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ASYMMETRIC CONDUCTOR

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FIG. 1

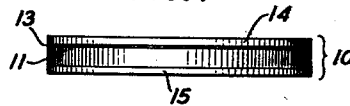


FIG. 2

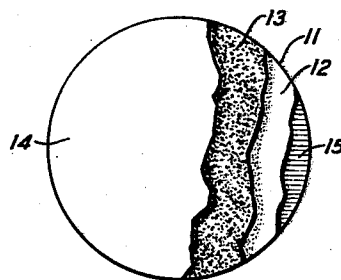
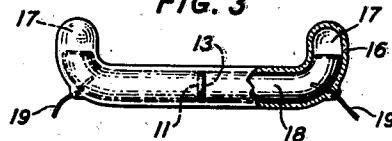


FIG. 3



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## ASYMMETRIC CONDUCTOR

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10 Claims. (Cl. 175—366)

This invention relates to asymmetric conductors of electricity, that is to say, to conductors which offer relatively low resistance to current flowing in one direction, but relatively high resistance to current flowing in the other direction, the currents through which, in either direction, need not obey Ohm's law.

An object of this invention is to enable the rectification of electrical current.

A feature of this invention comprises forming an asymmetric conductor or a rectifier by proper association of a semi-conductor, a thin film of a material of higher resistivity than the semi-conductor, and means for making contact with one surface of the semi-conductor and one surface of the film.

Another feature of this invention comprises a rectifier having a high resistance film at its rectifying junction, the film not being initially formed by drawing current, nor formed by the production on a metal plate of a compound of that metal.

A further feature of this invention comprises an asymmetric conductor or rectifier of a semi-conductor material in the shape of a disc or plate, one surface of the plate being cleaned, preferably by etching, and having a film of a material of higher resistivity thereagainst, a metal making intimate contact with the outer surface of the film, and a metal making intimate contact with the other surface of the plate.

A more complete understanding of this invention will be derived from the detailed description which follows read with reference to the appended drawing, wherein:

Fig. 1 is a side view of a device embodying this invention;

Fig. 2 is a plan view of the device of Fig. 1 with portions thereof broken away; and

Fig. 3 is an elevational view of another embodiment of the invention.

In Figs. 1 and 2, there is shown an asymmetric conductor or electrical rectifier, designated generally 10, comprising a disc or plate 11 of a semi-conducting material, for instance, cuprous oxide, silicon carbide, lead sulphide, zinc oxide, selenium or tellurium, or more generally, an oxide, a sulphide, a selenide or a telluride of a metal. A surface 12 of the disc is cleaned, preferably by etching, either an acid or an alkali being satisfactory, and has applied to it, either by adsorption, by drying from a solution, by evaporation, or by any other suitable means, a thin film 13 of a material of relatively higher resistivity than the semi-conductor. This film may be, for instance, of shellac, sulphur, wax, or quartz. A contact

plate or member 14 of any suitable material, such as lead or tin, makes intimate contact with the upper or outer surface of the film, and a contact plate or member 15 of similar material makes intimate contact with the lower, other or unfiled surface of the disc 11. The combination of a semi-conductor and film of a material of higher resistivity is in and of itself an asymmetric conductor but the contact members are required to connect it into an electrical circuit. Furthermore, if a sufficiently intimate contact is provided for the outer surface of the film, the latter may constitute a layer of adsorbed air.

In Fig. 3, is disclosed an arrangement in which such an air film, as well as films of the other materials recited, may be used. The disc 11 having thereon the film 13 is mounted within a tube 16 of insulating material, for instance, of glass, and divides it into two compartments 17, 17, each containing mercury 18 making intimate metallic contact with each surface of the asymmetric unit. The rectifier of Fig. 3 may be connected in an electrical circuit by the sealed-in conductors 19, 19.

Although this invention has been disclosed with reference to specific embodiments thereof, it is to be understood that various modifications therein may be made without departing from the spirit of this invention, the scope of which is to be considered limited by the appended claims only.

What is claimed is:

1. A rectifier comprising a semi-conductor, said semi-conductor being a disc of silicon carbide, a film of an insulating material of relatively higher resistivity than said carbide on one surface thereof, a metal making intimate contact with the outer surface of said film, and a metal making contact with the other side of said semi-conductor.

2. A rectifier comprising a disc of lead sulphide, a film of wax on one surface of said disc, a metal making contact with the outer surface of the film, and a metal making contact with the other surface of said disc.

3. A rectifier comprising a disc of silicon carbide, a film of wax on one surface of said disc, a metal making contact with the outer surface of the film, and a metal making contact with the other surface of said disc.

4. A rectifier consisting of a semi-conductor in the shape of a plate of a material of the group consisting of selenium, tellurium, a compound of an element of the sulphur group, and silicon carbide, one surface of said plate being etched, a film of an insulating material of higher re-

sistivity than said semi-conductor covering the etched surface, a metal making intimate contact with the outer surface of the film, and a metal making intimate contact with the other surface of the plate.

5 5. The method of making a device in and of itself an asymmetric conductor which comprises etching one surface of a disc of a semi-conductor of the group consisting of selenium, tellurium, 10 a compound of an element of the sulphur group, and silicon carbide, and forming a film of an insulating material of relatively higher resistivity than said semi-conductor on said etched surface.

15 6. The method of making a device in and of itself an asymmetric conductor which comprises etching one surface of a disc of a semi-conductor of the group consisting of selenium, tellurium, a compound of an element of the sulphur group, and silicon carbide, and placing on said etched 20 surface a film of an insulating material having the property of changing from the liquid to the solid form without a change of chemical composition.

7. The method of making a device in and of itself an asymmetric conductor which comprises etching one surface of a disc of a semi-conductor, and forming on said etched surface a wax film.

8. An asymmetric conductor consisting of a semi-conductor in the shape of a disc, a film of an insulating material of higher resistivity than said semi-conductor on one surface of said disc, and mercury in intimate contact directly with 5 said film and the other surface of the disc.

9. An electrically conductive device consisting of a semi-conductor in the shape of a plate or disc of the group consisting of selenium, tellurium, a compound of an element of the sulphur 15 group, and silicon carbide, and a film of an insulating material of relatively higher resistivity than said semi-conductor on one surface thereof.

10. A device in and of itself a rectifier consisting of a disc of cuprous oxide having a film of 20 wax on one surface thereof.

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