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ELECTRICAL CONTACT FOR RECTIFIERS

Filed March 30, 1934

Fig. 1.

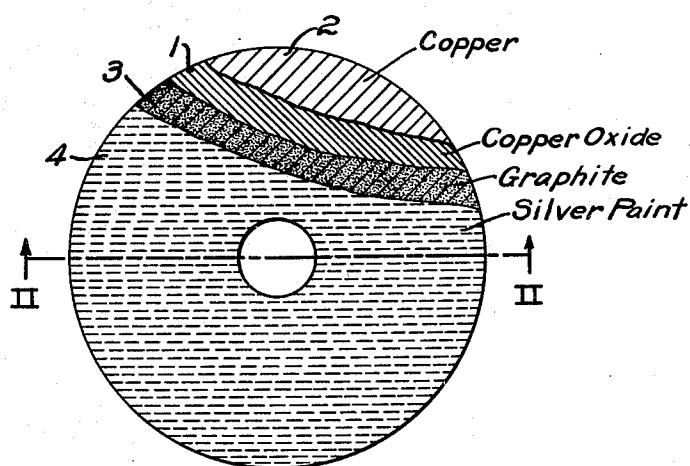
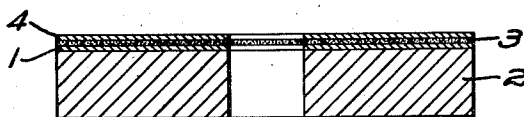


Fig. 2.



WITNESSES:

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ELECTRICAL CONTACT FOR RECTIFIERS

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2 Claims. (Cl. 175—366)

My invention relates to methods of making electrical contact to surfaces of certain materials, and particularly to methods of making electrical contact to surfaces comprising electrical compounds of the metals.

One object of my invention is to provide a method of making good electrical contact to the oxide surface of oxidized copper discs employed as contact rectifiers.

Another object of my invention is to provide a method of making good electrical contact to surfaces comprising oxides or other chemical compounds of the metals.

Another object of my invention is to provide a method of making good electrical contact which shall be of relatively low electrical resistance and which shall not change in the course of time or use at the surfaces of the oxide layers of copper oxide rectifiers.

Other objects of my invention will become apparent from reading the following specification taken in connection with the drawing in which Figure 1 is a plan view partly in section of a rectifier disc embodying my invention, and

Fig. 2 is a mid-sectional view taken along line II—II of the disc shown in Fig. 1.

It has heretofore been the practice to make electrical contact to surfaces of materials which cannot be welded or soldered without undergoing chemical or physical change, such for example, as the outer surfaces of oxide layers of the copper-oxide rectifiers described in Grondahl Patent No. 1,640,335, by superposing on such surfaces a layer of a soft metal such as lead or tin, making electrical contact from a copper or other metallic block to the reverse side of the lead or tin, and preferably reducing the electrical resistance of this composite contact by pressing the lead against the oxide surface with considerable force. Such arrangements, however, are not satisfactory under all circumstances for the reason that the soft metal layer undergoes slow deformation or "flow", thereby relieving the mechanical pressure and permitting the electrical resistance at the contact surfaces to increase appreciably with time.

In accordance with my invention, I have discovered that if the surface of the oxide layer is first coated with finely divided carbon or graphite and then covered with a layer of silver, gold, platinum, nickel, tin, or other such metal, held in suspension in a liquid carrier which may be of water, oil, lacquer, or other vaporizable liquid, electrical contact may be made by placing a metallic block or sheet in contact with the reverse side of the layer of metallic paint thus formed

on the oxide surface, with the result that electrical resistance of the contact is greatly reduced and remains permanent for long periods of time. Preferably, I coat the oxidized surface 1 of a copper oxide rectifier 2 with a thin coat of graphite 3 and then cover the graphitized surface with what may be termed a layer 4 of paint comprising finely divided silver suspended in ordinary water. By agitating the finely divided silver in a water solution, the silver particles may be made to stay in fairly uniform suspension in the liquid for a considerable period of time. This time increases with the fineness of the particles, and if the particles are so fine as to form what is called a colloidal solution of silver, the time of suspension is, for practical purposes, indefinite. The amount of water used for a gram of silver is capable of wide variation, but it is desirable that the percentage of water be only as great as is necessary to form a readily usable paint which spreads easily and freely over the graphitized surface. In many instances, it will be found desirable to raise the temperature of the oxide surface to assist the evaporation of the liquid vehicle, and this temperature rise may even be as high as the boiling point of the liquid, with satisfactory results in many cases.

While it is possible to coat the oxide surface with carbon or graphite by merely rubbing these finely divided materials over the oxide, I have found it advantageous in many instances, to coat the surface with the material known as aquadag, which I believe is a colloidal suspension of graphite in a liquid vehicle such as water.

While it is, of course, possible to coat the graphitized surface with metal by the Schoop spraying or by depositing silver by electrolysis or by chemical-reduction methods from solutions in the manner commonly employed in making mirrors, I have found the above-described painting process satisfactory from a practical standpoint.

While it is, of course, possible to deposit the silver or other metal by the methods described above directly on the oxide surface, I have not found the resulting contacts to be satisfactory where considerable amounts of current are to be carried for protracted periods of time, or where the rectifier element is subjected to temperature rise of considerable magnitude. While frequently contacts made without the use of graphite have shown satisfactory results when first completed, they have proved so unsatisfactory as to be virtually worthless for many services upon continued use, and this difficulty has completely disappeared when similar tests

were made with contacts subjected to the preliminary graphite coating. It seems probable that the tremendous improvement resulting from the interposition of the carbon between the silver and the oxide may result from some specific chemical or physical action on the oxide or the superposed metal, e. g. prevention of slow oxidation at the surface of the silver layer causing rapid deterioration of the contact from oxide direct to silver where carbon is not used; but whatever may be the reason, immense improvement results. The colloidal division of the metal can hardly be the cause since colloidal materials have been used for years, e. g. aquadag, for contact rectifier coatings without attaining the advantages of this combined colloidal carbon and silver.

While I have described my invention as applied particularly to electrical contacts for copper-

oxide rectifiers, I believe it to be capable of a considerably wider field of use in connection with the making of electrical contacts generally. I accordingly desire that the following claims be given the broadest interpretation of which they are reasonably capable in view of the prior art.

I claim as my invention:

1. The method of making electrical contacts to a surface of copper oxide which comprises coating said surface with finely divided carbon, and coating said carbon surface with a paint comprising finely divided silver suspended in water.

2. A rectifier element comprising copper metal having a portion of its surface oxidized, a coating of finely divided carbon on said oxidized surface, and a layer produced by coating said carbonized surface with colloidal silver paint.

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