April 10, 1951

I. LEVIN

2,547,951

RECTIFIER

Original Filed Feb. 8, 1945

FIG. 1.

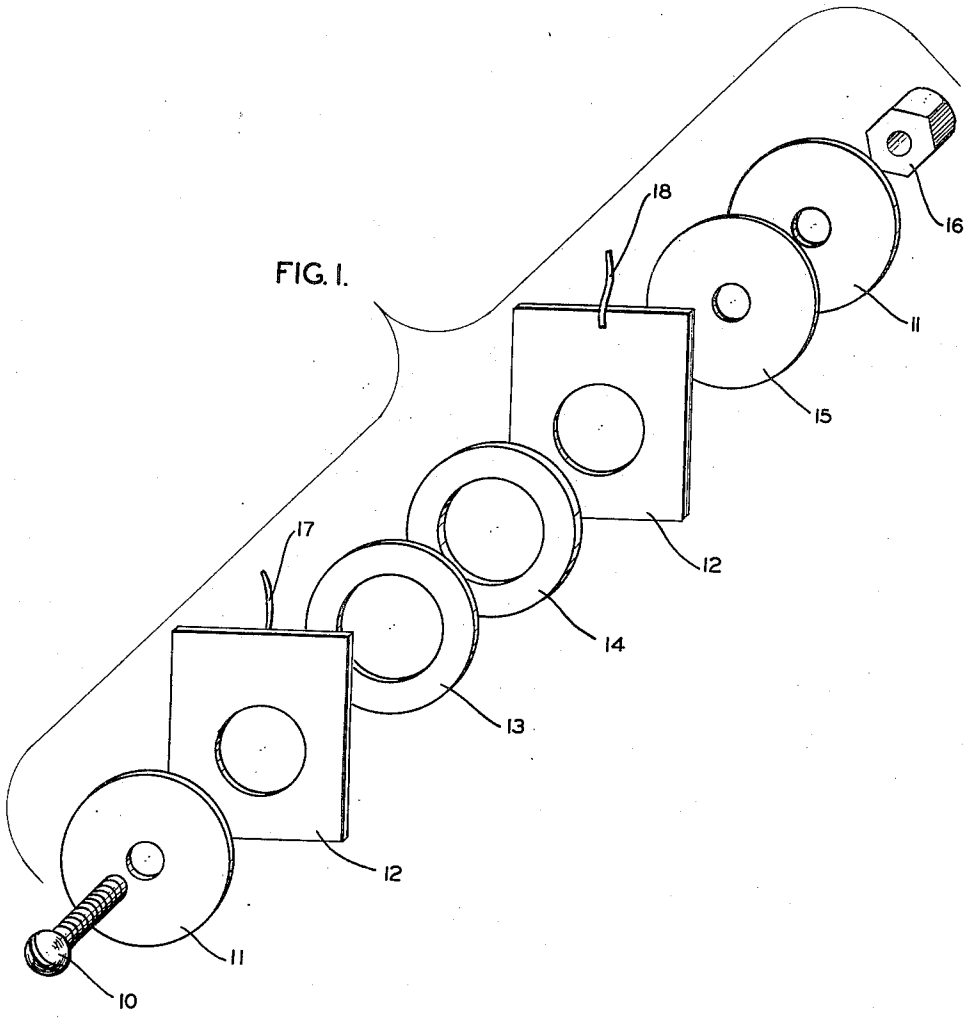
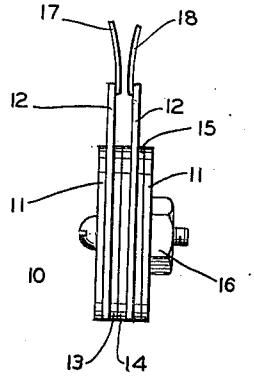


FIG. 2.



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UNITED STATES PATENT OFFICE

2,547,951

RECTIFIER

Irvin Levin, Baltimore, Md.

Original application February 8, 1945, Serial No. 576,864, now Patent No. 2,469,393, dated May 10, 1949. Divided and this application January 14, 1946, Serial No. 641,158

5 Claims. (Cl. 175—366)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

My invention relates to alternating current rectifiers and more particularly to the dry disc type rectifier.

The present application is a division of my copending application on "Rectifier," filed February 8, 1945, and having Serial Number 576,864, now Patent No. 2,469,393, issued May 10, 1949.

The dry disc type rectifier field at present comprises three different types of rectifiers, namely, the copper sulphide, the copper oxide and the selenium.

An object of my invention is to provide a method of construction of a dry disc type rectifier which can be easily assembled in the laboratory.

Another object of my invention is to provide a method of construction of the discs which are more easily formed chemically.

Another object of my invention is to provide a method of construction of an iron oxide-magnesium dry rectifier, in which the purity of the iron does not have to be important.

My invention was conceived by the need of a dry disc type rectifier which could easily be made in the laboratory. My dry disc type rectifier is much easier to form chemically in the laboratory than the copper oxide, copper sulphide and the selenium types. Only a flame or other source of heat is required for the formation of the iron oxide barrier layer, whose chemical name is ferroso-ferric oxide, whereas in the copper oxide and copper sulphide types critical temperatures and manipulations are required. The purity of the iron does not appear to be as important a problem as with the copper used in the copper containing rectifiers. In fact, the iron oxide-magnesium rectifiers can utilize mild steel or other ordinary steels commonly met with. The iron and magnesium discs can be at least as thin as 5 mils. The iron disc is heated at red heat for about three minutes on a sheet of asbestos mounted on a tripod by using a Bunsen flame or other source of heat. This allows a layer of the magnetic ferroso-ferric oxide to form over the surface of the iron disc. The iron disc is allowed to cool to the black color. The magnesium disc, which has a clean surface, is placed on the hot iron disc which contains the ferroso-ferric layer, pressed together immediately and the combination allowed to cool. The combination is assembled as a rectifier unit and tested for its D. C. to A. C. ratio. 0.636 is the limiting value of this ratio for perfect half-wave

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rectification. However, an oscilloscope check may be performed or even substituted for the above ratio test.

If the combination is found to rectify poorly, it is removed from the assembly and reheated carefully with a flame or other source of heat with the magnesium disc resting on top of the unit. Great caution is needed to prevent the melting or burning of the magnesium.

The rectifying layer can carry a current density (and rectify), as read on a D. C. meter, of 250 milliamperes per square inch, which is the maximum optimum amount. The D. C. to A. C. ratio changes very little with temperature, which rises to approximately 40° C. at the above current density of 250 milliamperes per square inch. All frequencies used were 60 cycles per second, but it does not necessarily mean that the frequency is limited to 60 cycles. Raising the voltage over the optimum maximum value does not impair the rectifying action when brought back to normal.

My invention will be more fully understood from the following detailed description taken in connection with the accompanying drawing wherein I have shown a preferred embodiment thereof.

In the drawings, Figure 1 is an exploded view of a rectifier embodying my present invention; and

Figure 2 is an elevational view of said rectifier when in its assembled operative condition.

In the drawing, Figure 1 shows an exploded view of my invention comprising: bolt 10, steel washers 11, radiator electrodes 12, iron disc with an oxide layer 13, magnesium disc 14, insulating gasket 15 and nut 16. The holes in steel washers 11 and insulating gasket 15 are of small diameter so as to be closely fitted around bolt 10. When the rectifier is assembled the bolt 10 is co-axially centered in the larger diameter holes of the radiator electrodes 12, iron disc with an oxide layer 13 and magnesium disc 14, so as to allow the current to enter only at wire terminal 17, pass through the iron disc with an oxide layer 13 in contact with the magnesium disc 14 and the circuit is completed through the rectifier at terminal 18 without making electrical contact between bolt 10, radiator electrode 12 adjacent to insulating gasket 15, and said discs 13 and 14.

Figure 2 shows a complete rectifier assembly comprising: an iron disc with an oxide layer 13 in surface contact with a magnesium disc 14, radiator electrodes 12, suitable insulating gasket 15 and metal washers 11. This assembly as shown is clamped securely by bolt 10 and nut 16, said bolt

10 and nut 16 insulated from the rectifying circuit as shown and described in Figure 1. Electrical connections 17 and 18 are made to the radiator electrodes 12 for connecting the rectifier in an electric circuit for rectifying purposes.

Having thus described my invention I desire to secure by Letters Patent and claim:

1. A rectifier of the class described comprising in combination, an input electrode, an electrode element having one face engaging said input electrode and having an oxide layer on the opposite face thereof, a second electrode element of magnesium having one face heat bonded to said oxide layer, an output electrode engaging the opposite face of said second electrode element, and means for holding said electrodes and elements in said engaged relation.

2. A rectifier of the class described comprising in combination, an input electrode, a metal disc having one face engaging said input electrode and having an iron oxide layer on the opposite face thereof, a second disc of electropositive metal having a considerably lower melting point than the first mentioned disc and having one face fused to said oxide layer, an output electrode engaging the opposite face of said second disc, and means for holding said discs and electrodes in said engaged relation.

3. A rectifier of the class described comprising, in combination, a metal plate providing an input electrode and having an effective radiation area and a central perforation, a metal disc having a central perforation and one face engaging said metal plate and having an iron oxide layer on the opposite face thereof, a second disc of mangesium having a central perforation and one face heat bonded to said iron oxide layer, a second metal plate providing an output electrode and having an effective radiation area and a central perforation, and clamping means including an element extending through said perforations for holding said elements in said engaged relation.

4. A rectifier of the class described comprising, in combination, a metal plate providing an input electrode and having an effective radiation area and a central perforation, an iron disc having a central perforation and one face engaging said metal plate and having an iron oxide layer on the opposite face thereof, a second disc of magnesium having a central perforation and one face heat bonded to said iron oxide layer, a second metal plate providing an output electrode and having an effective radiation area and a central perforation, and clamping means for holding said

elements in said engaged relation comprising a bolt member extending axially through the perforations in said elements and out of contact therewith, a metallic washer adjacent to the input electrode for applying clamping pressure thereto, an insulating gasket adjacent to the output electrode and a second metallic washer engaging the outer face of said insulating gasket for applying clamping pressure to the output electrode and threaded means connected with the bolt member for clamping the assembly together.

5. A rectifier of the class described comprising, in combination, a metal plate providing an input electrode and having an effective radiation area and a central perforation, an iron disc having a central perforation and one face engaging said metal plate and having a ferroso-ferric oxide layer on the opposite face thereof, a second disc of magnesium having a central perforation and one face heat bonded to said ferroso-ferric oxide layer, a second metal plate providing an output electrode and having an effective radiation area and a central perforation, and clamping means for holding said elements in said engaged relation comprising a bolt member extending axially through the perforations in said elements and out of contact therewith, a metallic washer adjacent to the input electrode for applying clamping pressure thereto, an insulating gasket adjacent to the output electrode and a second metallic washer engaging the outer face of said insulating gasket for applying clamping pressure to the output electrode and threaded means connected with the bolt member for clamping the assembly together.

IRVIN LEVIN.

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