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RECTIFIER AND METHOD OF MAKING SAME

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Fig. 1.

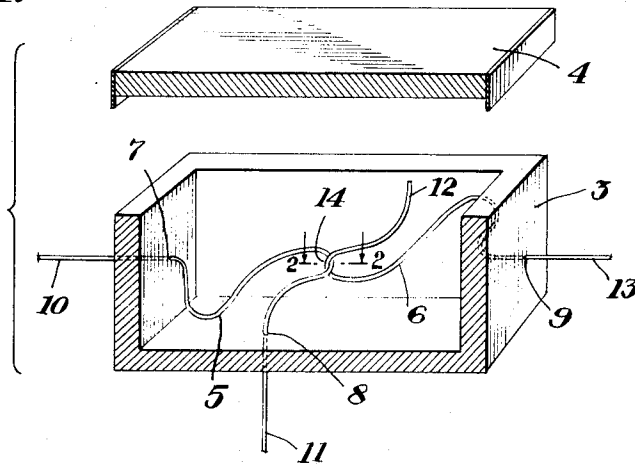


Fig. 2.

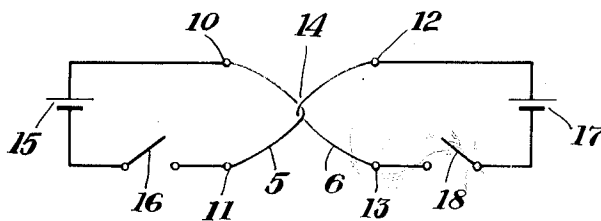
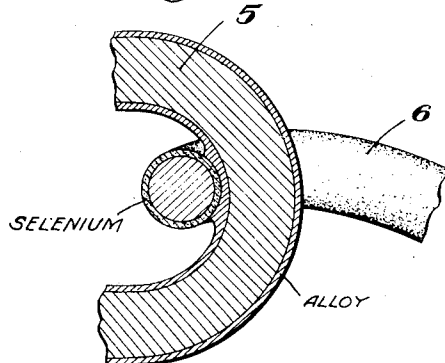


Fig. 3.

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RECTIFIER AND METHOD OF MAKING SAME

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7 Claims. (Cl. 175-366)

My invention relates to current rectifying devices and to a method of constructing the same.

One object of the present invention is to provide a simple, compact rectifying apparatus of the selenium type which has a satisfactory forward-reverse current ratio and a high operating efficiency.

A further object of the invention is to provide a method of quickly and easily constructing a selenium rectifier utilizing a minimum number of parts.

Conventional rectifying devices of the selenium type are used for carrying relatively heavy currents and are formed of a plurality of steel plates each covered with a semi-conducting layer of metallic selenium. These plates customarily range from about three-quarters of an inch to nearly five inches in diameter.

However, it is often desirable to rectify small currents such as those employed in connection with meters or other indicating instruments. The usual disc or plate construction is not suitable for this work, because the minimum practical size of such a device is still excessive in relation to the amount of current which is required to be rectified.

The present invention accordingly provides, in place of the above-mentioned discs or plates, a pair of specially-treated wires of small diameter which when joined in the manner described provide satisfactory rectification of relatively small currents.

Other objects and advantages of the invention will be apparent from the following description of a preferred embodiment of the invention and from the drawing, in which:

Fig. 1 is a perspective exploded view, partly in section, of a preferred embodiment of the present invention;

Fig. 2 is a view on line 2-2 of Fig. 1; and

Fig. 3 is a circuit diagram illustrating the manner in which the method of the present invention may be carried out.

In Fig. 1 is shown a box or container 3 formed of insulating material and having a cover 4. In the box 3 are two small spring wires 5 and 6. Wire 5 passes through and is supported by two adjoining walls of box 3 as shown at 7 and 8, and has two outer terminal portions 10 and 11 respectively.

Wire 6 passes through and is supported by a wall of box 3 opposite to the passage 7 for wire 5, as shown at 9, and has an outer terminal 13. End 12 of wire 6 may be left unattached. Wires

5 and 6 are sprung so as to contact each other at point 14 as shown.

Wire 6 is covered, particularly about the contact point 14, with selenium which has been applied in any suitable manner known to this art. Wire 5 is coated with one of the usual low melting point counter-electrode alloys such, for example, as a combination of cadmium, tin and thallium, although other suitable alloys may be used.

A preferred form of apparatus for carrying out applicant's novel method is illustrated in Fig. 3. A source of current 15 and a switch 16 in series are adapted to be connected across the terminals 10 and 11 of wire 5. A second source of current 17 and a second switch 18 are similarly adapted to be connected across the terminals 12 and 13 of wire 6.

The two wires 5 and 6 are first inserted through the walls of open box 3 in the manner shown in Fig. 1, so that they are rigidly supported at points 7, 8 and 9. However the wires are not allowed to contact one another. Source of current 17 and its series switch 18 are then connected across terminals 12 and 13 of wire 6, and upon closing of the switch current will pass through wire 6. This flow of current will heat the wire to such a temperature as to cause the selenium covering to undergo the desired treatment.

After a desired period of treatment, switch 18 is opened. Source of current 17 and switch 18 are then disconnected from terminals 12 and 13. Wire 6 is sprung into contact with wire 5 as shown in Fig. 1, the two wires being preferably positioned so that they are at substantially right angles to each other at point of contact 14. Source of current 15 and switch 16 are then connected across terminals 10 and 11 of wire 5, and upon closing of the switch wire 5 will be heated. The current sources 15 and 17 will be of such value as to heat the wires 5 and 6 to the required temperatures, which may have different values.

This heating of wire 5 will melt the alloy with which the wire is coated. At point 14 the melted alloy will flow over the selenium coating of wire 6, and the resulting structure will appear as shown in Fig. 2. A thin barrier layer is formed between the alloy and the selenium in the usual manner including electroforming.

That the structure of Fig. 2 will rectify electrical currents is well known in the art. The barrier layer formed between the alloy and the selenium results in a marked difference in re-

sistance for currents flowing in the forward and reverse directions. Current will flow readily from the wire 5 to the selenium, but practically not at all from the selenium to the wire 5.

When the heating of wire 5 has progressed for a desired period, switch 16 is opened, source of current 15 and switch 16 are disconnected from terminals 10 and 11, projecting end 11 of wire 5 is clipped off, and lid 4 placed on box 3. Leads 13 and 10 may then form the input and output terminals respectively of the completed rectifying device.

Care should be taken to keep the contact point 14 between the wires 5 and 6 as small as possible, as it has been found that within certain limits the rectifying efficiency of the device varies in proportion to the current density at the point of contact. This current density in turn depends directly on the contacting area.

While I have described above the principles of my invention in connection with a specific apparatus and a specific method, it is to be clearly understood that this description is made only by way of example and not as a limitation on the scope of my invention as set forth in the objects of my invention and the accompanying claims.

I claim:

1. The method of constructing a rectifier which include coating a first wire with selenium, coating a second wire with a counter-electrode alloy having a low melting point, passing current through the first wire to heat treat the selenium, placing the wires in contact with one another, and then passing current through the second wire to melt the alloy about the selenium at the junction of said wires.

2. In a rectifier including a pair of resilient wires one of which is coated with selenium and the other of which is coated with a counter-electrode alloy having a low melting point, the method which comprises passing current through the selenium-coated wire to heat treat the selenium, placing the wires in contact with one

another, and then passing current through the alloy-coated wire to melt the alloy about the selenium at the junction of said wires.

3. In a rectifier, a pair of wires in contacting relation, a selenium coating on one of said wires, and a counter-electrode alloy coating on the other wire fused to the selenium coating at the region of contact.

4. In a rectifying apparatus, a container, a pair of wires partially enclosed in said container, one of said wires passing through and being supported by the wall of said container at two points, the other of said wires passing through and being supported by the wall of said container at a single point, said wires being in contacting relation within said container, a counter-electrode alloy coating on one of said wires, and a selenium coating on the other of said wires, said alloy being fused to said selenium at the junction of said wires.

5. A rectifying apparatus according to claim 4 in which said container is in the form of a box of insulating material, and each of said wires respectively passes through and is supported by an opposite wall of said box.

6. In a rectifying apparatus, a container of insulating material, a pair of wires supported within said container, said wires being in contacting relation, a counter-electrode alloy coating on one of said wires, and a selenium coating on the other of said wires, said alloy being fused to said selenium at the junction of said wires.

7. A method of constructing a selenium rectifier which comprises coating a wire with a counter-electrode alloy, coating a conductor with selenium, applying the alloy to the selenium surface and fusing the alloy to the selenium surface by heating the wire by means of a current passed through it, thereby melting the alloy, and then cutting off the current and allowing the alloy to cool in fused relation to the wire and the selenium surface.

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