Sept. 28, 1948. E. A. RICHARDS ET AL 2,450,020

MANUFACTURE OF RECTIFIER DISKS

Filed Nov. 20, 1943

FIG. 1.

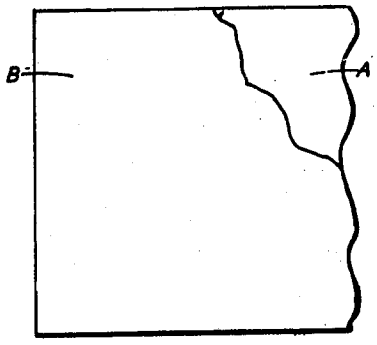


FIG. 2.

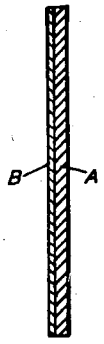


FIG. 4.



FIG. 3.

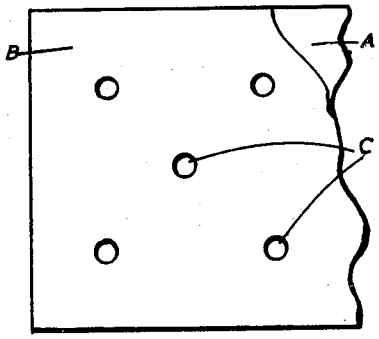


FIG. 5.

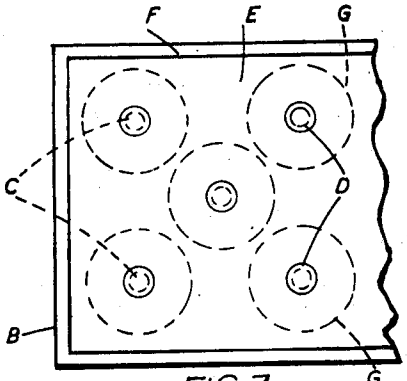


FIG. 6.

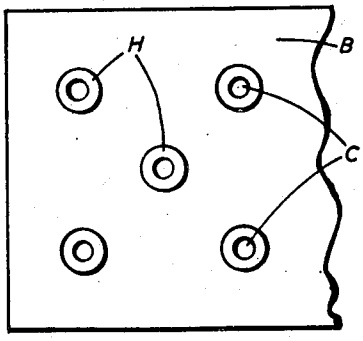


FIG. 7.

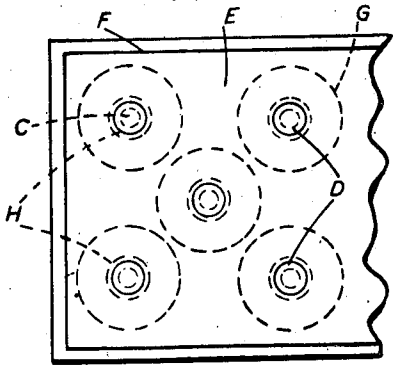
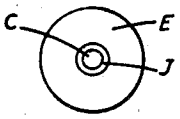


FIG. 8.



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UNITED STATES PATENT OFFICE

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MANUFACTURE OF RECTIFIER DISKS

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3 Claims. (Cl. 175—366)

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This invention relates to improvements in the manufacture of rectifier elements such as selenium rectifier discs which consist of a base plate of metal coated with a semi-conductor to which a counter electrode is applied, and consists in a method whereby small rectifier elements may be cut or blanked out from larger elements or sheets. The method is applicable to the manufacture of rectifier elements or discs having a central aperture by which the discs are mounted on a spindle and is applicable to the manufacture of the so-called centre contact construction described in British Patent No. 526,482.

The present invention provides a process for the manufacture of apertured rectifier elements by cutting or blanking them out from a relatively large sheet metal base plate provided with a layer of rectifying material to which a conducting layer forming the counterelectrode is applied, and is characterised in this that before the conducting layer is applied the base plate is provided with a plurality of holes corresponding to the apertures in the elements to be cut therefrom and these holes are masked during the application of the conducting layer to leave a clear space at the periphery of each hole and so avoid the necessity of subsequent trimming. Preferably the holes are masked by inserting mushroom-shaped elements therein.

In applying the process to the manufacture of so-called centre contact rectifier elements a layer of insulating material is applied to the layer of rectifying material to cover a small area around each hole either before or after the holes are cut in the plate.

The above and other features of the invention will be better understood from the following description of one particular embodiment thereof with reference to the accompanying drawings, in which

Fig. 1 is a plan view of a portion of a selenium coated base plate with a portion of the coating removed;

Fig. 2 is a sectional elevation thereof;

Fig. 3 shows the plate pierced with centre holes;

Fig. 4 shows a mushroom-shaped mask for masking the centre holes;

Fig. 5 shows the pierced plate of Fig. 3 with the masks in position and coated with counter-electrode metal, indicating in dotted lines the discs to be blanked out therefrom;

Fig. 6 shows the plate with a coating of insulating material around the centre holes as used in the manufacture of the so-called centre-contact discs;

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Fig. 7 shows the plate coated with counter-electrode metal with the mushroom-shaped masks in position; and

Fig. 8 is a view of one of the blanked-out discs.

Referring to Figs. 1 and 2, a sheet of steel or other metal forming the base plate A is coated with a layer of selenium B over the whole of one surface, and the appropriate heat treatment is applied to the selenium to convert it to the alpha modification. The sheet is then pierced with a number of holes C corresponding to the centre holes of the small discs which are eventually to be punched from the larger sheet, as shown in Fig. 3. Mushroom-shaped masks D (Fig. 4) are then placed in the holes, and the whole sheet is sprayed with counter-electrode metal E as shown in Fig. 5. The masks leave the rectifying layer exposed around the periphery of the holes in the sheet so that there is no possibility of short-circuit between the counter-electrode metal and the base plate. The necessary electrical forming process is preferably carried out before the small discs are punched from the larger sheet, and for this purpose the edge of the sheet is masked as indicated at F to prevent short-circuiting with the base plate. If desired, the small discs can be electrically formed individually after geing cut from the base plate. The dotted lines G shown in Fig. 5 indicate the outer periphery of the discs to be eventually cut from the plate.

In the manufacture of the so-called centre-contact discs, the base plate is placed in a mask provided with holes of a diameter larger than the holes C in the sheet, and a suitable insulating varnish or enamel is sprayed on to the portions of the sheet thus exposed. In this manner the surface surrounding each centre hole is coated with the insulating enamel over an area determined by the size of the holes in the mask as indicated in Fig. 6, wherein H represents the insulating coating around the holes. It will be understood that this insulating coating may be applied either before or after the holes C are cut in the plate. The sheet may then pass through a further heat treatment to convert the selenium to the beta form, and at the same time to bake the enamel portions H to the required degree of hardness. The mushroom-shaped masks D are then inserted in the holes and the counter-electrode metal sprayed on as previously described and as shown in Fig. 7. This leaves the insulating enamel H exposed around the periphery of the holes in the sheet so that there is no possibility of short circuit between the counter-electrode metal and the base plate, it being under-

stood that the mushroom-shaped masks are of such a size that the counter-electrode metal extends over a portion of the insulating rings H.

After the sheets have been prepared as above-described either for the manufacture of centre-contact type or non-centre-contact type, discs of the required diameter may then be cut or blanked out from the sheet using the centre holes as a guide. Fig. 8 shows one of the blanked out discs in which J represents the clear area left around the centre hole C. The counter-electrode metal at the outside edge of the blanket-out discs may be removed by cutting a groove or by shot-blasting in the manner described in previous United States applications numbers 509,109 and 508,225, both now abandoned. As an alternative to spraying the whole surface of the plate with counter-electrode metal except for the ring around the centre holes, a second mask may be used to limit the counter-electrode metal to the working surface of each small disc. This would leave the selenium exposed at the outside edge where the punching operation takes place, and thus avoid the need for removing the counter-electrode metal from the edge after the discs have been blanked. With this arrangement, however, it is not possible to form the whole sheet electrically unless special contacts are arranged to connect to each small disc separately, but as above indicated, the discs can be formed separately after blanking out.

The process has been described as applied to the manufacture of circular discs from a rectangular sheet, but it will be obvious that any other shape may be used either for the original sheet or for the final rectifiers, and that the small rectifiers may be produced by a cutting operation instead of punching as described. Moreover, although the aperture has been referred to as a centre hole, it will be understood that this may be otherwise located or may take the form of a slot.

What is claimed is:

1. A process of manufacturing a plurality of apertured so-called center-contact rectifier elements from a base plate provided with a layer of rectifying material which comprises the following steps: punching out a plurality of holes corresponding to the holes in the elements to be made, applying insulating material to the layer of rectifying material to cover a small area around each hole, inserting self-centering masks in these holes, spraying the base plate with a conducting layer forming the counter-electrode, covering the masks and the exposed surface of the rectifying layer.

2. A process of manufacturing apertured rectifier elements from a base plate provided with a layer of rectifying material which comprises the following steps: punching out a plurality of holes corresponding to the holes in the elements to be made, inserting self-centering masks in these holes, spraying the base plate with a conducting layer, forming the counter-electrode covering the masks and the exposed surfaces of the rectifying layer, severing the elements from the said base plate, and removing the conducting layer at the outer edges of the blanked-out rectifier elements by shot-blasting.

3. A process of manufacturing apertured rectifier elements from a base plate provided with a layer of rectifying material which comprises the following steps: punching out a plurality of holes corresponding to the holes in the elements to be made, inserting self centering masks in these holes, spraying the base plate with a conducting layer forming the counter-electrode covering the masks and the exposed surfaces of the rectifying layer, and subjecting the sheet-metal base plate, the rectifying layer, and the conducting layer to an electrical forming process before the individual rectifier elements are cut therefrom.

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