Aug. 8, 1950 E. A. RICHARDS ET AL 2,517,602

METAL CONTACT RECTIFIER AND PHOTOELECTRIC CELL

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FIG. 1.

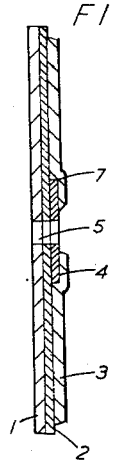


FIG. 1a

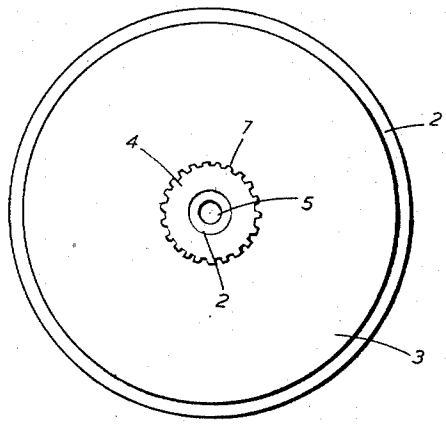


FIG. 2.

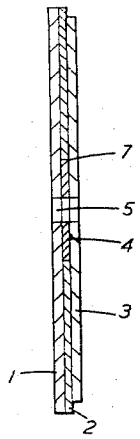
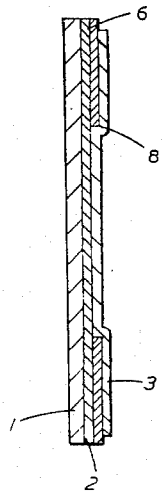


FIG. 3.



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FIG. 5.

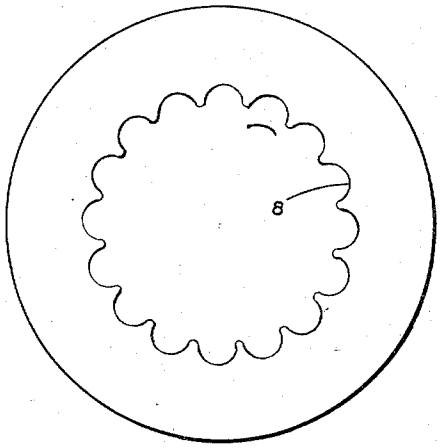


FIG. 4.

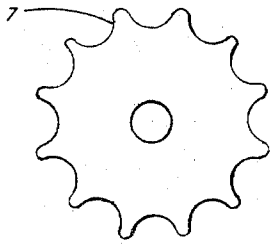
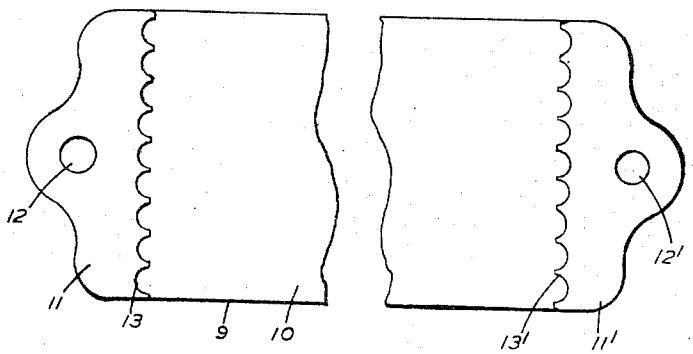


FIG. 6.



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Patented Aug. 8, 1950 2,517,602

UNITED STATES PATENT OFFICE

2,517,602

METAL CONTACT RECTIFIER AND PHOTOELECTRIC CELL

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Application January 5, 1946, Serial No. 639,470
In Great Britain January 17, 1945

3 Claims. (Cl. 175—366)

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The present invention relates to improvements in selenium cells, by which term is meant both dry contact rectifiers and photoelectric cells.

Dry contact rectifiers generally consist of a metal plate having on one face a layer of semi-conducting material; a counter-electrode is provided by spraying a coating of a suitable alloy on the surface of the semi-conductor. Photoelectric cells are of similar construction except that the counter-electrode is formed of a translucent or transparent material, such as a thin coating of gold.

To make satisfactory contact with the counter-electrode it is necessary to apply a certain amount of pressure. It has been found, however, that if this pressure is too great, a decrease of the reverse resistance of the rectifier is produced. It has also been found that when sufficiently light pressure is used to avoid this difficulty, bad contacts are often produced in rectifiers which are moistureproofed, on account of the moisture-proofing material penetrating between the counter-electrode and the pressure member.

In order to overcome these difficulties, it was proposed in U. S. Patent No. 2,314,104, granted March 16, 1943, to E. A. Richards and L. J. Ellison upon an application entitled "Metal Rectifiers," to provide a layer of insulation between the semi-conducting layer and the counter-electrode over a limited area to which the contact pressure would be confined. The insulating layer may be provided by applying varnish or by attaching a thin washer of insulating material to the semi-conducting surface, before applying the counter-electrode thereto. In an actual example given, the base plate consisted of a circular disc, having a central hole and covered on one side with a layer of selenium, and an annular washer of insulating material fixed to the selenium surface so as to surround the central hole. The counter-electrode was then sprayed over the washer and over the remainder of the selenium surface, and contact to the counter-electrode was made by clamping over the area of the insulating washer. A number of such discs could be mounted on a central spindle and could be clamped together with a reasonably high pressure without affecting the quality of the rectifiers.

In another form the rectifier element consisted of a metal base portion covered on one side with a layer of selenium which is then covered with an insulating material except for a central area, the outer surface of the insulating material and the exposed area of the selenium surface being

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then covered in the normal manner by the counter-electrode.

In yet another form the rectifier element consisted of a metal base portion only partially covered on one side with a layer of selenium, the part of the metal base not so covered being covered with an insulating material and the surfaces of the selenium and the insulating material being covered with the counter-electrode.

It has been found that where the counter-electrode layer passes over the edge of the thin insulating layer it tends to develop cracks, or to become unduly thin so that the resistance of the counter-electrode is effectively increased. The principal object of the present invention is to prevent this increase of resistance by providing the insulating layer with an indented edge so that the length of contour of the edge which is bridged by the counter-electrode is greatly increased, thus providing an increased number of parallel paths for the current in the region where the counter-electrode is likely to crack or to be unduly reduced in thickness.

In the specification of co-pending application Serial No. 639,469, filed January 5, 1946, by E. A. Richards and W. E. Pease, entitled "Photoelectric Cells," the principle of the insulating layer is applied to photoelectric cells, and it will be understood that the edge of the layer may be indented according to the present invention for exactly the same reasons as in the case in the dry contact rectifier.

It will be understood that the important point of any of these arrangements is that the counter-electrode will be applied to the surface of the semi-conducting material and will overlap the insulating layer. According to the present invention the periphery of the insulating layer over which the counter-electrode extends is indented, in order to increase the length of the contour. Contact pressure is applied over the area covered by the insulating layer. The indentations may be of any desired form.

In order that the invention may be more clearly understood reference is directed to the accompanying drawings which show diagrammatically and by way of example embodiments of the invention.

In these drawings:

Figs. 1 and 1*a* are respectively a sectional elevation and a front view of an element wherein the layer of insulation is between the semi-conducting layer and the counter-electrode around a centre hole.

Fig. 2 is a view similar to Fig. 1, of modified

construction wherein the layer of insulation is between the metal base and the counter-electrode around a centre hole.

Fig. 3 shows yet another modified construction wherein the layer of insulation is between the semi-conducting layer and the counter-electrode around the outer periphery of the element.

Figs. 4 and 5 are enlarged diagrammatic plan views of the layers of insulation used respectively in Figs. 1 and 2 and Fig. 3.

Fig. 6 is a plan view, broken at the centre, of an elongated plate type rectifier having mounting holes at each end.

Further modifications to the combination could be shown wherein, for example, the modification in Fig. 3 is combined with the construction shown in Fig. 1 or Fig. 2 but the examples already shown will suffice for a full understanding of this invention.

Referring particularly to Fig. 1, the reference 1 indicates a disc, of iron or other suitable material having a centre hole 5, the whole surface of one face of the disc being coated with semi-conducting material such as selenium at 2. 4 denotes a layer of insulating material around the centre hole 5 and 3 denotes a covering of counter-electrode material extending over the surfaces of the semi-conductor 2 and the insulation material 4. The shape of the layer of insulation material is more clearly indicated in Fig. 4 in which the length of the contour of the edge or line of demarcation 7 which is bridged by the counter-electrode 4 is increased by indentations. In Fig. 2, 1 indicates the base metal having a central hole 5 and 2 a layer of semi-conducting material which covers a part of the base 1. The part of the base 1 around the centre hole 5 which is not covered with the semi-conducting material is covered with an insulation material 4 whose shape may be as indicated in Fig. 4. A layer of counter-electrode material 3 extends over the surfaces of the semi-conductor 2 and the insulation material 4.

A modified construction according to one embodiment of the invention is shown in Fig. 3 in which 1 indicates the base metal and 2 a layer of semi-conducting material. 3 is a layer of counter-electrode material separated from the semi-conductor 2 around the periphery of the element by a layer of insulation material 6, the shape of which is more clearly indicated in Fig. 5 in which the length of the contour of the edge 8 which is bridged by the counter-electrode 3 is increased by indentations.

In Fig. 6, 9 is an elongated base plate having a layer 10 of semi-conducting material thereon and 11 and 11' are layers of insulating material surrounding mounting holes 12 and 12' and extending over a portion of the semi-conducting layer 10 as far as the indented edges 13 and 13'. The surfaces of the layers of insulating material 11 and 11' and the exposed surface of the semi-conductor 10 are covered with a continuous layer of counter-electrode material (not shown) which bridges the indented edges 13 and 13'.

It is believed that the above description will suffice for a clear understanding of the invention which is not limited to the embodiments shown and described which are made only by way of example and it will be understood that various modifications and changes may be made therein as will be apparent to those skilled in the art to which this invention pertains.

By the term selenium cell, as used in the following claims is meant both selenium photocells and selenium rectifiers.

What is claimed is:

1. In a selenium cell including elements of the type individually comprising a metallic base plate bearing a selenium layer with an overlying counter-electrode, said elements being supported in operating relationship by application of pressure to discrete areas adjacent marginal portions thereof, the improvements that comprise interposing an electrically insulative substantially flat body between the base plate and the counter-electrode underlying that portion of the counter-electrode at the said marginal portions where pressure is applied, the edge of said body most remote from the margin of the element being of irregular outline.

2. A selenium cell element as defined in claim 1 wherein the edge of the substantially flat body interposed between the base plate and the counter-electrode most remote from the margin of the element is serrated.

3. A selenium cell element as defined in claim 1 wherein the edge of the substantially flat body interposed between the base plate and the counter-electrode most remote from the margin of the element is undulant.

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