

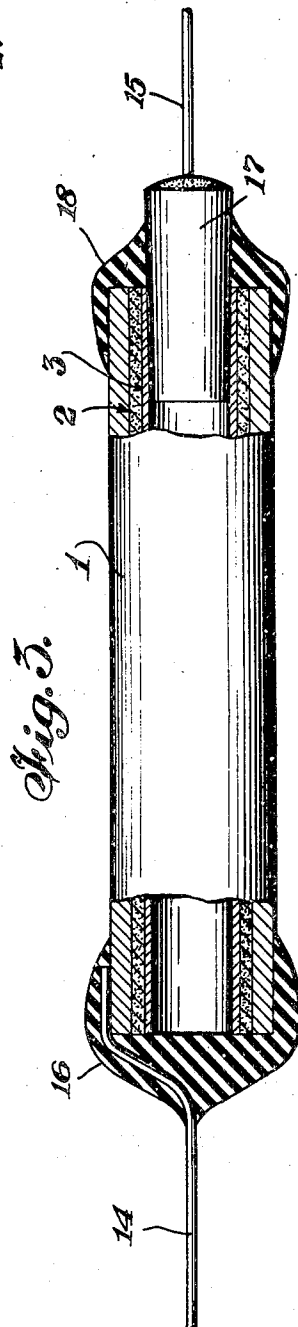
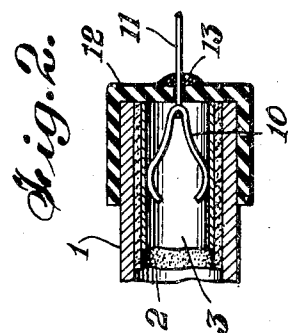
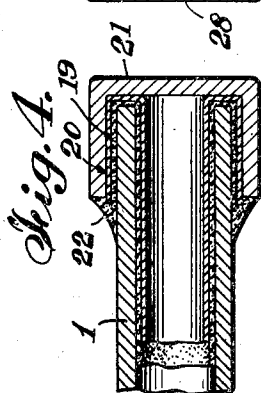
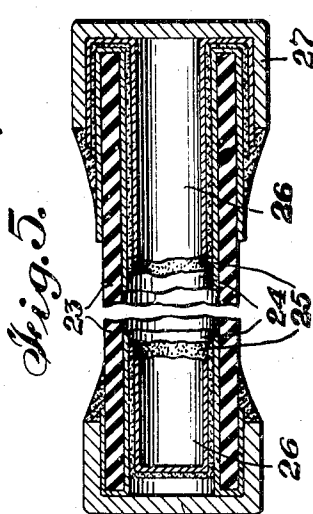
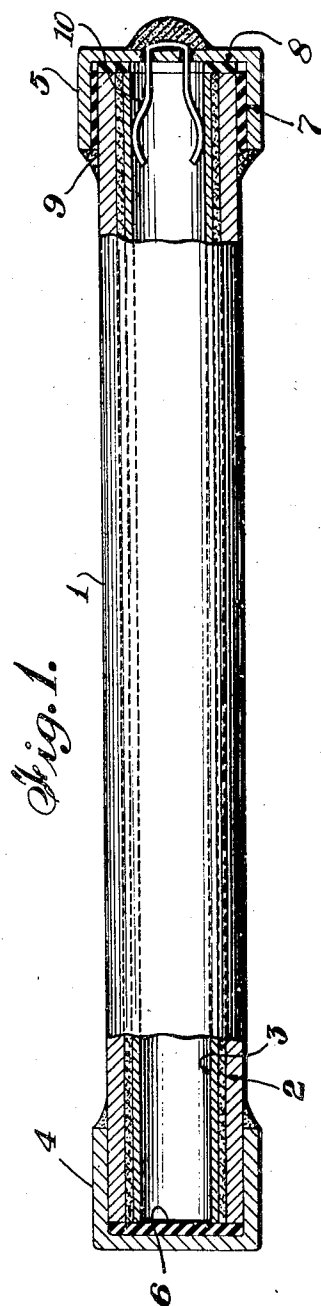
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C. A. ESCOFFERY ET AL

2,457,138

RECTIFIER

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RECTIFIER

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10 Claims. (Cl. 175—366)

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Our invention relates to rectifiers and is particularly directed to structural improvements in the dry-plate rectifiers of the semi-conductor type.

The semi-conductor type rectifier contemplated here comprises a base plate with a coating of semi-conducting material such as selenium. The coated material is overlaid with a counter-electrode, such as a low melting alloy of cadmium, tin, bismuth and lead, terminals being electrically connected to the base plate and to the counter-electrode. The coated materials are thin and are easily damaged mechanically, and are easily corroded in certain atmospheres.

An object of our invention is to provide an improved dry-plate rectifier of the semi-conductor type.

Another object of our invention is to provide a semi-conductor rectifier that is compact, self-contained, and that protects the coated materials from mechanical as well as chemical damage.

The scope of our invention is defined in the appended claims and embodiments of our invention are described in the following specification and shown in the accompanying drawings, in which:

Figs. 1, 3, and 5 are longitudinal sectional views of three embodiments; and

Figs. 2 and 4 are sectional detail of alternative terminals.

Our rectifier comprises a metal tube or cylinder 1 of any desired cross-sectional shape, a round cross-section being shown. On the interior wall of the tube is applied a layer of semi-conducting material 2 such as selenium, and on the selenium layer is applied a thin coating 3 of counter-electrode alloy. Unidirectional current carrying characteristics are found to exist between terminals connected to the metal tube and to the counter-electrode so that the assembly may be employed for rectifying alternating current.

The electrical terminals may comprise metal caps 4 and 5, as shown in Fig. 1, fitted over the ends of the tube, one cap 4 being mounted directly on and electrically connected to the tube and the other cap 5, being insulatingly carried on the tube and electrically connected to the counter-electrode. The cap 4 is telescoped over the tube and brazed or soldered directly to the tube to hermetically seal the end of the tube, care being taken to maintain electrical separation between the cap and the end of the counter-electrode. An insulating washer or disc 6 may be inserted between the end of the tube and the cap.

The opposite end of the tube is likewise sealed,

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but here, the cap is electrically insulated from the tube by a layer of insulation applied around and across the end of the tube, or if desired, by a sleeve 7 and a washer 8 of insulating fiber fitted inside the cap. The edge of the cap is hermetically sealed to the side of the tube with an adherent filler 9 of insulating plastic material. To electrically connect the cap to the counter-electrode, a metal spring clip 10 is attached to the center of the cap to extend into the end of the tube and yieldingly bear against the counter-electrode. The spring clip may be spot welded to the cap or threaded through holes in the cap and soldered as shown.

The semi-conducting layer 2 and the thin counter-electrode film 3 are completely enclosed and protected from mechanical damage and are sealed from injurious atmospheres. The finished rectifier is similar in appearance to a cartridge type fuse and may conveniently be mounted in a fuse-type holder for easy replacement.

Terminal wires are, if desired, easily connected, mechanically and electrically, to our novel rectifier. As shown in Fig. 2, the counter-electrode connection is made through the metal spring clip 10 attached to a lead-in conductor 11 extending through the center of a preformed cap 12 of insulating material. The cap is preferably secured in place with an adhesive that will effect a good seal, and the hole for the conductor may be closed with a patch of plastic 13.

In Fig. 3, the terminal conductors 14 and 15 extend centrally from opposite ends of the tube, and a structure provided that is mechanically strong and pleasing in appearance. The conductor 14 is welded or soldered to the side of the tube and is then cast or molded in an insulating thermoplastic cap 16 of any desired configuration. The connection of conductor 15 to the inside counter-electrode is made by a solid rod or plug 17 of conductive material, such as copper or hard carbon. For a snug fit, the plug and the opening at the end of the tube should be tapered. A molding of plastic 18 seals and forms the end of the rectifier around the plug, and the conductor 15 is soldered to the end of the plug.

Another capping arrangement is shown in Fig. 4 whereby conduction from the counter-electrode layer is obtained by extending the selenium and counter-electrode layers over the end of the tubular member as indicated at 19 and 20. The cap 21 is then hermetically sealed to the tube with insulating plastic 22.

The cylinder or tube 1 has thus far been considered as of metal, but it is apparent a tube of

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insulating material may be substituted. In Fig. 5 we show a tube 23 either of glass or hard thermoplastic which is metalized at 24 to form a base for the selenium and counter-electrode layers 25 and 26. The deposited layers 24, 25 and 26 may cover only the interior of the tube or they may be extended out and over one end of the glass tube to make contact with a cap 27 similarly as in Fig. 4. The cap 28 at the other end is connected to the base metal 24 by continuing the metalized coating 24 over the end of the tube, the layers 25 and 26 being terminated short of the end substantially as shown.

To internally coat the tube with metals, electroplating is preferred, although electrostatic deposition may be employed, or dipping or spraying with the proper solutions of the metals may be used.

The entire outer surface of the tube is effective in cooling the rectifier in operation, and since the outside surface area is proportionally larger than the area of the rectifying materials, the operating temperature of the rectifying materials is lower, for a given current between terminals, than dry-plate rectifiers of other shapes.

Our novel rectifier is self protected, is compact and mechanically strong, is attractive, and is hermetically sealed to prevent deterioration or corrosion of the selenium or counter-electrode layers.

We claim:

1. A rectifier comprising a tubular member, at least the interior surface portion being electrically conductive material, a semi-conductive material coated on the said electrically conductive portion of said member, a counter-electrode layer on said semi-conductive material, and caps sealing the ends of said member, said caps including means electrically connected, respectively, to said member and to said counter-electrode.

2. A rectifier according to claim 1 wherein said member includes a tube of insulating material and the electrically conductive surface portion is a layer of conductive material coating the interior surface of the tube.

3. A rectifier according to claim 2 wherein said

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layer of conductive material extends outwardly over both ends of said tube and said semi-conductive material and said counter-electrode layer extend outwardly of one end of said tube.

4. A rectifier comprising a tube, a semi-conducting layer on the interior wall of said tube, and counter-electrode material on said layer, and a cap over one end of said tube, said cap including therewith a conductive element disposed in said tube in conductive relation with said counter-electrode material.

5. A rectifier comprising a tube, material having electrical rectifying properties on the interior of said tube, a conductor connected to the wall of said tube, and a cap of insulating material for the end of said tube, said cap inclosing a portion of said conductor.

6. A rectifier comprising a hollow cylinder, semi-conducting and counter-electrode material on the interior wall surface of said cylinder; and a plug of conducting material extending into said cylinder and contacting the counter-electrode material.

7. A self contained rectifier of the dry-plate type comprising a tube of insulating material, a base metal deposited on the interior surface of said tube, a layer of selenium on said base metal, and a layer of counter-electrode metal on the selenium layer.

8. A rectifier comprising a metal tube, rectifying material deposited on the interior wall of said tube, a metal closure on one end of said tube electrically contacting said tube, and a metal closure on the other end of said tube and electrically containing only said rectifying material.

9. A rectifier according to claim 8, wherein the second mentioned closure comprising a metal cup, said cup being fitted over the end of said tube, with a sleeve of insulating material between the walls of said cup and tube.

10. A rectifier according to claim 8, wherein the rectifying material extends over one end of said tube for direct contact by the metal closure.

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No references cited.