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MANUFACTURE OF ELECTRICAL RECTIFIERS

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7 Claims. (Cl. 175—366)

My invention relates to the manufacture of electrical rectifiers of the type disclosed and claimed in Letters Patent of the United States, No. 1,640,335, granted to L. O. Grondahl on August 23, 1927.

One object of my invention is the provision of novel and improved means for producing metallic copper on the outer surface of the copper oxide in rectifiers of the type referred to.

I will describe one process embodying my invention, and will then point out the novel features thereof in claims.

A copper blank is first treated to form cuprous oxide thereon. This may be done, for example, by heating the blank in an oxygen atmosphere to a temperature of approximately 1000° centigrade.

The treated blank is then placed in a non-aqueous electrolytic bath containing an inorganic salt to reduce the outer layer of the copper oxide to copper. I have found that one of the salts in this bath should be calcium chloride. In addition, it should contain chlorides of some of the alkaline metals of the first group in the periodic table, such as chlorides of sodium or potassium either singly or in combination. The addition of the latter salts has the effect of reducing the melting point of the mixture to such a value that it can be kept molten at the temperature that is desired for quenching as hereinafter explained. A typical mixture that has been found suitable is the eutectic formed by mixing 66% of calcium chloride with 6% of potassium chloride and 28% of sodium chloride. This mixture melts at 504° C. The temperature of the electrolyte should be approximately 500° C. to 600° C. The treated blank, when in the electrolyte, should be in contact with a piece of metal having a higher potential than copper in the electromotive series; this metal may conveniently be a piece of iron. The iron then becomes the anode, and the oxidized blank becomes the cathode, the circuit being completed through the electrolyte. No outside source of potential is required for this process. I have found that a time interval of approximately one minute is sufficient to form an adequate copper surface on the cuprous oxide.

The purpose of producing the layer of copper on the outer surface of the copper oxide is, of course, to make it possible to readily make electrical contact with the cuprous oxide.

The preferred heat treatment of copper oxide rectifiers involves removing the treated blanks from the oxidizing furnace to a second furnace maintained at approximately 500° to 600° C., and quenching the blanks in water after they have reached the temperature of the second furnace. The reason for maintaining the reducing bath of my invention at 500° to 600° C. is to make this bath serve the purpose also of the second furnace, so that the blanks may be quenched in water directly from the reducing bath. The electrolyte must be so chosen that it will function as a reducing agent at 500° to 600° C.

Although I have herein described only one process of manufacturing electrical rectifiers, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. The process of producing a rectifier unit which consists in treating a copper blank to form cuprous oxide thereon, and treating the oxidized blank in a non-aqueous electrolytic bath containing calcium chloride to reduce the outer surface of the oxide to copper.

2. The process of producing a rectifier unit which consists in treating a copper blank to form cuprous oxide thereon, and treating the oxidized blank in a non-aqueous electrolytic bath containing calcium chloride at a temperature of 500° C. to 600° C. to reduce the outer surface of the oxide to copper.

3. The process of producing a rectifier unit which consists in treating a copper blank to form cuprous oxide thereon, and placing the oxidized blank in contact with iron in a non-aqueous electrolytic bath containing calcium chloride which elements themselves constitute an electric battery which furnishes current to reduce the outer surface of the oxide to copper.

4. The process of producing a rectifier unit which consists in treating a copper blank to form cuprous oxide thereon, and placing the treated blank in contact with a metal having a higher potential than copper in the electromotive series in a non-aqueous electrolyte containing calcium-chloride which elements themselves constitute an electric battery which furnishes current to reduce the outer surface of the oxide to copper.

5. The process of producing a rectifier unit which consists in treating a copper blank to form cuprous oxide thereon, and placing the treated blank in contact with a metal having a higher potential than copper in the electromotive series in a non-aqueous electrolyte maintained at a temperature of 500° C. to 600° C. and containing

calcium chloride to reduce the outer surface of the oxide.

6. The process of producing a rectifier unit which consists in treating a copper blank to form cuprous oxide thereon, treating the oxidized blank in a non-aqueous electrolytic bath containing calcium chloride to reduce the outer surface of the oxide to copper, and then quenching the blank.

7. The process of producing a rectifier which consists in heating a copper blank to approximately 1000° C. to form cuprous oxide thereon, placing the treated blank in a non-aqueous electrolytic bath containing calcium chloride at a temperature of approximately 500° to 600° C. to reduce the outer surface of the oxide to copper, and then quenching the blank from the temperature of said bath.

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