Patented Jan. 7, 1941 2,227,827

UNITED STATES PATENT OFFICE

2,227,827

MANUFACTURE OF DEVICES PRESENTING ELECTRICAL ASYMMETRIC CONDUCTIVITY

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No Drawing. Application March 16, 1939, Serial No. 262,233. In France September 21, 1938

8 Claims. (Cl. 175—366)

This invention relates to the manufacture of alternating electric current rectifiers of the kind comprising a rectifying body or layer composed of or containing selenium and has for its object to provide improvements in the manufacture of rectifiers of this character.

As usually constructed, the rectifying element comprises a metal base plate or electrode upon the surface of which is formed in any suitable manner a relatively thin layer composed of or containing selenium in a crystalline or so-called metallic condition in which it is a relatively good conductor of electricity, a counter-electrode being provided in intimate contact with the surface of the layer and constituted for example by a metal film formed by any suitable process such as spraying or electro-deposition.

In this as in other dry surface contact rectifiers it is desirable that the resistance offered to the passage of current between the base plate or electrode and the counter-electrode should be as low as possible in one direction termed the forward direction and as high as possible in the other or reverse direction.

As regards the flow of current in the reverse direction, the rectifying element possesses a critical applied voltage above which the reverse current tends to increase rapidly in service from its original value until the rectifier becomes useless, and it is evidently desirable that this critical voltage should be as high as possible. In rectifiers of this character, as hitherto manufactured, the resistance characteristics of the rectifying element in the forward and reverse directions are both determined by the process of manufacture and composition of the rectifying layer, and the characteristic in each direction can only be varied within narrow limits without altering the characteristic in the other direction.

According to the present invention, however, the resistance characteristic of the rectifying element in the reverse direction and the applied critical voltage above referred to is materially increased without a substantial corresponding alteration of the characteristic in the forward direction by subjecting the element during a stage in its manufacture to an additional treatment consisting in immersing the element in a liquid or gaseous bath or medium of such a nature as to effect an alkaline reaction with the material of the rectifying layer.

It is believed that the alkaline bath reacts with the selenium oxide or other substances contained in or added to the selenium to render these substances inactive and by this action increases the reverse direction resistance and the critical voltage above referred to without appreciably increasing the resistance in the forward direction.

The invention thus enables various substances capable of reducing the resistance of the rectifying layer to be added to the selenium without correspondingly reducing the resistance of the rectifying element in the reverse direction.

In carrying the invention into practice the bath utilised in the case of a rectifying element comprising a layer of relatively pure selenium or containing in addition selenium oxide only, may contain sodium or potassium hydroxide, calcium, barium or lithium oxide, or carbonate, an alkaline sulphide, selenide or cyanide, or an alkaline phosphate, silicate or borate. Similar ammonia or amino salts may also be employed.

Amongst other substances which may be added to the selenium with or without selenium oxide for the purposes above indicated are fluorine, chlorine, bromine, and iodine or oxides or oxyhalogen compounds of sulphur or selenium, extremely small percentage amounts of these substances being found to be effective. In the case of rectifying elements comprising layers containing these added substances the fluid bath employed should be considerably more alkaline in character than in the case of rectifying elements containing selenium with or without added or formed selenium oxide only.

The rectifying element produced in accordance with the invention may be further improved by a stage of treatment involving the passage through the element of a suitable electric current.

It will be evident from the above description that the invention consists essentially in subjecting the rectifying element during its manufacture to the action of a fluid bath having an alkaline reaction, this treatment not only serving to increase the reverse direction resistance and critical voltage of the element but permitting the incorporation in the rectifying layer of various substances which would otherwise be inadmissible for the reasons explained above.

The invention is thus not limited to any particular composition of the bath employed nor to the addition of the substances mentioned by way of example, and variation in these and other respects may evidently be made without exceeding the scope of the invention.

Having thus described my invention, what I claim is:

1. The method of improving the resistance characteristics of a selenium rectifier which comprises treating the rectifying layer with a liquid

or gaseous bath or medium capable of effecting an alkaline reaction with the material of which the rectifying layer is composed.

2. The method of improving the resistance characteristics of a selenium rectifier which consists in treating the rectifying layer with an alkaline bath containing sodium or potassium hydroxide, calcium, barium or lithium oxide or carbonate, an alkaline sulphide, selenide or cyanide, or an alkaline phosphate, silicate or borate.

3. The method of improving the resistance characteristics of a selenium rectifier having selenium oxide included in the selenium layer which comprises treating the selenium layer with an alkaline bath which reacts with the selenium oxide to render it inactive.

4. The method of improving the rectifying characteristics of a selenium rectifier having selenium oxide included in the selenium layer which comprises treating the selenium layer with an alkaline bath containing sodium or potassium hydroxide, calcium, barium or lithium oxide, or carbonate, an alkaline sulphide, selenide or cyanide, or an alkaline phosphate, silicate or borate, or ammonia or amino salts.

5. The method of improving the rectifying characteristics of a selenium rectifier which consists in adding to the selenium with or without selenium oxide small quantities of the halogens fluorine, chlorine, bromine or iodine, or oxy-halogen compounds of sulphur or selenium and subjecting the selenium layer to the action of a fluid bath having an alkaline reaction.

6. The method of improving the resistance characteristics of a selenium rectifier which consists in treating the selenium layer with a fluid bath having an alkaline reaction and then passing an electric current through the rectifier.

7. The method of improving the resistance characteristics of a selenium rectifier which consists in adding to the selenium with or without selenium oxide small quantities of the halogens fluorine, chlorine, bromine, or iodine or oxy-halogen compounds of sulphur or selenium, treating the selenium layer with a bath containing sodium or potassium hydroxide, calcium, barium or lithium oxide or carbonate, an alkaline sulphide, selenide or cyanide, or an alkaline phosphate, silicate or borate, and then passing an electric current through the rectifier.

8. A process for the manufacture of a selenium rectifier comprising forming a rectifying layer on a metal baseplate subjecting the rectifying layer to the action of a liquid or gaseous bath having an alkaline reaction to increase the reverse direction resistance and the critical voltage above which the reverse resistance tends to increase rapidly in service, and then providing a metal film counter-electrode in intimate contact with the layer.

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