Oct. 22, 1935. H. BIENFAIT ET AL 2,018,343

ELECTRICAL CONDUCTOR AND METHOD OF MAKING THE SAME

Filed Oct. 19, 1932

Fig. 1

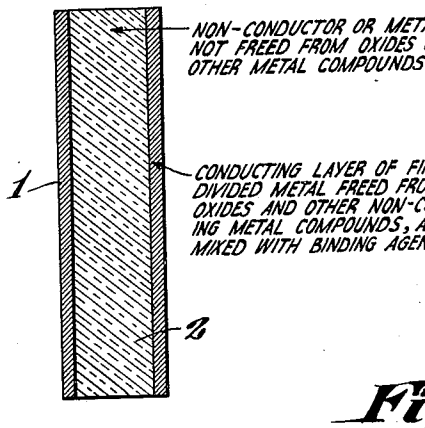


Fig. 2

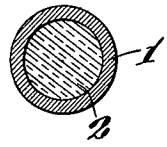
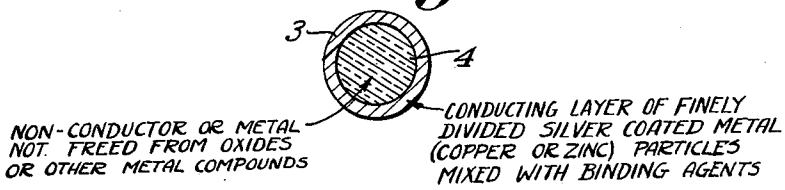


Fig. 3.



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Patented Oct. 22, 1935 2,018,343

UNITED STATES PATENT OFFICE

2,018,343

ELECTRICAL CONDUCTOR AND METHOD OF MAKING THE SAME

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Application October 19, 1932, Serial No. 638,478
In the Netherlands October 27, 1931

4 Claims. (Cl. 173—13)

This invention relates to electrical conductors which comprise a core, preferably non-conducting, and coated with an electrically conducting layer, and also to the method of providing such layers.

It has been found that the difficulties which may be encountered and which have often been encountered, when coating bodies with electrically conducting layers, may be avoided in a simple and efficient manner by making use of the present invention, according to which a body, for instance an electric device, is provided for this purpose with an electrically conducting layer, which layer contains an organic binding agent and in addition a finally divided metal, the surface of which is free of oxides and other nonconducting metal compounds such that the conductivity is practically not reduced by them. It has turned out that the cause of the failure of the efforts made for providing electrically conducting layers consisting of a binding agent mixed with a finely divided metal, must often be ascribed to the fact that the metals present in the binding agent either lose their conductivity during operation of the devices or do not possess at all this conductivity when these finely divided metals are used for this purpose in the form in which they are on the market. By means of the invention bodies may be obtained which are provided with electrically conducting layers retaining their conductivity even at high temperatures.

In the drawing forming a part of this application, Figs. 1 and 2 illustrate, respectively, longitudinal and transverse cross-sectional views of a composite electrical conductor, according to one form of the invention, and Fig. 3 is a view similar to Fig. 2 showing another form of the invention.

In Figs. 1 and 2 an electrically conducting layer 1 is applied onto an insulating body 2 by mixing a finely divided metal entirely free of oxides and other nonconducting compounds with an organic binding agent and by subsequently depositing it on the body, for instance, by spraying. Before being mixed with the binding agent the surface of the finely divided metal may be liberated from oxides and other nonconducting compounds. However, it is also possible as suggested above to coat a metal, which is not entirely deprived from oxides and other compounds before being mixed with the binding agent, with a nobler metal by adding a solution of a salt of the latter.

In Fig. 3 an electrically conducting layer 3 containing metal particles consisting internally of a second metal which need not be free of oxides and other metal compounds, is applied onto a nonconductive core member 4. It has proved to be advantageous to use silver for the outer metal and to use copper or zinc for the inner metal. In other words, the finely divided particles of copper or zinc are coated with silver, as for example, by silver plating.

The invention which, as stated above, may be more particularly used in electric devices, for instance in electric discharge tubes, has many advantages. In the first place conductive layers are obtained. For this purpose it is possible to start from finely divided metals mixed with one of the known organic binding agents. Furthermore the electrically conducting layer may be applied on to the body at room temperature. Due to this the invention has a very important advantage over the known Schoop's method in which heating of the body together with all drawbacks inherent thereto is unavoidable. Moreover, the method according to the invention is much simpler and, as regards the means for carrying it out, cheaper than the methods of the prior art. Furthermore the layer may be provided in one operation on bodies consisting of ceramic material having a smooth surface, for instance, glass, whereas with the metal spraying method referred to above, a lacquer layer must initially be provided in order that the metal sufficiently adheres.

The invention will be more clearly understood by the following examples which describe some methods of providing conductive layers according to the invention.

25 gr. of copper powder is treated with 25 cc. of water in which 100 mg. of concentrated sulfuric acid is contained. The suspension is sucked off, washed out with alcohol, mixed with 50 cc. of an organic binding agent consisting of 10 gr. of collodion, 5 gr. of ester gum and 5 grams of dibutylphthalate, in 100 cc. of a solvent, for instance, amylacetate. The suspension thus obtained is applied on to the body in a suitable manner, for instance, by spraying. In this manner a good conducting layer is formed on the body. Instead of the above mentioned binding against good results have been obtained with usual commercial nitro-cellulose lacquers.

The method according to the invention may also be carried out in the following manner: 25 gr. of copper powder is suspended in water, to which a solution is added containing 25 gr. of silver in form of sodium silver-cyanide. The suspension thus obtained is sucked off, washed out with alcohol and ether and dried in a vacuum

desiccator. The powder thus obtained is mixed with 50 cc. of an organic binding agent, as indicated above.

After this suspension has been applied for instance, by spraying on to a nonconducting body an admirabily conducting layer is formed, whose conductivity does practically not decrease even at high temperatures, and which, moreover, is proof against atmospheric influences.

The conductivity of the coating made with the pure metal powder prepared according to the present invention is very much greater than that of a similar coating made with commercial metal powder. We have found for example that a sheet of 10 cm. in length and 1 cm. in width prepared according to the present invention possesses a resistance of 5 ohms, whereas the same sheet of commercial metal powder possesses a resistance of more than 10,000 ohms.

What we claim is:

1. A composite electrical conductor comprising a solid non-conducting core member and a uniform firmly adherent coating of high conductivity, said coating comprising finely divided silver coated metal particles mixed with an organic binding agent.

2. A composite electrical conductor comprising a solid non-conducting core member and a uniform firmly adherent coating of high conductivity, said coating comprising finely divided silver coated copper particles mixed with an organic binding agent.

3. A composite electrical conductor comprising a solid non-conducting core member and a uniform firmly adherent coating of high conductivity, said coating comprising finely divided silver coated zinc particles mixed with an organic binding agent.

4. The method of producing an electrically conducting coating on a solid non-conducting core member, which consists in suspending finely divided metal particles in a solution containing silver-cyanide, washing out and drying the suspension, mixing the particles thus obtained with an organic binding agent, and then uniformly spraying the mixture on to the core member.

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