July 14, 1931. P. H. GEIGER 1,814,592

APPARATUS FOR USE IN THE MANUFACTURE OF RECTIFIERS

Filed Aug. 22, 1929

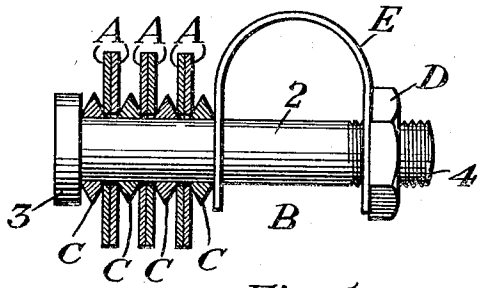


Fig. 1.



Fig. 2.



Fig. 3.

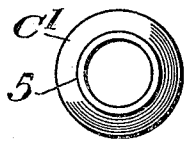


Fig. 4.



Fig. 5.



Fig. 6.

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UNITED STATES PATENT OFFICE

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APPARATUS FOR USE IN THE MANUFACTURE OF RECTIFIERS

Application filed August 22, 1929. Serial No. 387,654.

My invention relates to apparatus for use in the manufacture of electrical rectifiers, and has for an object the provision of novel and improved means for supporting rectifier blanks during heat treatment.

I will describe certain forms of apparatus embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a view showing in vertical section one form of apparatus embodying my invention. Figs. 2 and 3 are end and side views, respectively, showing one of the spacers forming part of the apparatus illustrated in Fig. 1. Figs. 4 and 5 are side and end views, respectively, showing a modified form of spacer which may be used in the apparatus illustrated in Fig. 1. Fig. 6 is a view showing still another form of spacer which may be employed in the apparatus illustrated in Fig. 1.

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

Apparatus embodying my invention is intended for use in the manufacture of rectifiers of the type disclosed and claimed in Letters Patent of the United States, No. 1640335, granted to Lars O. Grondahl on August 23, 1927. Rectifiers of this type are usually prepared by forming upon a metallic blank, such as copper or iron, a compound of the metal, such as an oxide or an iodide. If the rectifier element is prepared by oxidizing a copper blank, it is usually necessary to remove the oxide from one surface of the blank to provide terminals for connecting the element with an external circuit. The purpose of the present invention is the provision of apparatus whereby the oxidation of one surface of the copper blank is retarded.

Referring now to Figs. 1 and 2, the copper blanks, which are here designated by the reference character A, are each provided with a centrally located aperture, and are assembled in pairs upon the shank 2 of a bolt B. This bolt is provided with an enlarged head 3 at one end, and the other end of the shank 2 is threaded at 4 to receive a nut D.

Located on each side of each pair of blanks A is a spacer C, which is apertured to slide on the shank 2 of the bolt B. Each spacer C is in the form of an annular wedge, so that it engages with only the edge of the aperture in the adjoining blank A.

As shown in Fig. 1, the rectifier blanks and the spacers are all urged toward the head 3 of the bolt B by a flat spring E, one end of which engages the nut D, and the other end of which engages the spacer C nearest to the nut. This spring may be omitted if the bolts are always handled in the vertical position with the head 3 at the lowest point, thus causing the blanks and the spacers to be held together by their own weight. When the spring is used, it need not be of a material which will withstand the temperature used in the heat treating process, because it needs to exert a force only until the bolt is placed in position in the furnace.

Referring now to Figs. 4 and 5, the spacer, which is here designated C^1, is similar to the spacers shown in Figs. 2 and 3, except that the spacer C^1 is provided with a hub 5 which supports the adjacent rectifier blanks A. The length of this hub in the direction of the axis of the bolt B should be less than twice the thickness of each rectifier blank A.

Referring now to Fig. 6, the spacer, which is here designated C^2, is the same as that shown in Figs. 2 and 3, except that each surface is concaved in order to facilitate the seating of the rectifier blanks A against the spacer.

Apparatus embodying my invention has the following advantages.

There will be a minimum of oxide formed on the back of each blank, that is, on the surface of each blank which is in contact with the surface of the other blank in the same pair.

On the inside edge of the treated blank, where the spacer has engaged with the blank, there will be a ring where no oxide is formed; this is desirable, because the possibility of current leakage around the inner edge of the blank will be minimized, and the resistance of the rectifier blank in the high resistance direction will be improved.

The possibility of the oxide surface near the inside edge of the blank being injured is minimized.

The supporting bolt is not weakened by notches.

The number of rectifier blanks which can be placed on a rod of given length is maximum, thereby resulting in a maximum output of a given furnace.

The tendency of the blanks to separate is minimized.

The loading of the bolts can be accomplished quickly, and if desirable, it can be done by a machine.

If the blanks are held together with considerable force, they may tend to stick together after heat treatment. If this difficulty is encountered, it can be obviated by placing a thin nickel or nichrome washer between the blanks of each pair.

Although I have herein shown and described only certain forms of apparatus embodying my 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 my invention.

Having thus described my invention, what I claim is:

1. A support for holding flat apertured rectifier blanks during heat treatment, comprising a rod having a shank passing freely through the apertures in the blanks said rod having an enlarged head at one end and the shank being threaded at the other end, apertured spacers mounted to slide on the shank of said rod, the blanks being mounted in pairs with one spacer located on each side of each pair of blanks, a nut on the threaded end of said shank, and a spring coacting with said nut and with the spacer nearest to said nut to urge all of the blanks and spacers toward the head of said rod.

2. A support for holding flat apertured rectifier blanks during heat treatment, comprising a rod passing through the apertures in said blanks, and apertured spacers mounted to slide on said rod, the blanks being mounted in pairs with a spacer located between each two adjacent pairs of blanks, each spacer being in the form of an annular wedge so that it engages only with the edge of the aperture in the adjoining blank.

3. A support for holding flat apertured rectifier blanks during heat treatment, comprising a rod having a shank passing freely through the apertures in the blanks said rod having an enlarged head at one end and the shank being threaded at the other end, apertured spacers mounted to slide on the shank of said rod, the blanks being mounted in pairs with one spacer located on each side of each pair of blanks, a nut on the threaded end of said shank, and a spring coacting with said nut and with the spacer nearest to said nut to urge all of the blanks and spacers toward the head of said rod, each spacer being in the form of an annular wedge so that it engages with only the edge of the aperture in the adjoining blank.

4. A support for holding flat apertured rectifier blanks during heat treatment, comprising a rod passing through the apertures in said blanks, and apertured spacers mounted to slide on said rod, the blanks being mounted in pairs with a spacer located between each two adjacent pairs of blanks, each spacer being in the form of an annular wedge provided with a hub which supports the adjoining blanks.

In testimony whereof I affix my signature.

PAUL H. GEIGER.