June 8, 1943. O. SASLAW 2,321,523

METHOD OF RECLAIMING SELENIUM ELEMENTS

Filed June 27, 1942

FIG. 1.

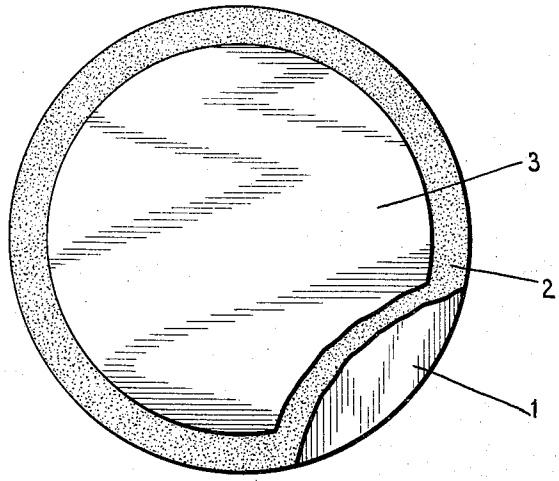
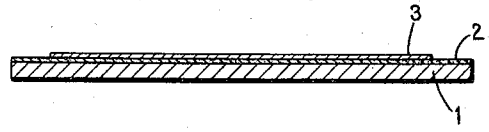


FIG. 2.



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METHOD OF RECLAIMING SELENIUM ELEMENTS

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5 Claims. (Cl. 175—366)

This invention relates to selenium cells and particularly cells of the dry plate type adapted for use in rectifiers.

The object of this invention is to reclaim selenium plates which have broken down under voltage or are otherwise rejected.

Selenium plates or elements are commonly composed of an annealed selenium layer on a metal base plate and a metallic counter electrode layer sprayed over the selenium. When voltage is applied to such elements, they sometimes break down, thereby destroying their usefulness. At it has heretofore been the practice to discard broken-down and rejected selenium elements, there has resulted great waste of the selenium and base plate and also of the work and processing performed on the element in making it.

In accordance with my invention this waste is largely eliminated by reclaiming the base plate together with most of the selenium and saving at least some of the processing steps. The invention will be better understood from the following detailed description and the accompanying drawing of which

Fig. 1 illustrates a face view of a selenium rectifier element; and

Fig. 2 is a side view in cross section.

In the drawing the selenium element comprises a base plate 1 ordinarily of steel which is preferably nickel plated on its top surface, and a coating 2 of selenium which has been annealed by heat treating in a well-known manner to crystallize the selenium. The annealing is ordinarily done in two heat treatment steps: The first step involves heating to around 120° C. under pressure in some sort of a jig for about a half hour; and the second step involves heating without pressure for some hours at a higher temperature just under the melting point of selenium for example, about 214° C. A treatment is then usually given the selenium with selenium dioxide vapor, after which a conducting counter-electrode 3, ordinarily an alloy of tin, bismuth and cadmium, is sprayed over the selenium surface.

When such a rectifying element breaks down under voltage, the breakdown is in the form of an arc which burns through the selenium from the counter-electrode to the base plate, thereby destroying the element.

In accordance with my invention I treat a destroyed or rejected selenium element with hydrochloric acid, which may be of practically any concentration for this purpose. Both concentrated HCl and a 50% concentration HCl have been found satisfactory, for example. This acid treatment removes the counter-electrode layer apparently by dissolving the tin in the alloy which thereby undermines the layer 3 causing it to become separated from the selenium. The surface layer on the selenium just beneath the counter-electrode should then preferably be scraped as by sandpaper. Thereafter, I heat the plate containing the remaining selenium coating 2 sufficiently to fuse the selenium just enough to cause it to flow together somewhat to eliminate any effect of a breakdown. I then allow the disc to cool and then press a relatively small amount of vitreous selenium powder within the uneven portions left on the surface of the cooled selenium, using a high pressure and an elevated temperature. The pressure is not critical as a high pressure of 1,000 lbs. per square inch or more, but preferably in the order of about 8,000 pounds per square inch will do. The temperature at this pressure may satisfactorily be around 120° C., although it may be varied considerably from this. It should not be hot enough to melt the selenium, of course.

At this stage, the selenium layer is in the condition it was at the end of the first heat treatment step in its initial annealing. The disc is then subjected to the second heat treatment step by placing in an oven at about 214° centigrade for about one-half hour.

By the use of this reclaiming process I have succeeded in saving the work and hours of time ordinarily used in coating the selenium on the base plate and heat treating it in the initial heat treatment steps under pressure. In addition to this saving of time and work there is the additional saving of the base plate and the selenium layer which would be lost if the element were thrown away.

I claim:

1. The method of reclaiming a selenium element which comprises applying hydrochloric acid, then fusing the remaining selenium and allowing it subsequently to harden, then pressing selenium powder in the uneven portions of the selenium surface at a high pressure and an elevated temperature.

2. A method of reclaiming a plate coated with selenium and with a counter-electrode over the selenium which comprises dissolving off the counter-electrode in hydrochloric acid, then fusing the selenium remaining on the plate and allowing it subsequently to harden, then pressing selenium powder into the hardened selenium surface at a high pressure of around a thousand

pounds per square inch or more and an elevated temperature.

3. The method of reclaiming a selenium coated element having a counter-electrode coating over the selenium which comprises removing the counter-electrode in hydrochloric acid, then fusing the selenium remaining on the element and allowing the selenium subsequently to harden, then pressing selenium powder over the hardened selenium surface at a pressure in the order of 8,000 pounds per square inch and a temperature of the order of 120° C. and below the melting point of selenium.

4. The method according to claim 3 which comprises the additional step of a second heat treatment without pressure and at a higher temperature below the melting point of selenium.

5. The method of reclaiming a selenium coated element having a counter-electrode coating over the selenium which comprises removing the counter-electrode by application of hydrochloric acid, then scraping the selenium surface, then fusing the remaining selenium somewhat and allowing it subsequently to harden, then pressing selenium powder into the selenium surface at a high pressure and an elevated temperature.

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