Aug. 23, 1932. P. M. HENGSTENBERG 1,872,947

COPPER OXIDE RECTIFIER

Filed Aug. 22, 1928

Fig. 1.

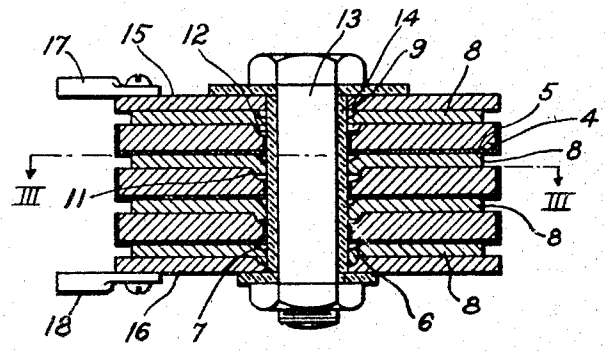


Fig. 2.

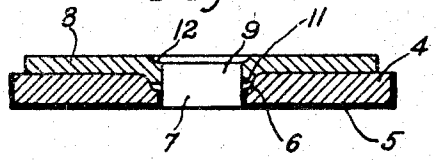
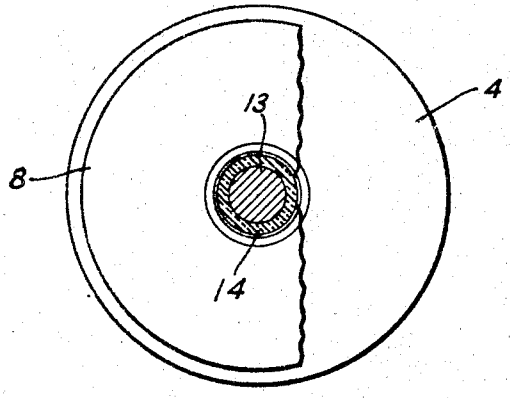


Fig. 3.



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UNITED STATES PATENT OFFICE

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COPPER OXIDE RECTIFIER

Application filed August 22, 1928. Serial No. 301,275.

My invention relates to rectifiers and particularly to rectifiers comprising metal discs having chemical combinations of metal formed on the surface placed in contact with terminal plates of a different material.

An object of my invention is to provide a rectifier wherein oxidized copper discs are placed in contact with discs made of an impressible metal and wherein the discs are provided with interfitting portions for centering the discs and for maintaining portions thereof out of contact with one another.

A further object of my invention is to provide a rectifier of the metal disc type wherein the discs are held in cooperative engagement by a central tie bolt extending through perforations in the disc and wherein the material of the discs adjacent to the perforations therein is maintained in spaced relation for preventing contact of the edges of the perforation of one plate with those of an adjacent plate.

A further object of my invention is to provide a rectifier of the oxidized disc type wherein the discs of one character are of larger diameter than those of the discs disposed between them, in order to offset the marginal edges of the discs and thereby prevent any portion of the edge of one disc from engaging a portion of the edge of a cooperative adjacent disc.

These and other objects that will be made apparent throughout further description of my invention, are obtained by means of a rectifier device hereinafter described and illustrated in the accompanying drawing wherein:

Figure 1 is a vertical section through a rectifier unit embodying features of my invention.

Fig. 2 is a vertical section through a pair of cooperating discs constituting a part of the rectifier, and

Fig. 3 is a transverse section of the rectifier taken on the line III—III of Fig. 1.

Rectifiers of the metal disc type usually comprise a plurality of metal discs preferably made of copper and which are coated on one side and on all edges thereof with copper oxide. Discs made of an impressible material, such as soft nickel or lead are usually disposed between the copper discs in such manner that current passes in series through the lead or nickel discs, by passing first through the bare surface of the copper disc and thence through the copper oxide on one face of the copper disc to the lead or nickel disc in engagement therewith. Any desired number of lead and copper discs may be arranged alternately, as indicated in Fig. 1 in order to secure the capacity desired in the rectifying unit.

A soft metal disc is usually placed in contact with the oxidized surfaces, in order that the soft metal surface may conform with the irregularities in the oxidized surface and thereby produce an efficient conductive joint or contact. A rectifier of this character is disclosed in the copending application of Alfred Atherton, filed December 31, 1927, and assigned to the Westinghouse Electric & Mfg. Company.

It has been found that the lead and copper discs sometimes become short circuited by reason of the contact of portions of the edges of the discs, in the event that the copper oxide coating of the outer marginal edges of the discs and the edges of the perforations is chipped off during manufacture and assembly of the rectifier units. In order to obviate this difficulty and to facilitate the centering of the disc, the lead or nickel discs are made of smaller diameter than the copper discs, thus so off-setting the marginal edges of the discs that they cannot come into contact with one another. In addition, the copper discs are counter bored adjacent the perforation, and the lead discs are embossed adjacent the perforation in a manner to separate the portions of the copper and lead discs adjacent the perforations, as will be hereinafter more fully described.

Referring to the drawing, the rectifier unit comprises a plurality of copper discs 4, that are provided with an oxidized surface or coating 5 that covers one surface of the disc and the marginal edges thereof, as indicated in Figs. 1 and 2. The unoxidized surface of the discs 4 are provided with a counter bore or depression 6 that is preferably made by

counter boring the disc adjacent the perforation 7 therein. The depression is counter bored instead of being pressed, because it has been found that forming the depression by a pressing operation distorts the surfaces of the disc.

Between each copper disc, a lead or nickel disc 8 is disposed, having a perforation 9 and which is embossed adjacent the perforation to provide a boss 11 that fits within the depression 6 of the adjacent copper disc and serves to center the discs with respect to one another. The embossing of the disc 8 also forms a depression or counter bore 12, which provides an insulating space between the depression side of the lead disc 8 and the adjacent oxidized surface of the copper disc 4.

It will be seen, by reference to Fig. 1, that the oxidized edges of the perforations in the copper discs are spaced from the edges of the perforations in the lead discs and thus contact therewith is obviated. Since the outer marginal edges of the lead and copper discs are off set by reason of their different diameters, there is no chance for portions of the outer marginal edges of the oxidized disc to come in contact with or short circuit, the lead or nickel disc in the event that the oxidized coating is chipped off through assembly or manufacture.

The discs are retained in assembled relation by means of a tie bolt 13 that extends through the perforations in the discs 4 and 8 and insulated therefrom by means of an insulating bushing 14 that surrounds the bolt. End plates 15 and 16 are provided for tightly clamping the discs in assembled relation and terminals 17 and 18 are provided for the electrical conductors.

From the foregoing, it is apparent that simple means are provided for centering the discs and for preventing the oxidized edges of the copper plates from coming in contact with the edges of the lead or nickel plates. The method employed is inexpensive, and the dimensions of the assembled unit are not increased by the reason of an improvement in the design of the rectifier unit.

I claim as my invention:

1. A rectifier comprising a pair of perforated cooperating current-rectifying discs, one of which is oxidized on one surface and counter-bored adjacent to the perforation on the unoxidized side and the other of which is embossed to provide a raised portion fitting within the said counter-bored depression in the first disc.

2. A rectifier comprising a plurality of perforated cooperating current-rectifying discs, alternate discs being severally provided, on one side, with a counter-bored depression adjacent to the perforation, and the intervening discs being severally provided with an offset portion forming a boss on one side to fit into the depression on one adjacent disc and with a depression on the other side to provide an insulating space between it and the other adjacent disc.

3. A rectifier comprising two groups of perforated cooperating current-rectifying discs, the discs of one group being disposed in alternate side-to-side relation to the other group and each having the portion surrounding the perforation offset to provide a depression on one side and a boss on the other side, the discs of the other group being severally provided with a counter-bored depression adjacent to the perforation to receive the boss of the adjacent disc.

In testimony whereof, I have hereunto subscribed my name this 13th day of August 1928.

PAUL M. HENGSTENBERG.