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F. BRUNKE

2,205,897

DRY PLATE RECTIFIER AND METHOD OF PRODUCING SAME

Filed June 8, 1937

Fig. 1.

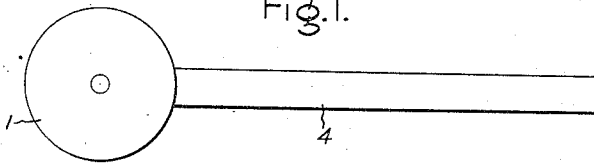


Fig. 2.

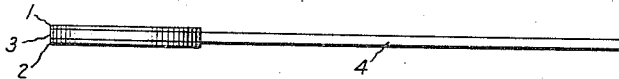


Fig. 3.

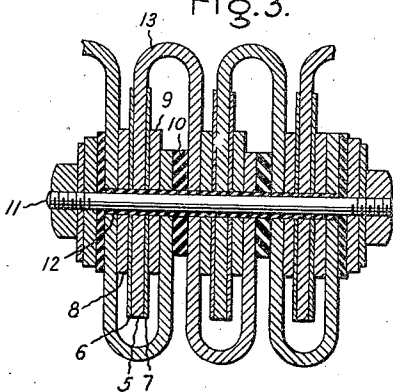
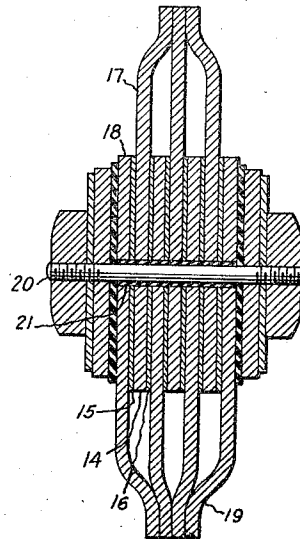


Fig. 4.



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DRY PLATE RECTIFIER AND METHOD OF
PRODUCING SAMEFritz Brunke, Berlin-Steglitz, Germany, assignor
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New YorkApplication June 8, 1937, Serial No. 147,105
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4 Claims. (Cl. 175—366)

My invention relates to dry plate rectifiers and like devices such as light-sensitive cells, wherein a semi-conductor layer composed, for example, of selenium or comprising selenium is deposited on a base or carrier electrode composed of a suitable material such as aluminum, iron, or nickel. The object of the invention is to provide improved devices of the above-mentioned type and an improved method of producing such devices.

Heretofore in the process of manufacturing a selenium rectifier and the like cells or elements, which normally include a base or carrier electrode having a selenium semi-conductor layer thereon, and a counter electrode, the selenium layer has usually been applied in liquid form to the material of the relatively thin carrier electrode. In this prior process powdered selenium is placed on the carrier electrode to which heat is supplied from a hot plate upon which the electrode is laid, the selenium then melting, and flowing over the carrier electrode to form a thin layer thereon. In this method as well as in other prior methods of forming the semi-conductor layer on the carrier electrode, only a portion of the total surface of the carrier electrode is utilized for forming the semi-conductor material thereon, with a resulting waste of carrier electrode material and an increase in the required size and weight of the assembled rectifiers for a given power.

In accordance with my present invention a method of producing dry plate rectifiers and the like, particularly of the selenium type, is provided whereby the above-mentioned disadvantage is obviated, and devices of this character may be easily constructed which are relatively small for a given power.

My invention will be better understood from the following description when considered in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

Referring to the drawing, Figs. 1 and 2 are, respectively, plan and side elevational views of a rectifier base or carrier electrode member having thereon semi-conductor material, in accordance with my invention; and Figs. 3 and 4 are cross-sectional views on an enlarged scale of rectifier units having, respectively, series-connected and parallel connected rectifier cells or elements incorporating the carrier electrode and semi-conductor elements illustrated in Figs. 1 and 2.

When the above-described prior method of depositing the semi-conductor layer on the carrier electrode by melting the selenium thereon is employed, only one side of the latter electrode can be

covered by the semi-conductor layer, with consequent waste of available carrier electrode surface and material. In accordance with my present invention, and as illustrated in Figs. 1 and 2, semi-conductor layers or films 1 and 2, preferably composed of selenium or comprising selenium, are deposited on both sides of a portion of a sheet of a suitable conductive material, preferably aluminum, the main or carrier electrode portion proper of which is designated by the numeral 3. The semi-conductor layers are formed by the vaporization process, which includes exposing the carrier electrode 3 to a vapor of the semi-conductor material for such a period of time and under such conditions of ambient temperature and pressure that the resulting films 1 and 2 are of the desired electrical characteristics and small thickness. The films may be deposited on the carrier electrode either simultaneously or in succession.

Since both sides of the carrier electrodes are thus provided with semi-conductor layers, therefore in assembling rectifier units employing these double-coated carrier electrodes, counter electrodes are provided on both sides of the carrier electrode 3 in order to utilize both coated surfaces, one counter electrode being in contact with layer 1 and the other in contact with layer 2. To aid in assembling rectifier units employing the above-described double-coated carrier electrodes it is of advantage to provide the latter with an extension element or strap 4, which may be formed integrally with the carrier electrode proper, 3, as by being stamped in one piece with the portion 3, or which may be joined thereto in any suitable manner, the coating process being so arranged that the extension portion 4 is not covered with the semi-conductor material. The extension element 4 serves as a current lead-in to the carrier electrode 3 and, as will be more clearly explained hereinafter, may also serve advantageously as a connection to other elements of the rectifier unit.

Referring to Fig. 3, the series-connected rectifier unit illustrated therein comprises a plurality of rectifier cells or elements each comprising a carrier electrode 5 having semi-conductor layers or films 6 and 7 which have been applied to the opposite surfaces of the carrier electrode by the above-described vaporization process, and counter electrodes 8 and 9 in contact, respectively, with the layers 6 and 7. The cells are insulated from each other by insulating plates 10 and are preferably mounted in the usual manner on a bolt 11 which may be of insulating material but which

is preferably of metal insulated from the rectifier elements by an insulating sleeve 12. The rectifier cells are connected in series relation by employing, preferably, the extension elements or straps 13, similar to the strap 4 above described in connection with Figs. 1 and 2, to connect any given carrier electrode, for example, the carrier electrode at the left-hand end of Fig. 3, with the counter electrodes of the next succeeding rectifier cell of the series.

It will be readily seen that, for a rectifier unit having a given area of carrier electrode surface coated with semi-conductor material, the series-connected unit, illustrated in Fig. 3, incorporating the double-coated carrier electrodes in accordance with the invention, requires only one half of the number of carrier electrodes which would necessarily be employed in a conventional unit incorporating carrier electrodes having a layer melted to only one side thereof.

In the parallel-connected rectifier unit illustrated in Fig. 4, the numeral 14 designates the similar members of a group of carrier electrodes each having semi-conductor layers 15 and 16 which have been deposited by the vaporization process on the opposite sides thereof, the electrodes of the group being connected together preferably by means of extension portions or straps 17. The numeral 18 designates the similar members of a group of counter electrodes connected together by any suitable connection means 19. The group of double-coated carrier electrodes 14 is interleaved with the group of counter electrodes 18 and the interleaved electrodes are preferably mounted in the usual manner on a bolt 20 insulated from the rectifier elements by an insulating sleeve 21.

It will be seen that, for a parallel-connected rectifier unit having a given area of carrier electrode surface coated with the semi-conductor material, the unit illustrated in Fig. 4, having a group of double-coated carrier electrodes in accordance with the invention, requires, as compared with a conventional unit having the same area of semi-conductor coated carrier electrode surface but with the carrier-electrodes coated on one side only, one half the number of carrier electrodes, only one more than half as many counter electrodes, and no insulation between individual cells or elements of the unit.

It will be readily understood, further, that as required to meet various voltage and current conditions, rectifier cells or elements in accordance with the invention may be arranged partly in parallel and partly in series.

My invention has been described herein in particular embodiments for purposes of illustration. It is to be understood, however, that the invention is susceptible of various changes and modifica-

tions and that by the appended claims I intend to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A dry plate device including a plurality of rectifier cells, each of said cells comprising a plate of conductive material having a carrier electrode portion and an extension portion, coatings of semi-conductor material on opposite sides of said carrier electrode portion, a pair of counter electrodes in contact respectively with said oppositely-disposed coatings, said carrier electrode portions and said counter electrodes having openings formed therethrough, clamping means extending through said openings, and means including said extension portions to connect said rectifier cells in series along said clamping means.

2. A dry plate device including a group of carrier electrodes connected in parallel, each of said carrier electrodes having coatings of semi-conductor material on opposite sides thereof, and a group of counter electrodes connected in parallel, said group of carrier electrodes being interleaved between said group of counter electrodes and said coatings being in contact with corresponding surfaces of said counter electrodes.

3. A dry plate device including a plurality of rectifier cells, a mounting bolt, each of said cells comprising a plate of conductive material having a perforated carrier electrode portion insulatingly mounted on said bolt and an extension portion, coatings of semi-conductor material on opposite sides of said carrier electrode portion, and a pair of perforated counter electrodes insulatingly mounted on said bolt and in contact respectively with said oppositely-disposed coatings, and means including said extension portions to connect said rectifier cells in series along said mounting bolt.

4. A dry plate device including a mounting bolt, a group of carrier electrodes each comprising a perforated portion insulatingly mounted on said bolt having coatings of semi-conductor material on opposite sides thereof and an extension portion, said extension portions being connected together thereby to connect said carrier electrodes in parallel, and a group of counter electrodes each comprising a perforated portion insulatingly mounted on said bolt and an extension portion, said last-named extension portions being connected together to connect said counter electrodes in parallel, said group of carrier electrodes being interleaved between said group of counter electrodes and said coatings being in contact with corresponding surfaces of said counter electrode.

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