PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Improvements in or relating to Photo-sensitive Cells.

We, ARCTURUS RADIO TUBE COMPANY, a corporation of the State of Delaware, United States of America, of 260, Sherman Avenue, Newark, New Jersey, United States of America, Assignees of Samuel Reuben, a Citizen of the United States of America, residing at 801, Riverside Drive, City and State of New York, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

This invention relates to a photo-sensitive cell and more particularly it relates to a cell of this type which is an improvement upon those described in the Specification of our Application No. 31599 filed on 17th October, 1929. The object of the invention is the provision of a more sensitive and a more durable photo sensitive cell than those known in the art.

According to the terms of this invention the variations of the contact and specific resistances of a cuprous oxide layer integrally formed on a copper electrode, in response to variations in the density of light rays impressed thereupon are employed to produce corresponding changes of potential and current discharge, means being provided to prevent a decrease in the sensitivity of the layer due to the reduction of the oxide surface with the operation of the device. This is accomplished by exposing the electrodes in an electrolyte which releases nascent oxygen independently of electrolytic action, which oxidizes any hydrogen produced by electrolysis, thus preventing the reduction of the cuprous oxide surface.

In a preferred form of the invention we employ the change of internal resistance of a voltaic cell formed by the combination of, either an electrode which is electropositive with respect to the cuprous oxide surface, such as magnesium, zinc, cadmium and aluminium, or of an electrode which is electro-negative with respect to cuprous oxide, such as selenium or carbon, in combination with a cuprous oxide electrode immersed in an electrolyte which does not permit the electrolytic reduction of the cuprous oxide surface.

With an electrode composed of an electropositive material, for example, zinc, immersed in an electrolyte of ammonium or magnesium chloride, in combination with a cuprous oxide electrode, in the operation of the cell there is an electrolytic reduction of the cuprous oxide to copper, destroying the photo-sensitivity of the electrode. Unless the cell is biased by a potential opposite in direction to that generated by the couple itself, as described in our above mentioned Specification, there is a diminution in the effectiveness of its operation.

As the photo-sensitivity of a cuprous oxide cell is much greater when the cuprous oxide is employed as the anode, or as the cathode if an external potential is applied, it is of fundamental importance to prevent the reduction of the cuprous oxide to copper by the hydrogen generated in its operation. We have found that such reduction constitutes an inherent limitation in cells of this type even when a low current is consumed and over only short periods as, for instance, for two hours with a current discharge of 2 milliamperes per square centimeter. By the means hereinafter described we provide a method for preventing such deterioration of the cell.

We have found that if the electrolyte is composed of a solution of hydrogen peroxide, the electrolytic hydrogen which ordinarily causes the reduction of the cuprous oxide to copper thereby deteriorating the cell, is oxidized to water. To reduce the polarization potentials to a minimum, it is desirable to utilise a material electronegative to cuprous oxide such as carbon or selenium.

Reference is made to the accompanying drawing of embodiments of the invention in which Fig. 1 shows an elevation of a photo-electric cell within a glass envelope, Fig. 2, a section plan view thereof at 2—2 of Fig. 1. Fig. 3 is illustrative of an embodiment of the invention in

[*Price* 1/-]

which the copper electrode comprises the outer wall of the cell.

In Fig. 1, 1 represents a glass envelope having a cap at 1*a*, and containing in a solution of hydrogen peroxide 2, copper electrode 3 having a surface of crystalized cuprous oxide 3*a*, facing a zinc electrode 4. The two electrodes are firmly placed in a neutral base of wax. In Fig. 3, the copper electrode 3, having a truncated cone form, the inner surface being crystalized cuprous oxide 3*a*, and containing a solution of hydrogen peroxide 2. Extending axially of the cone is a carbon electrode 4*c*. One end of the cone rests upon a bakelite or other insulating base 8. a ring of similar material at the wide end 7, supports a glass seal 6. The electrode terminals are indicated at 9 and 10.

In the operation of the device, when used as a voltaic cell, a potential is generated by the contact of the electrodes with the electrolyte under the influence of light impressed upon the cuprous oxide electrode, and the contact and specific resistances of the oxide layer decrease, thus reducing the internal resistance of the cell and permitting an increased current to flow. The hydrogen generated by the electrolytic conduction is oxidized by the nascent oxygen released from the hydrogen peroxide electrolyte, the reduction of the cuprous oxide to metal being in this way avoided.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:

1. A photo-sensitive cell having a cuprous oxide electrode, arranged in contact with an electrolyte capable of releasing nascent oxygen independently of electrolytic action.

2. A photo-sensitive cell having an electrode cooperating with a cuprous oxide electrode, both of said electrodes being arranged in an electrolyte capable of liberating nascent oxygen independently of electrolytic action.

3. A photo-sensitive cell as claimed in claim 1 or 2, in which the electrolyte contains hydrogen peroxide.

4. A photo-sensitive cell as claimed in claim 2 or 3, in which the first mentioned electrode is electro-negative with respect to the cuprous oxide electrode.

5. A photo-sensitive cell as claimed in claim 4, in which the first mentioned electrode is made of selenium.

6. A photo-sensitive cell as claimed in any of claims 1 to 5, including an outer wall constituting a copper electrode, in the form of a truncated cone, having on its inner surface a layer of cuprous oxide contacting with the electrolyte. while the cooperating electrode extends axially of said cone, and has its surface in contact with the electrolyte.

7. A photo-sensitive cell as claimed in claim 6, including means for retaining the electrolyte within the truncated cone.

8. A photo-sensitive cell as claimed in claim 6 or 7, including a translucent closure, such as a glass cover, at one end of said cone.

9. A photo-sensitive cell as claimed in claim 8, in which the other end of the cone is closed by an insulating material.

10. The improved photo-sensitive cell substantially as hereinbefore described and illustrated, for the purpose specified.

Dated the 30th day of September, 1929
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FIG.1.

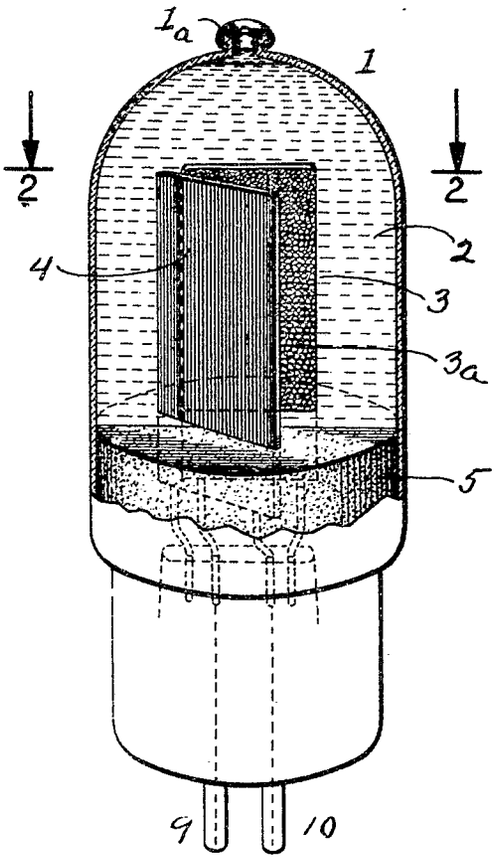


FIG.2.

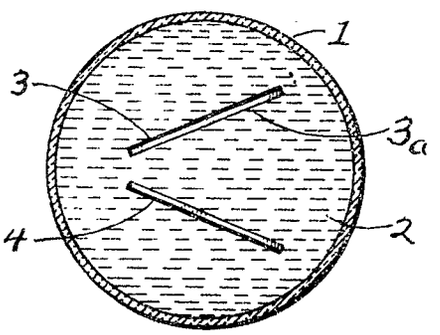
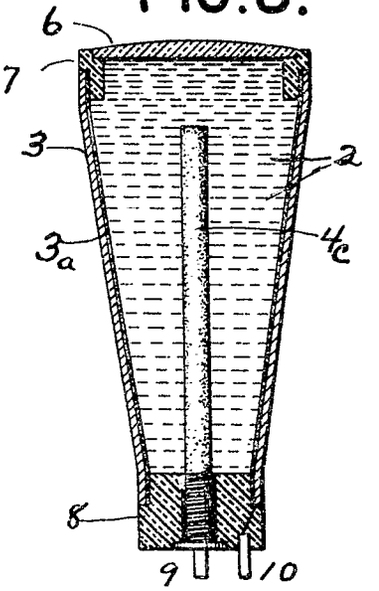


FIG.3.



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