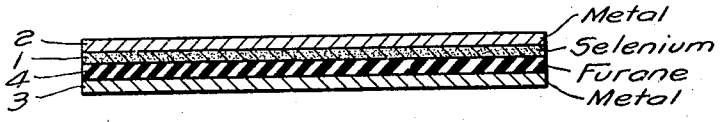
March 12, 1940. A. LOTZ 2,193,598

METHOD OF PRODUCING SELENIUM RECTIFIERS

Filed Aug. 20, 1937



WITNESSES:

E. A. McCloskey.

Wm. C. Goode

INVENTOR

Albert Lotz.

BY F. W. Lyle.

ATTORNEY

Patented Mar. 12, 1940 2,193,598

UNITED STATES PATENT OFFICE

2,193,598

METHOD OF PRODUCING SELENIUM RECTIFIERS

Albert Lotz, Berlin-Siemensstadt, Germany, assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application August 20, 1937, Serial No. 160,053
In Germany September 5, 1936

7 Claims. (Cl. 175—366)

My invention relates to rectifiers and especially to selenium rectifiers.

An object of the invention is to increase the resistance ratios of selenium rectifiers to the order of 1 to 5,000 to 1 to 10,000.

The single figure of drawing illustrates a rectifier in accordance with one embodiment of my invention. It comprises a layer of selenium deposited upon a metal. Between the free surface of the selenium and a metallic counter-electrode is sandwiched a layer of furane.

The invention provides for increasing the effectiveness of the rectifier by inserting artificially between the selenium layer and the metallic counter-electrode a nonconductive intermediate layer of organic material. The invention also contemplates subjecting the selenium layer and the rectifier electrodes to a treatment with organic material having a reducing effect. By this means the resistance ratio, namely, the resistance in the current conductive direction to the resistance in the blocking direction, is notably improved.

Still better effects may, however, be obtained in this connection if, in accordance with the invention, the non-conductive intermediate layer, which is applied at a temperature between room temperature and the fusion temperature of selenium, is produced by vaporizing organic material that preferably is obtained as nitrogen containing, oxygen containing or sulphur containing cyclic or heterocyclic compounds, which are free of other organic radicals. Particularly effective are those compounds which, when heated wholly or partly, break up and condense in lacquer-like brown precipitates. Preferably the vaporization of the above-named materials takes place during the thermic compression of the selenium.

The cyclic compounds which are especially suitable for the above-mentioned purpose are listed as follows with the particularly suitable derivative of the compounds added in parenthesis:

Alcohol, aldehyde, ketone (OH derivatives)
Amine (N derivatives)
Quinone (O derivatives)
Nitro compounds (NO_2 derivatives)
Nitroso compounds (NO derivatives)
Analine (NH_2 derivatives)

As heterocyclic compounds the most suitable are, for example, pyrrole and pyrroline (N containing) furane and dimetholfurane (O containing) as well as pyradine piperidine and quinoline (N containing). As particularly suitable, the following, among numerous ones, have proven themselves:

Hydroquinone
Alizarine
Resorcine
Phenylhydrazine
Piperonal quinoline

As thio compounds, those derivatives of a cyclic or heterocyclic compound in which the oxygen, nitrogen or hydrogen is wholly or partly replaced by an element of the sulphur group (sulphur, selenium, tellurium) for example, thiophene or thiophenyl, are also suitable.

Selenium rectifier plates treated in this manner have resistance ratios, namely, the resistance in the current conductive direction to resistance in the blocking direction, of the order of 1 to 5,000 to 1 to 10,000. The selenium rectifiers constructed according to the invention distinguish themselves by the fact that they may be operated at essentially higher blocking potentials than has been usual heretofore.

In the production of the intermediate layer the procedure is first to carry out the compression of the selenium into a conductive modification, and then heat the converted plates at approximately 200° C. for several hours in the vapor of the preferred organic material. The whole conversion may instead take place in the vapor. The organic material is broken up partly during the heating and forms on the selenium layer a precipitate of condensed dark brown color products of decomposition, so that the selenium layer has a dark or substantially black shiny appearance.

While there has been disclosed several modifications of the invention, yet it is apparent that still further modifications may be made without departing from the spirit of the invention. Accordingly, it is not intended that the terms of the following claims be limited except as is necessitated by the prior art.

I claim as my invention:

1. The method of producing selenium rectifiers in which a non-conducting intermediate layer is artificially inserted between the selenium layer and the metallic counter-electrode characterized by the fact that the intermediate layer is produced at a temperature which lies between room temperature and the fusion temperature of the selenium by vaporizing those organic materials which are contained from the group of nitrogenous, oxygenous and sulphur containing deriva-

tives of cyclic or heterocyclic compounds and which are free of other organic radicals.

2. Method according to claim 1 characterized by the fact that for the organic material to be vaporized on derivatives of cyclic compounds are selected which contain one of the following groups: O, OH, NO_2, NO, N, NH_2, NOH.

3. Method according to claim 1 characterized by the fact that for the vaporizing one of the following materials is utilized: hydroquinone, alizarine, resorcine, phenylhydrazine, piperanol, thiophen or thiophenyl.

4. Method according to claim 1 characterized by the fact that for the organic material to be vaporized an N or O derivative of heterocyclic compounds are selected.

5. Method according to claim 1 characterized by the fact that, for the vaporizing, one of the following materials is utilized: pyrrole, pyrroline, furane, dimetholfurane, pyradine, piperidine, quinoline.

6. Method according to claim 1 characterized by the fact that the vaporization takes place during the thermic compression of the selenium.

7. A rectifier comprising an electrode having at least its surface of selenium, a non-conducting intermediate layer consisting of a cyclic or heterocyclic compound containing nitrogen, oxygen or sulphur, and a counter-electrode having a metallic surface.

ALBERT LOTZ.