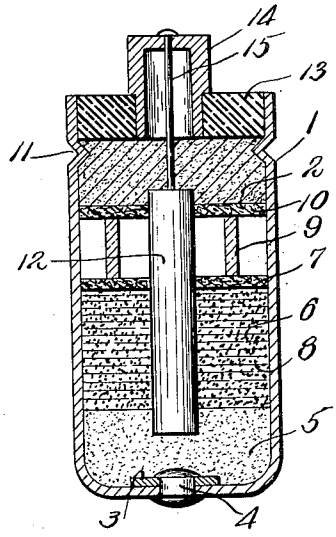
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RECTIFYING APPARATUS AND METHOD OF MAKING

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Inventor
Henri G. André
by Pollard Cushman & Woodbury
Attys.

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HENRI G. ANDRÉ, OF PARIS, FRANCE

RECTIFYING APPARATUS AND METHOD OF MAKING

Application filed October 29, 1926. Serial No. 145,017.

The present invention relates to electrical apparatus, and in particular to alternating current rectifiers in which two metals of different character are employed as electrodes, the metals fulfilling alternately the function of cathode and anode.

In my application Serial No. 749,214, filed November 11, 1924, entitled "Unilateral conductor for rectifying alternating current", I have disclosed a rectifier, one electrode of which comprises a metallic colloid while the other is formed of a material that, when subjected to an oxidizing agent, yields a surface layer of such nature that the device is permeable to current in one direction only. In the application supra the compound was derived by surrounding the electrodes with acid and passing an electric current between them.

In accordance with the above identified application, the colloid is preferably silver, the oxidizing liquids being sulphuric acid and water vapor absorbing materials, such as meta-phosphoric acid, while calcium chloride may be also employed as a water vapor absorber. Ortho-phosphoric acid may also be used as an oxidizer.

Now, I have found that the resistance of the rectifier may be considerably reduced by the application of pressure to the colloid. In order to prevent a possible short circuit due to intensity of pressure offered by the metallic particles to the surface of the other electrode, I propose to increase the thickness of oxide layer on the latter. Briefly, this is accomplished by treating the electrode prior to immersion in the acid.

The primary object of my invention is to reduce the internal losses of the colloid type of rectifier so called, and another object is to simplify the mode of manufacture. A still further object is to improve the unilaterally conducting characteristic of such rectifier. Other features will be apparent as the specification is perused.

The accompanying drawing illustrates an exemplary embodiment of the device forming the subject of the present invention.

The figure shows a vertical section of the improved rectifier.

Referring to the illustration, the invention in its preferred form consists of a tube or receptacle 1 having an enameled interior and made of a metal passive to concentrated acid, for example, iron. One end of the receptacle is closed by the material forming the tube and the other by an amorphous sealing compound 2 of sulfur or the like. At the bottom there is located electrode 3, hereinafter referred to as anode, of a metal, as silver, which lends itself readily to colloidal form and having oxidation products that are relatively good conductors of electrical energy. This electrode is of such thickness as to be readily sprung to the form of the receptacle, being secured to latter by rivet 4, preferably of the same material as the anode. A snug fit between the silver member and casing prevents deleterious effects caused by electrolytic action at the joint and also about the periphery of the rivet. By the numeral 5 I designate a quantity of metal in powdered form of the same material as the anode and derived by well-known processes, filling the space below the level indicated by dash and dot line while directly above, there is a mass of liquid absorbing material 6 as sand, glass wool or the like, supporting layer 7 of asbestos. By horizontal lines 8 the presence of acid in concentrated form is denoted, completely saturating the absorbing material.

In order to prevent creepage of liquid by capillarity, I provide glass ring 9 separating asbestos layer 10 from the one adjacent. Centrally disposed of the structure and sunk to considerable depth in the powdered metal is another electrode 12, hereinafter referred to as cathode, of an alloy, as nickel-silicon, the surface of which is rendered permeable to current in one direction only. As stated, the entire structure is held in place by the sulfur covering into which indentations 11 of the casing are made. These indentations support circular plate 13 of insulating material, as vulcanite, ebonite, in the center of which is located metallic thimble 14. The latter is connected to member 12 by lead 15 of a material similar to the cathode, the thimble having dimensions suitable for pressing into a standard clip contact. It is obvious, however, that the device may terminate

in other forms of structure for convenience in making electrical connection to external circuits. Apparatus made according to the foregoing specification has the property of rectifying alternating current of comparatively large amplitude.

In the manufacture of my device procedure is as follows: The anode is first secured to the casing and the required amount of powdered silver heaped thereon. Cathode 12 is heated by external means, as in a furnace, to a red color, approximately 500° C., and in this condition tightly pressed into the center of the silver mass tending to compress the particles in the neighborhood of the cathode. This in turn has the desirable effect of decreasing the internal resistance of the rectifier, and consequent losses. While pressure on the cathode is continued, a small quantity of silver is added, the upper surface of which supports the sand or glass wool; acid is then poured until the absorbing material becomes saturated. Upon contact with the acid the heated cathode causes violent sputtering and a heavy oxide layer is formed which adheres tenaciously to the metal imparting to the rectifier a long life of stable operation and also precluding any possibility of short circuit due to pressure exerted by the silver particles. The asbestos plates separated by the glass ring are inserted next resting on the mass of sand, the sulfur seal being then poured and finally, the insulating cap and thimble added.

It is apparent that, if desired, the function of either cathode or anode could be transferred to the container in which case, the latter would comprise nickel-silicon or silver, respectively.

I claim:

1. In a rectifier of the type having two spaced electrodes with a mass of finely divided conducting material substantially bridging the space therebetween and one of the electrodes of which contains an oxidation product derived from a surrounding acid, the method which consists in heating the latter electrode prior to subjection to acid to increase the thickness of layer and applying pressure to increase the intensity of surfacial contact with the finely divided material.

2. In a rectifier the combination of a receptacle one end of which is closed by a stopper, an anode in sub-divided form, a cathode associated therewith, means including a liquid operating in conjunction with said anode and cathode to cause unidirectional flow of current, and means for substantially preventing passage of the liquid to that end of the receptacle containing the stopper, all of said elements being located in said receptacle.

3. In a rectifier, a receptacle containing the following in combination, an anode in subdivided form, the particles of which are under relatively high stress, a cathode adapted to be oxidized, and means including an acid for producing a heavy layer of oxide on the cathode and for operating in conjunction with the anode and cathode to cause unidirectional flow of current.

4. As an article of manufacture, a receptacle the material of which closes one end, containing two electrodes immersed in acid, means for absorbing superfluous liquid and having superimposed thereon a plurality of layers of asbestos separated by a glass member to prevent creepage along the walls of the receptacle and an amorphous compound closing the open end of the latter.

5. A rectifier comprising a cup shaped container and anodic mass in finely divided form at the bottom thereof, said anodic mass having a corrosive liquid therein, a member connecting said anodic mass with the outside of said container, a cathode centrally disposed of the container and having a portion buried in the anodic mass, a layer of liquid absorbing material above said anodic mass, two layers of liquid absorbing material and different from the first layer, means including a glass member for spacing said two layers of absorbing material whereby creepage of liquid is prevented and means for sealing the top of said container.

Signed by me at Boston, Massachusetts, this 17th day of September, 1926.

HENRI G. ANDRÉ.