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2,414,801

RECTIFIER ELEMENT AND STACK

Filed June 16, 1942

Fig. 1.

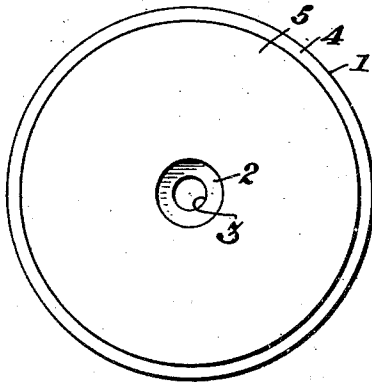


Fig. 6.

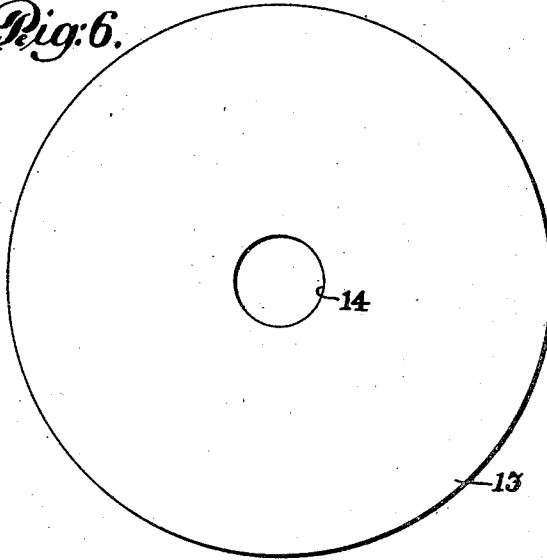


Fig. 2.

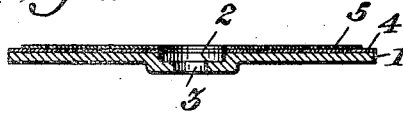


Fig. 7.

Fig. 8.

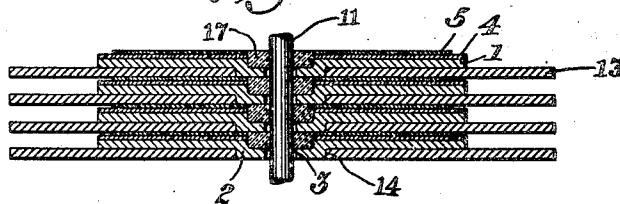


Fig. 5.

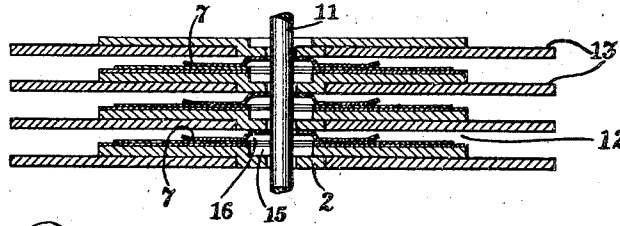


Fig. 3.

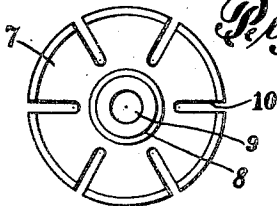


Fig. 4.



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RECTIFIER ELEMENT AND STACK

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12 Claims. (Cl. 175-366)

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This invention relates to dry rectifier stacks and has for its object to provide a simple stack for such rectifiers.

The invention is applicable to rectifiers of the dry plate type. An element of such a rectifier ordinarily comprises a base plate coated with a semi-conductor layer such as selenium over which there is placed a counter-electrode layer which in turn is covered by a metallic plate or electrode. It is a common practice to connect a number of such rectifier elements in series to form a stack. Heretofore it has been customary to separate the individual rectifier elements in the stack by washers so that there is a space between each element. The use of such washers, however, has the disadvantage of increasing the expense and complication of the stack. In accordance with my invention it is not necessary to use such spacing washers, the necessity for using them being avoided by so shaping the base plate that it presents a boss which spaces the next adjacent rectifier element in the stack. A contact member or plate may if desired be fitted over the boss to perform a cooling function and may be made to establish contact between adjacent rectifier elements in the stack.

The invention will be better understood from the following detailed description when taken in conjunction with the accompanying drawing of which

Fig. 1 is a face view of a base plate containing a coating of selenium, made in accordance with this invention;

Fig. 2 is a cross-section side view of the device in Fig. 1;

Fig. 3 is a face view of a metallic contact member used in the stack;

Fig. 4 is a side view of the contact member of Fig. 3;

Fig. 5 is a cross-sectional view of a stack assembled according to this invention;

Fig. 6 is a face view of a metallic cooling member which may be used in the stack;

Fig. 7 illustrates an insulating collar which may be used with the stack; and

Fig. 8 is a cross sectional view of an alternative form of stack according to this invention.

Referring to Figs. 1 and 2 of the drawing, the dry rectifier element may be made by a coating of selenium 4 placed on a base plate, preferably of steel 1, in a well known manner. This is preferably done by coating the surface of plate 1 with nickel and roughening it so that the selenium will adhere, and then melting the selenium onto the roughened plate causing the selenium to fuse

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to the plate. The plate 1 is formed into a boss 2 at its central location, as shown, and a hole 3 is provided through which the usual mandrel is placed when the rectifier is stacked. The selenium layer 4 is coated on its outer surface with a metallic coating 5 which is preferably sprayed onto the selenium to make an intimate contact with it. The base plate 1 constitutes one electrode or terminal of the rectifier element and the coating 5 constitutes the other terminal or counter-electrode of the rectifier.

A number of rectifier elements as shown in Figs. 1 and 2 may be stacked by placing between successive elements a contact member. Such a contact member is shown in Figs. 3 and 4 wherein the contact disc 7 is a spring member ordinarily of brass provided with a raised central boss 8 through which there is a hole 9 of about the same diameter as hole 3 in the rectifier plate. A number of radial slots 10 serve to improve the resilience of the member 7 so that the portion around the boss 8 will flatten down as shown in Fig. 4.

The assembly into a stack of a number of rectifier elements according to my invention is illustrated in Fig. 5, wherein the rectifier plates of the type of Figs. 1 and 2 are interleaved with the plates 7 such that the boss 8 is in contact with the back of boss 2. The assembly may be mounted in the usual manner upon a mandrel or bolt 11 and clamped between end clamps which are not shown. The pressure on the clamp should be sufficient to flatten the outer circumferential portion of members 7 against the counter-electrode surfaces 5, while allowing the bosses 8 to remain raised to create a space 12 between the rectifier elements. Any number of the rectifier elements and members 7 may be stacked up in series to form a rectifier, the number depending upon the circuits, voltages and currents with which the rectifier is to be used.

The use of a base plate 1 having a boss 2 according to this invention has the advantage of enabling the rectifier elements to be stacked without the necessity for any washer between adjacent elements. Such a washer has been necessary under the prior practice in which the base plate of the rectifier element had been made as a flat plate or disc without any boss such as boss 2.

In accordance with another feature it is possible to use a cooling element or disc to conduct away heat. Such a disc is shown in Fig. 6 wherein the flat disc 13, for example, has a centrally located hole 14 of a diameter large enough to pass over the boss 2 and advantageously fits snugly over the boss to hold the disc in place.

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Such a disc may be placed against the underside of each rectifier plate in the position shown in dotted lines in Fig. 5. By this arrangement heat is conducted radially through discs 13 and additional heat may be radiated through the remaining spaces 12 between disc 13 and member 7.

If desired, washers (not shown) similar to the washers 17 of Figure 8 may be placed in the spaces 15 and 16 within the bosses 2 and 8, respectively. Other means, known to men skilled in the art serving the same purpose can be provided as a bolt 11 of insulating material or a sleeve (not shown) of insulating material put over the bolt 11.

A possible alternative manner of stacking the elements which eliminate the spring contact member 7 while utilizing the member 13 both as a cooling member and a contacting member is illustrated in Fig. 8. The thickness of member 13 is made equal to the elevation of boss 2 so that the plate 13 just fits between the back of base plate 1 and the counter-electrode 5 of the next adjacent element. This stack is shown with the insulating washers 17 in position. It will be understood that in this arrangement the plates 13 need not necessarily be enlarged beyond the peripheries of the rectifier discs as shown in Fig. 8, but might be made of substantially the same diameter or even of the somewhat smaller diameter of the counter-electrode layer 5. When enlarged as shown in Fig. 8, however, these plates perform the function of conducting heat away from the rectifier as well as making contact between adjacent elements.

The assembly arrangements according to my invention eliminate the use of any spacing washers together with the attendant work of assembling such additional elements.

I claim:

1. In a rectifier stack, a rectifier element comprising a base plate having a boss at a central portion, a semi-conductor layer over one surface of the base plate, and a counter-electrode over the surface of the semi-conductor layer, and a contacting member over the counter-electrode and having a portion which abuts against the boss of the next succeeding base plate.

2. In a rectifier stack, a rectifier element comprising a base plate having a boss at a central portion, a semi-conductor layer over the surface of the base plate opposite from the boss, and a counter-electrode over the surface of the semi-conductor layer, and a contacting member having a boss projecting toward and against the boss of the base plate and making contact over the counter-electrode surface of the next succeeding rectifier element.

3. Apparatus according to claim 2 in which said contacting member is a spring member.

4. In a rectifier stack, a rectifier element comprising a base plate having a boss, a semi-conductor layer over the surface of said base plate

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opposite the boss, and a counter-electrode layer over the surface of the semi-conductor layer, a contacting member having a flattened portion in contact with said counter-electrode layer and a raised boss portion projecting away from said semi-conductor layer and against the boss of the base plate of the next succeeding rectifier element, and a cooling disc having an opening which fits over the boss of the base plate and in contact with the back of the base plate.

5. Apparatus according to claim 4 in which said cooling member is held into position by the boss of the contacting member.

6. In a rectifier stack, a base plate, a selenium coating thereon, said base plate having an embossed portion having an opening through it, and a contacting plate adapted to be placed against the surface of the base plate which is opposite the selenium coating and having an opening adapted to fit over the boss of the base plate.

7. Apparatus according to claim 6, in which the second mentioned plate is of larger diameter than the base plate to act as a cooling element.

8. In a rectifier stack, a base plate, a semi-conductor coating thereon, said base plate being formed with an embossed portion having an opening through it, a contacting plate adapted to be placed against the surface of the base plate which is opposite the semi-conductor coating and having an opening adapted to fit over the boss and an insulating washer which fits within the embossed portion and is of a thickness which causes it to fill the space between the inside of the embossed portion and the outside of the embossed portion of the next base plate in the stack.

9. A rectifier element comprising a base plate having a flat portion and a boss struck up therefrom, a mounting selenium coating on the side of and extending solely over said flat plate portion which is opposite said boss, and a counter-electrode layer over said selenium layer.

10. A rectifier element comprising a base plate having a flat portion and a centrally located embossed portion, a hole through said embossed portion, a selenium layer on the side of said flat portion opposite the boss and a counter electrode over said selenium.

11. A rectifier stack comprising a plurality of rectifier elements, each element comprising a base plate having a boss at a central portion, a semi-conductor layer on the surface of the base plate opposite from the boss, and a counter-electrode on the surface of said semi-conductor layer, and a contacting member in contact with the counter electrode surface and with the boss of the next adjacent element in the stack.

12. A rectifier stack according to claim 11 in which the contacting member includes a raised portion engaging the boss of said next adjacent element.

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