the rolling operation said connection is not damaged by crushing and separation of said helical surface.

HENRI ANDRÉ PEULET.

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