July 10, 1945. A. J. MILLER ET AL 2,379,919

MANUFACTURE OF SELENIUM ELEMENTS

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Fig: 1.

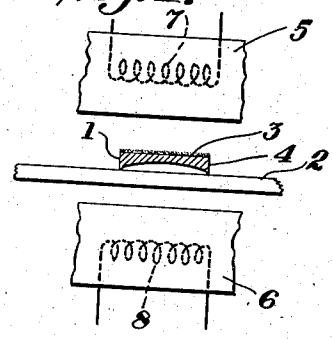



Fig: 2.

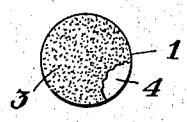



Fig: 3.

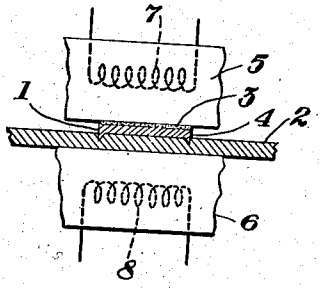
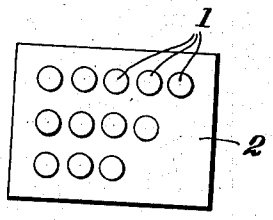



Fig: 4.

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# UNITED STATES PATENT OFFICE

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## MANUFACTURE OF SELENIUM ELEMENTS

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Application May 1, 1943, Serial No. 485,383

9 Claims. (Cl. 175—366)

This invention relates to the manufacture of selenium coated elements such as are used for rectifiers and particularly to the simultaneous treating and processing of a plurality of such elements.

The object of this invention is to make or process a plurality of selenium rectifiers as a unit during their manufacture.

Selenium elements are commonly made by applying selenium to a base plate ordinarily composed of a metal as iron, steel or aluminum or the like, and subjecting the treated plates to elevated temperatures in one or more steps and also to pressure if desired. A counterelectrode comprising a conducting substance such as Wood's metal is then usually applied, as by spraying, on the selenium surface. It is thought that the rectifying property, i. e., the ability to pass current flowing in the forward direction and to block the flow in the reverse direction is due to the formation of a "blocking layer" at the selenium surface under the counterelectrode.

According to our invention a number of such selenium elements are made as a unit. To do this we provide burrs at the bottoms of the individual base plates so that the burrs may be pressed into a supporting plate which acts as a jig. The various steps in the fabrication and treatment of the elements are carried out with the base plates on the support.

The invention will be better understood by reference to the following detailed description and the attached drawing of which:

Figure 1 is a cross-section view of a selenium coated element shown resting on a carrier plate or jig;

Figure 2 is a face view of the element;

Figure 3 shows one of the elements pressed into the jig; and

Figure 4 is a face view of a jig having a plurality of elements affixed thereto.

Referring to the drawing, Fig. 1 shows a cross section of a rectifier element in which a circumferential burr 1 of base plate 4 is resting on the surface of the jig 2. The burr may conveniently be formed by punching out the base plate by the use of a punch; which by its operation produces the burr at one side of the punched out plate. A selenium coating is then applied to the surface of the base plate opposite the burr. This may conveniently be a layer of selenium powder. A number of these elements are similarly placed on the carrier plate as shown in Fig. 4 with their burrs against the jig, and are similarly covered with a selenium layer. The jig bearing the elements is then placed in a press indicated by the press platens 5 and 6 in Fig. 1, so that the burrs are pressed into the carrier plate which should be of a metal soft enough to receive them, such as aluminum. Fig. 3 shows one of the elements in compression between the press platens and shows the burr pressed into the jig plate. The pressure required is not critical; a pressure of around 4,000 pounds per square inch having been found satisfactory. During the pressing the temperature should be elevated somewhat to soften the selenium for example, in the range of about 100° C. to 150° C. This may be done by heating the press platens by heating elements 7 and 8. The selenium powder is thereby compressed and sintered sufficiently to become a solid thin layer adhering to each base plate.

The elements carried by the jig will then ordinarily be subjected to a second heat treatment for example by placing them in an oven at a temperature in the range of about 150° C. to 217° C., and further treatments may be applied, such as fuming the selenium surfaces by gas or moisture. Following this a conducting alloy serving as the counter-electrode is sprayed on the selenium surfaces. To adapt the elements as rectifiers they are commonly electroformed by passing a D. C. or pulsating D. C. current through them in the direction opposite that of normal forward current flow. All of the foregoing steps may be performed while the elements are held in the jig 2; they may then be pushed out of the jig.

The invention provides a method of affixing a large number of elements to a holding jig and treating them by various treatments as a unit, thereby saving much time and work. It is understood that this invention is not limited to the particular illustration given as variations may be made within the scope of the claims.

What is claimed is:

1. The method of making a plurality of selenium elements which comprises forming burrs on a number of base plates, placing the base plates on a supporting jig with the burrs against the jig, covering the base plates with selenium and pressing the selenium covered plates into the jig and then heat treating, applying counter-electrodes and electroforming the elements while in the jig.

2. The method of making a plurality of selenium elements as a unit which comprises forming burrs at the bottoms of a number of base plates, covering the tops of the base plates with

selenium and then pressing the selenium covered base plates against a jig so that the burrs enter the jig, and then further treating the elements.

3. The method of making a plurality of selenium elements which comprises punching out base plates with circumferential burrs, placing the base plates with the burrs against the carrier plate, covering the base plates with selenium powder, then pressing the powder covered base plates with the burrs against the jig at an elevated temperature to form adherent solid selenium layers adhering to the base plates and to press the base plates to the jig, and then further treating the elements while in the jig.

4. Process for making selenium rectifier elements by placing on a jig a plurality of metal plates each having a burr around the rim so that the burr is touching the jig surface, covering said plates with selenium and subjecting the whole to pressure at an elevated temperature whereby said selenium is sintered to said plates and the burrs forced into the surface of the jig.

5. Process for making selenium rectifier elements by placing on a jig a plurality of metal plates each having a burr around the rim so that the burr is touching the jig surface, covering said plates with selenium powder and subjecting the whole to elevated temperature and pressure whereby said selenium is sintered to said plates and the burrs forced into the surface of the jig.

6. Process for making selenium rectifier elements by placing on a soft metal jig a plurality of metal plates each having a burr around the rim so that the burr is touching the surface of said jig, covering said plates with selenium powder and subjecting the whole to elevated temperature and pressure whereby said selenium is sintered to said plates and the elements held to the jig by the burrs.

7. The combination of a plurality of selenium rectifier elements and a metal jig plate, said elements each having a punching burr extending substantially entirely around its periphery forced into the surface of said jig.

8. Method of making a plurality of selenium elements by punching out metallic base plates with circumferential burrs, placing said plates on a soft metal jig, covering said plates with selenium powder, pressing said plates with the burrs against the jig at a temperature in the range 100° C. to 150° C. to sinter the selenium powder to said plates so as to form an adherent layer thereon and to force said burrs into the jig, subjecting the elements to a second heat treatment in the range 150° C. to 217° C., fuming the elements with a gas, spraying a conducting alloy on the selenium surfaces and electroforming, and then removing the elements from the jig.

9. A process for mounting selenium rectifier elements on a jig which comprises punching out a plurality of metal rectifier base plates with the formation of a marginal burr at one side of each plate, placing a plurality of said plates on the jig with the burr of each plate contacting the jig surface, and pressing the plates against the jig to force the burrs into the jig surface.

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