March 17, 1931. W. R. JAMISON 1,796,372

ASYMMETRIC CONDUCTOR OF ELECTRICITY

Filed Jan. 31, 1929

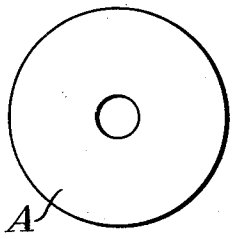

Fig. 1.

Fig. 2.

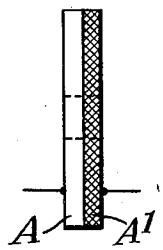

Fig. 3.

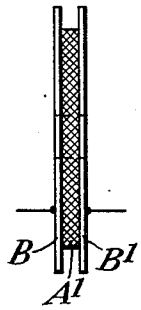

Fig. 4.

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UNITED STATES PATENT OFFICE

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ASYMMETRIC CONDUCTOR OF ELECTRICITY

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My invention relates to asymmetric conductors of electricity, that is, to conductors which offer relatively low resistance to current flowing in one direction but relatively high resistance to current flowing in the other direction.

I will describe one form of conductor embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawing, Fig. 1 is a view showing a front elevation, and Fig. 2 a view showing in side elevation, a blank from which a conductor embodying my invention may be formed. Fig. 3 is a side view of the blank shown in Fig. 2 after an asymmetric conductor has been formed thereon in accordance with my invention. Fig. 4 is a view showing one manner of utilizing an asymmetric conductor embodying my invention.

Similar reference characters refer to similar parts in each of the views.

Referring first to Figs. 1 and 2, the blank, which is designated by the reference character A, is a plate of an alloy of copper, and may, for example, be commercial soft brass. This plate is heated in an atmosphere containing oxygen at a temperature slightly below its melting point for a period of at least 12 hours, to form a layer of compounds, which is self supporting and is non-adherent to the mother metal. Referring to Fig. 3, the layer of compounds is designated by the reference character A^1, it being understood that this layer will be formed on all surfaces of the plate A but that, as shown in Fig. 3, the layer has been removed from all parts of the plate except one surface.

I have found that a layer of compounds produced in this manner is an asymmetric conductor of electricity. By asymmetric conductor I do not mean that no current will pass through the layer in one direction, but I mean that the resistance in one direction is considerably greater than in the other direction. This asymmetric conductivity is in a path substantially normal to the surface of the layer which is or was in contact with the mother metal. The high resistance occurs when the surface of the layer of compounds which is or was in contact with the mother metal is positive. That is to say, as viewed in Fig. 3, the resistance to the flow of current from the mother metal A to the layer A^1 will be greater than the resistance to the flow of current from the layer A^1 to the mother metal A.

The layer of compounds A^1 being self supporting and non-adherent, it may be removed from the mother metal A and placed between two electrodes B and B^1, as shown in Fig. 4. These electrodes may be of a soft impressionable metal, such for example, as lead. The combination shown in Fig. 4 has substantially the same electrical characteristics as the combination shown in Fig. 3, that is to say, assuming that the surface of the layer A^1 which is in contact with the electrode B is the surface which was in contact with the mother metal, then the combination shown in Fig. 4 will have a higher electrical resistance to the flow of current from electrode B to electrode B^1 than from electrode B^1 to the electrode B.

When the mother metal is oxidized for a period less than 12 hours, the layer of compounds is so thin that it is not self supporting. I have found that oxidation for a period of 12 to 36 hours is satisfactory, although there seems to be no reason why the oxidation cannot be continued for a period of more than 36 hours.

The layer of compounds produced by oxidizing commercial soft brass has relatively low electrical resistance, and therefore is highly suitable for the rectification of comparatively large currents.

When brass is oxidized, the most readily oxidizable metal in the brass probably combines first and diffuses outwardly toward the surface of the brass. As the oxidation progresses, the percentage of this first metal that is present in the alloy decreases, and the other metals are attacked more and more by the oxygen. The result is, that the oxide layer that is first formed has a different constitution from the oxidized layer that is last formed, and it is probable that the asymmetric conductivity occurs at one or more internal boundaries between such layers.

Although I have herein shown and described only one form of asymmetric conductor embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. A layer of compounds produced by oxidizing common brass, said layer constituting in and by itself an asymmetric conductor of electricity.

2. The method of producing an asymmetric conductor of electricity which consists in oxidizing common brass at a temperature slightly below its melting point for at least 12 hours.

3. The method of producing an asymmetric conductor of electricity which consists in oxidizing common brass at a temperature slightly below its melting point for at least 12 hours, and cooling the layer of oxides in air at room temperature.

4. An asymmetric conductor of electricity comprising a layer of oxides of common brass mounted between two electrodes of soft impressionable metal.

5. An asymmetric conductor of electricity comprising a layer of oxides of common brass mounted between two lead electrodes.

6. A layer of electro-conductive compounds of brass, said layer constituting in and by itself an asymmetric conductor of electricity.

7. A layer of compounds produced by oxidizing common brass to form a self-supporting layer which is non-adherent to the mother metal, said layer constituting in and by itself an asymmetric conductor of electricity in a path substantially normal to the surface which is or was in contact with the mother metal.

8. A layer of compounds produced by oxidizing common brass, said layer constituting in and by itself an asymmetric conductor of electricity in a path substantially normal to the surface which is or was in contact with the mother metal.

9. A layer of compounds produced by oxidizing common brass, said layer constituting in and by itself an asymmetric conductor of electricity in a path substantially normal to the surface which is or was in contact with the mother metal.

In testimony whereof I affix my signature.

WAYNE R. JAMISON.