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MANUFACTURE OF ELECTRICAL RECTIFIERS

Filed Aug. 26, 1926

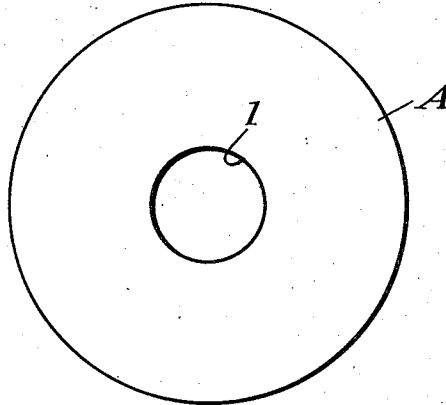


Fig. 1.

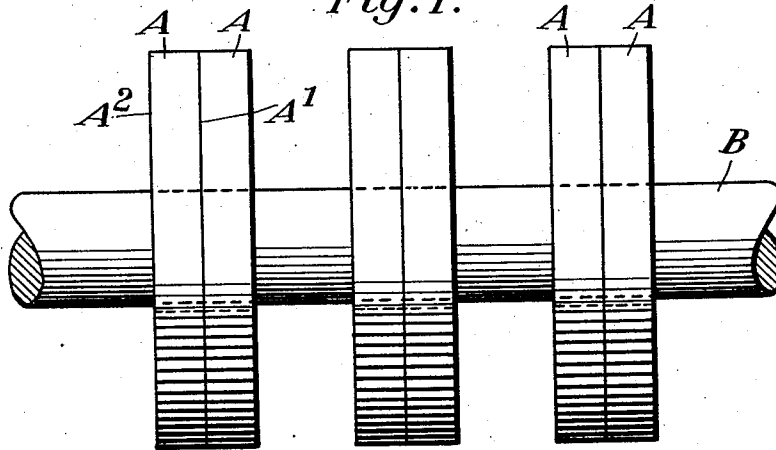


Fig. 2.

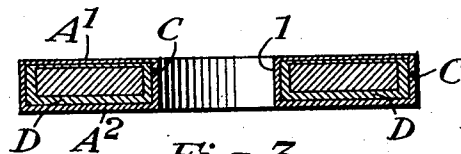


Fig. 3.

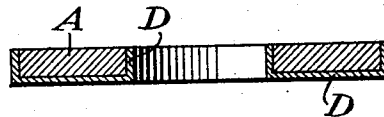


Fig. 4.

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UNITED STATES PATENT OFFICE.

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MANUFACTURE OF ELECTRICAL RECTIFIERS.

Application filed August 26, 1926. Serial No. 131,620.

Our invention relates to the manufacture of electrical rectifiers, and more particularly to the manufacture of the elements for rectifiers of the type disclosed and claimed in an application for Letters Patent of the United States, filed by Lars O. Grondahl on January 7, 1925, Serial No. 1,111, for unidirectional current carrying devices.

We will describe one process of manufacture embodying our invention, and will then point out the novel features in claims.

In the accompanying drawing, Fig. 1 is a view showing in elevation one form of blank ready to be prepared as a rectifier element in accordance with one process of manufacture embodying our invention. Fig. 2 is a view showing a number of the blanks assembled upon a support as they appear during one step in the manufacture. Fig. 3 is a view showing, in vertical section, a rectifier element as it would appear at one stage in the process of manufacture embodying our invention. Fig. 4 is a view showing a completed rectifier element constructed in accordance with our invention.

Similar reference characters refer to similar parts in each of the several views.

Referring to the drawing, the reference character A designates a blank of suitable material such as copper. As here shown this blank is of circular configuration and is provided with a central aperture, although this particular form is not essential. A number of these blanks are assembled upon a suitable support B and arranged in pairs so that the blanks of each pair have their adjacent faces A^1 in contact. The blanks, supported in the manner shown in Fig. 2, are chemically treated, as by the application of heat, to form upon the blanks a coating of a compound of the copper such as an oxide.

The oxidation process is continued until a sufficient deposit of oxide is formed over the outer surfaces of the blanks. Each blank will then appear as shown in Fig. 3. It will be seen that blank A is now covered with a coating D of cuprous or red oxide of copper and outside of this cuprous oxide coating is a thin layer of cupric or black oxide of copper. It will also be apparent that the oxide coating on the exposed surface A^2 of the blank is much thicker than on the opposite face A^1 which was in contact with an

adjacent blank during the oxidation process.

After the oxidation is completed the element is treated to remove the black oxide layer from the entire surface of the blank and to remove the red oxide coating from only one face A^1 of the blank. We have discovered that the rectifying characteristics of the completed element are considerably impaired if the oxide is removed mechanically. In practicing our invention, therefore, we prefer to remove the oxide coating by chemical means. To accomplish this result the oxidized blank is treated with a material which dissolves the oxide coating. We have discovered that cyanides of the alkali metals, such, for example, as the cyanides of potassium or sodium, are particularly suitable for this purpose. These cyanides have the characteristics of dissolving the black oxide much more rapidly than the red oxide.

In the preparation of the rectifier element the oxidized blank is treated with the cyanide, usually in an aqueous solution, until all of the oxide, both cuprous and cupric, is removed from the surface A^1 of the blank. During this step in the manufacture the cupric oxide is completely removed from the entire surface of the blank. After the proper amount of oxide has been dissolved by the cyanide the blank is washed in water and then appears as illustrated in Fig. 4 in which D designates the coating of cuprous oxide remaining on the inner and outer edges of the copper blank and on one face A^2 of the blank. It should be noted that no oxide remains on the other face A^1 of the copper blank A.

The element in its completed form, in which it is illustrated in Fig. 4, is ready for the application of contact members, such for example, as are disclosed in the application of Lars O. Grondahl hereinbefore referred to.

One advantage of a process of manufacture embodying our invention is that since the oxidation process is carried out with the blanks arranged in such manner that the oxide formed upon the blank is of non-uniform thickness, the removal of the oxide from a portion of the blank can be accomplished without special machinery. The rectifier elements can therefore be made with greater uniformity and economy when prepared in

accordance with our invention than with processes of manufacture hitherto known.

Although we have herein shown and described only one process of manufacture embodying our invention, 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 our invention.

10 Having thus described our invention, what we claim is:

1. The process of preparing a rectifier element which consists in forming upon a metallic blank an oxide coating of non-uniform 15 thickness, and treating the oxidized blank with a cyanide to dissolve all the oxide from a portion only of the blank.

2. The process of preparing a rectifier element which consists in forming upon a metallic blank a compound of the metal in a 20 coating of non-uniform thickness, and subsequently treating the blank with a solvent of such compound to remove all the compound from a portion only of the blank.

25 3. The process of preparing a rectifier element which consists in oxidizing a copper blank to form a coating of non-uniform thickness, treating the oxidized blank with a cyanide of an alkali metal to remove all the oxide 30 from a portion only of the blank, and finally washing the blank in water to remove the cyanide.

4. The process of preparing rectifier elements which consists in supporting flat metallic blanks in pairs with adjacent faces in 35 contact, forming a coating of a compound

of the metal directly on said blanks so that the coating is thicker on the exposed faces than on the adjacent faces of each pair, and finally separately treating the blanks with 40 a solvent of such compound to remove all the compound only from the faces which were in contact.

5. The process of preparing a rectifier element which consists in oxidizing a copper 45 blank to form a non-uniform coating of cuprous oxide directly on the copper and a coating of cupric oxide on such cuprous oxide, and treating the blank with a cyanide to remove all the cupric oxide and to remove the 50 cuprous oxide from a portion only of the blank.

6. In a process of preparing a rectifier element the step of forming directly upon a metallic blank a compound of the metal in a 55 coating of non-uniform thickness.

7. The process of preparing a rectifier element which consists in heating a copper blank to form thereon a coating of cuprous oxide which is thicker on one side of the blank than 60 on the other and an outer coating of cupric oxide, and treating the blank with a cyanide of an alkali metal to dissolve the cupric oxide from the entire blank and to dissolve all of the cuprous oxide from the side having the 65 thinner coating but leaving a layer of cuprous oxide on the side having the thicker coating.

In testimony whereof we affix our signatures.

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