

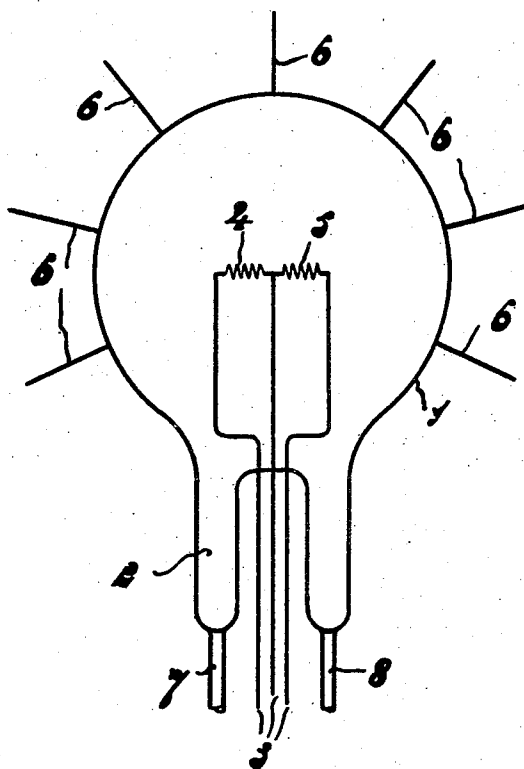
Dec. 13, 1949

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2,491,199

PHOTOELECTRIC CELL AND METHOD OF MANUFACTURING IT

Filed Feb. 14, 1947



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UNITED STATES PATENT OFFICE

2,491,199

PHOTOELECTRIC CELL AND METHOD
OF MANUFACTURING IT

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Application February 14, 1947, Serial No. 728,613
In Belgium December 15, 1944

Section 1, Public Law 690, August 8, 1946
Patent expires December 15, 1964

5 Claims. (Cl. 201—63)

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This invention relates to a photo-electric cell, the light-sensitive layer of which is constituted by an alloy of one or more of the elements antimony, arsenic or bismuth with an alkaline metal. Photo-electric cells provided with a light-sensitive layer constituted by one of the aforesaid alloys excel by high integral sensitiveness and by the fact that the maximum of sensitiveness lies in the shortwave part of the visible spectrum, with the result that they are especially suitable for given uses.

These cells have a disadvantage in that, if the light-sensitive layer is applied to glass, the transverse resistance of the layer is very high, so that the operation of the cell requires a high voltage, with the result that all kinds of undue additional effects, such as secondary emission, high leakage current or the like occur.

It is already known to alloy the antimony with one out of a number of very different metals in order to reduce the transverse resistance of the layer: It is, however, very difficult to apply these alloys, for example by volatilization, the constitution being changed by the volatilization. In addition the alloy constituent affects the sensitiveness and the position of the maximum of sensitiveness.

It is known that the treatment of the layer with traces of oxygen or one of its homologues shifts the maximum of sensitiveness to longer wavelengths and that the sensitiveness thus increases.

It is also known to effect this sensitising with oxygen by treating the arsenic, antimony or bismuth with oxygen before alloying it with the alkaline metal. As an alternative, the alloy may be heated in oxygen. Both methods have the disadvantage that they do not allow of satisfactorily proportioning the oxygen, as is generally desired, and that they are not suitable for the manufacture of large numbers of cells.

A photo-electric cell according to the invention has a light-sensitive layer constituted by an alloy of arsenic, antimony or bismuth with an alkaline metal which is applied to a substratum of iron. This may be solid iron equally well as an iron film applied to glass by volatilization. Owing to the iron substratum the high transverse resistance of the sensitive layer is practically no longer a source of trouble. In contradistinction to many other metals, iron is readily oxidized in given measures, particularly in a glow discharge with oxygen, so that any desired degree of sensitising is readily obtainable. The results thus obtained are equivalent to those obtained when treating the

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layer with traces of oxygen, and the manufacture is simpler because the quantity of oxygen supplied is larger.

It is already known to apply the said alloy in photo-electric cells and electron multipliers to an oxidized substratum of copper or nickel, but these metals fairly readily alloy with antimony and also with the other metals. It is also known to use nickel as a substratum, but this is not readily oxidized reproducibly and due to occlusions, rejects gases, such as carbon oxide, which poison the layer.

In order that the invention may be clearly understood and readily carried into effect, it will now be set out more fully with reference to the accompanying drawing, in which the single figure represents a photo-electric cell according to the invention.

Referring to the single figure of the drawing, 1 designates a glass bulb having a foot step 2, through which three wires 3 are led in. The wires 3 have arranged between them an iron wire helix 4 and a tungsten helix 5 which is coated with a layer of antimony. The bulb is provided with an exhaust tube 7 and a communication tube 8 which leads to a space in which caesium vapour can be generated. The manufacture of the cell is as follows. At first the bulb is adequately deprived of occluded gases and exhausted to a high vacuum; next the helix 4 is raised to high incandescence, so that it starts volatilizing and the wall of the cell is coated with a transparent film of iron. Oxygen is then introduced through the exhaust tube 7 up to a pressure of 50 mms., after which, for two minutes, a glow discharge having a current strength of 5 ma. is maintained between the helix 4 and the wall of the bulb which is provided with a plurality of current leads 6, the wall acting as a cathode. The bulb is then again exhausted and after the antimony is volatilized by heating the helix 5, it is caused to assume a temperature of about 160° C., after which, for ten minutes, caesium vapour is admitted through the tube 8. The bulb is then sealed and is ready for use as a photo-electric cell. Sensitivenesses up to 80 $\mu\text{A}/\text{L}$ are thus readily ensured.

What we claim is:

1. A photo-electric cell comprising a light-sensitive layer of an alloy of a metal of the group consisting of arsenic, antimony and bismuth with an alkaline metal, said layer being borne by a substratum of iron.

2. A photo-electric cell comprising a substra-

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tum of oxidized iron bearing a light-sensitive layer of an antimony-caesium alloy.

3. A method of manufacturing a photo-electric cell, which comprises oxidizing an iron surface and then depositing thereon a light-sensitive layer of an alloy of a metal of the group consisting of arsenic, antimony and bismuth with an alkaline metal, from vapors of said metals under a high vacuum.

4. A method of manufacturing a photo-electric cell, which comprises depositing a layer of iron upon the inner surface of a glass bulb, oxidizing said iron layer, and then depositing thereon a light-sensitive layer of an alloy of a metal of the group consisting of arsenic, antimony and bismuth with an alkaline metal, said metal layers being deposited from vapors of the metals in said bulb under high vacuum.

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5. A method as claimed in claim 4 wherein the oxidation of the iron layer is effected by introducing oxygen into the evacuated bulb and causing a glow discharge therein.

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