

ALIEN PROPERTY CUSTODIAN

INSULATED WIRE AND METHOD OF MAKING THE SAME

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Our invention relates to wires having an insulating layer of a lacquer material, and to a method of forming such layers.

Our invention is particularly important for the so-called lacquered lead wires, for instance tele-
5 phone connecting wire, which must have certain electric properties such as high insulation resistance, low dielectric losses, and a low sensitivity from a dielectric standpoint to moisture and water.

Such lacquered wires are generally made by applying several layers of lacquer with intermediate drying of the layers. More particularly, the wire is passed through several baths of the lacquer in the form of a solution, and between the
10 baths it is subjected to a drying in air, if necessary with a gentle heating.

We have found that such a method is not satisfactory when using lacquering materials from which it is difficult to remove the solvent, for example materials which contain a lacquer substance, such as chlorinated rubber, in addition to the necessary softening agents and solvents. More particularly, we have found that when using
15 such materials it is difficult to make the lacquer layer sufficiently dry and hard, even if one uses for the lacquer substance very volatile solvents, such as benzene or a mixture, for example, of 90% acetone and 10% benzene. If one tries to obtain the desired hardening by excessively reducing the speed at which the wire is passed through the
20 lacquering machine, the cost of production is increased, and if a high temperature is used in the process of drying the wire, such for example as 70° C., bubbles and bladders are formed in the lacquer layer, which deleteriously affect the electrical properties of the layer. Furthermore, drying at a high temperature causes the lacquer layer to become so sticky and soft that there is the danger that the layer will stick to the guide
25 wheels and that the lacquer layer will be damaged.

The main object of our invention is to overcome the above difficulties when using lacquering materials of the above type, and to provide a method by which it is possible to form from such materials layers which have satisfactory electrical
30 properties.

In accordance with the invention we apply a plurality of lacquer layers to the wire and between the application of the layers we dry each preceding layer only superficially in air. After all of the desired layers have been applied, we remove the residual solvent from the composite layer by slowly increasing the temperature of the layer
35 40 45 50 55

from room temperature to a higher temperature. This increase in temperature may be effected either continuously or in steps.

When using the stepwise or continuously increasing heating according to the invention, the solvent moves by diffusion to the surface of the composite lacquer layer and is vaporized at that point. If the invention is not employed and it is attempted to completely volatilize the solvent
10 by merely giving the layer a high temperature, i. e. quickly bringing the layer to a high temperature, bubbles will be formed in the material during the heating. This is caused by the fact that the solvent would not have sufficient time in which to move by diffusion to the surface, and
15 instead forms bubbles within the lacquer layer.

The lacquer layer according to the invention is hard throughout, does not contain gas bubbles and is not mechanically damaged. Furthermore, adhesion, sticking or damage are avoided because the solvent is removed simultaneously with the increase in temperature, which prevents the lacquer material from becoming excessively soft.

The speed at which the temperature of the layer is increased and the temperature to which the composite layer is heated depends upon several factors, such as the thickness and the composition of the layer.

In the case of a continuously-increasing temperature, we prefer to heat the layer from room temperature to a temperature of about 50° C. to 60° C. at a rate increasing with increase of temperature about 2° C. and 20° C. per hour.

Highly satisfactory results are obtained when carrying out the heating according to the invention with a stepwise increase of the temperature of the composite layer. For example, the temperature of the layer is increased from room temperature to about 30° C. and allowed to remain at the latter value for a few hours. The temperature is then increased to about 40° C. and allowed to remain at this value for several hours. The temperature is then increased to about 50° C., and allowed to remain for about one hour at that value, after which the layer is given a temperature of about 60° C. for about half an hour. In such a stepwise method the increase of the temperature from one step to the next can be effected rapidly. It will be observed to one skilled in the art that the progress of the heating stretches can be correlated to circumstances, such as the lacquer material and solvents used and the thickness of the lacquer layer.

In carrying the invention into effect in a continuous manner, the conductor with the compos-

ite lacquer layer thereon may be passed continuously through a long furnace which may be divided into compartments each having a certain temperature. However, to avoid the use of such a long furnace a semi-continuous method may be used.

In the semi-continuous method the application of the lacquer layers is effected in a continuous manner by passing the wire through several baths of the lacquer material with intermediate air drying. After leaving the last bath the coated wire is dried at a temperature of below 40° C., which places the lacquer layer in such a condition that the wire can be passed over guide wheels without damage, but the layer is so soft that the wire cannot be coiled on a reel. The wire is then passed over a set of guide wheels which are spaced a considerable distance apart in order to allow a long length of wire to be suspended therefrom. After the required length of wire has been placed

on these guide wheels, additional lengths of the coated wire may be suspended between further sets of guide wheels.

While the wire is suspended between the guide wheels the lacquer layer is hardened or aged, and for this purpose we may pass through the wire a current which is of such intensity that the layer is heated to the desired temperature. During the time required to complete the drying and hardening, this current is increased in such a manner as to increase the temperature of the coating either in steps or continuously to the desired value.

We wish it to be understood that we do not desire to be limited to the examples and applications used in describing the invention, for obvious modifications will occur to a person skilled in the art.

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