Oct. 10, 1933. H. W. PARKER 1,929,932

PHOTO-ELECTRIC TUBE

Filed March 3, 1931

FIG. 1

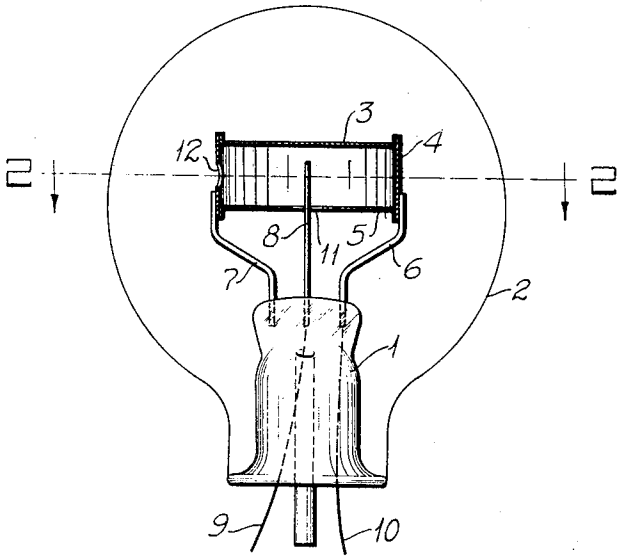
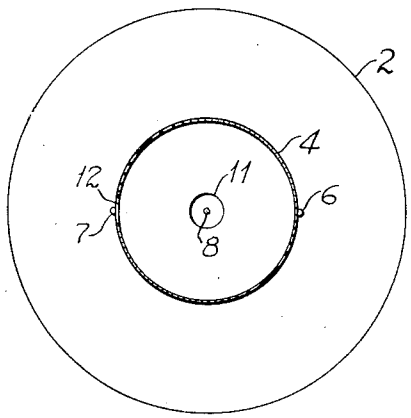


FIG. 2



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PHOTO-ELECTRIC TUBE

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4 Claims. (Cl. 250—27.5)

My invention relates to electron discharge devices and pertains particularly to that class of electron discharge devices which, as the electron discharge is occasioned by the action of light on the cathode, are termed photoelectric tubes.

An object of my invention comprises producing a photoelectric tube capable of providing superior electrical performance at greatly reduced cost of construction.

A still further object consists in providing a tube of such simplicity of construction as to greatly facilitate the mass production thereby by the use of automatic machinery.

A still further object comprises producing a tube structure which is adapted to production by use of the well-known automatic machinery now used in the mass production of thermionic tubes.

I accomplish all of the above noted desirable features and others which will hereinafter be pointed out and discussed by employing a cathode in the shape of a substantially closed cylinder, the inner surface of which is coated with alkaline earth oxides to provide a low work function surface upon which the layer of light sensitive electro-positive alkali metal is placed, positioning the anode substantially axially within the cathode cylinder, and mounting both in correct position upon the stem of the tube that their relative positions may be accurately determined before enclosure by the usual vitreous blank or envelope.

My invention will be more fully understood by reference to the following description in combination with the accompanying drawing, in which:

Fig. 1 illustrates a partially sectioned elevation of one embodiment of my invention.

Fig. 2 illustrates a sectional plan view of the same taken on the line 2—2 of Fig. 1.

Referring now particularly to the figures, my novel photoelectric tube comprises a cathode formed of a circular metallic band 4 provided with a perforated bottom member 5 and top member 3, the entire element thus being formed in the shape of a substantially closed cylinder. An opening 12 is provided in one side of the cylinder for the admission of radiant energy. The cathode is supported by the metal standards 6 and 7 which are supported in the stem 1. A terminal connection 10 for the cathode is electrically united with the standard 6. The anode 8 is supported in the stem 1 and extends through the aperture 11 in the bottom member 5 of the cathode into the interior thereof. It is positioned substantially axially within the cylindrical cathode. A conductor 9 is attached to the anode 8 and serves as a terminal therefor. A vitreous blank or envelope which may be of any desired or convenient shape is attached in the usual manner to the flange of the stem 1 and completes therewith the enclosure of the cathode and anode.

The cathode is preferably constructed of sheet nickel and is coated on the inside with one or more of the alkaline earth oxides as calcium, strontium, or barium, or preferably coated with a combination of the oxides of strontium and barium to provide a very low work function surface or, in other words, a surface in which the work done by electrons during egress is very low. A thin layer of an electro-positive alkali metal such as lithium, sodium, potassium, rubidium or caesium, is disposed on this low work function surface by solution, distillation, electrolysis, or disintegration, all methods which are well-known in the art, and, if desired, the surface may be further sensitized by heating the cathode in an atmosphere of hydrogen, a process that is further well-known in the art.

The tube, after complete assembly, is placed in an automatic exhaust machine of the same type used in the mass production of thermionic tubes and the cathode is heated by high frequency induced currents while exhausting of the tube is in process to break down and activate the alkaline earth oxides in much the same manner in which the oxide coated cathodes of thermionic tubes are activated. In the gaseous type of tube, argon or other chemically inert gas is introduced at the necessary low pressure before sealing off the tube.

By the use of a cylinder coated with barium and strontium oxides, a very low work function surface is obtained and the sensitivity of this surface is increased by the thin layer of alkali metal, preferably potassium, placed on this prepared alkaline earth oxide activated surface.

Light entering the aperture 12 obviously is reflected many times within the cathod to increase the emission of electrons over that hitherto known in other types of such cathodes. The size of the aperture 12 may in its relative proportions be larger than that shown in the figures if desired to provide a greater area for the direct irradiation of the cathode.

It will be obvious from the foregoing that my improved photoelectric tube provides an efficient type of construction both with regard to its electrical properties and with regard to the sim-

plicity of construction which facilitates mass production by means of the well-known automatic machinery utilized in the production of thermionic tubes. It will be observed that prior to the addition of the enclosing blank the relative positions of the cathode and anode may be definitely determined and fixed and that thereafter the construction and exhaust processes may be carried on by the usual mass production methods with the assurance that uniformity of production will be attained.

Having thus completely described my invention that which I claim as new and original and desire to secure by Letters Patent of the United States is as follows:

1. A photoelectric tube comprising, a stem, a cylindrical photo cathode, the top of which is closed supported wholly by said stem, and anode in the form of a rod supported by said stem and axially positioned with respect to said cathode, and an enclosing vitreous envelope attached to said stem.

2. A photoelectric tube comprising, a stem, a closed cylindrical photo cathode, having an aperture for the admission of light, supported by said stem, and anode in the form of a straight rod supported by said stem and axially positioned with respect to said cathode and an enclosing vitreous envelope attached to said stem.

3. A photoelectric tube comprising, a vitreous envelope enclosing a photo cathode in the form of a cylinder, the top of which is completely closed, and an anode axially positioned within said cathode.

4. A photoelectric tube comprising, a vitreous envelope enclosing a closed cylindrical photo cathode having an aperture for the admission of light in the side thereof and an anode in the form of a straight rod axially positioned with respect to said cathode.

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