Feb. 14, 1939. M. J. BROWN 2,147,426

PHOTO GLOW TUBE

Filed Oct. 21, 1936

Fig. 1.

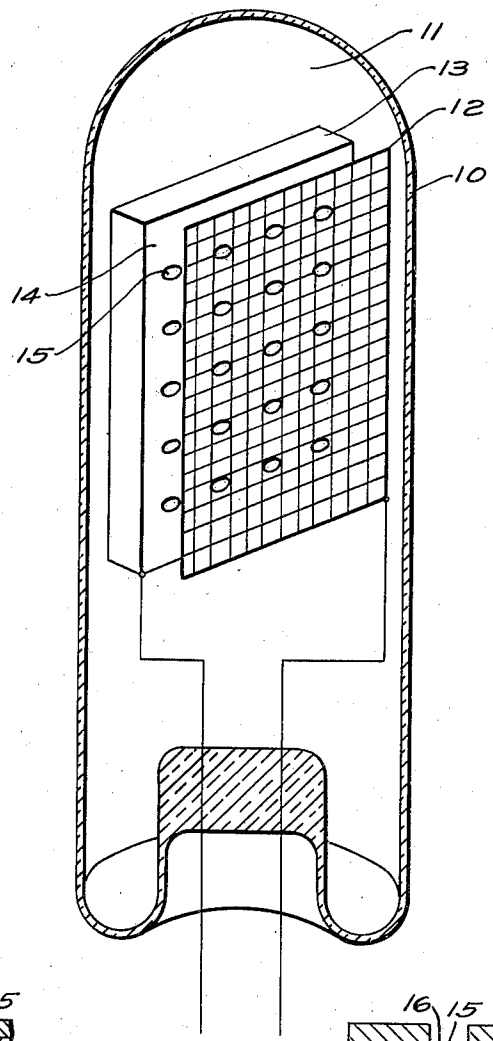


Fig. 2.

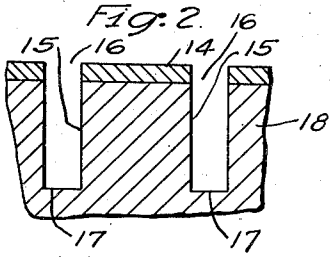
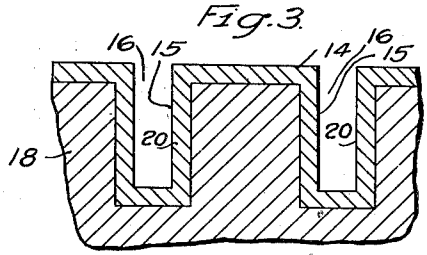


Fig. 3.



WITNESSES:

E. A. McCloskey.

R. W. Bailey

INVENTOR

Myron J. Brown.

BY F. W. Lyle.

ATTORNEY

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UNITED STATES PATENT OFFICE

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PHOTO GLOW TUBE

Myron J. Brown, Wilkinsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

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3 Claims. (Cl. 250—171)

My invention relates to discharge devices, and especialy devices of the photo-glow type.

An object of my invention is to prolong the life of photo-glow tubes.

Another object of my invention is to provide means whereby a photo-sensitive surface will be protected from continuous ion bombardment.

More specifically stated, it is an object of my invention to provide craters or substantially enclosed pockets in the photo-sensitive surface of the cathode electrode, in order that the discharge, after it is initiated by the photo-sensitive surface, will transfer to these craters or pockets. An electron in the craters or enclosed pockets will travel back and forth between the walls of a pocket or crater and cause more intense ionization therein. Due to this more intense ionization, the discharge path will transfer from the photo-sensitive surface to the crater, and the photo-sensitive surface will not have to withstand a continuous ion bombardment that has shortened the life of photo-glow tubes of the prior art.

Other objects and advantages will become apparent from the following detailed description and drawing in which:

Figure 1 is a cross-sectional view through a photo-glow tube with the electrodes in elevation.

Fig. 2 is a partial cross-sectional view of the cathode electrode of Fig. 1; and

Fig. 3 is a modification of Fig. 2.

The device has the container 10 enclosing a gaseous medium 11 at low pressure. This gaseous medium may be of any of the noble gases such as neon, argon, etc., or any combination of them. Within the container are two or more electrodes and, as illustrated, the electrode 12 is preferably in the form of a mesh to act as an anode for collecting electrons emitted by the cathode electrode 13, yet permitting the passage of light to the cathode. The cathode electrode has a photo-sensitive exposed surface 14 facing the anode electrode 12. Over the surface of the cathode are a plurality of craters or pockets 15. These craters or pockets are more fully illustrated in Fig. 2 and its modification in Fig. 3.

As shown in Fig. 2, the craters or pockets 15 have an opening 16 through the photo-sensitive exposed surface 14 and preferably extend very deep at 17 into the cathode. The cathode has a photosensitive surface 14 composed of caesium, potassium, or any of the other well known photo-sensitive materials, or their compounds, as a coating on a base 18. This base is preferably of a metal having a very low cathode drop such as iron, aluminum or "Misch" metal. The area of the craters or pockets 15 is substantially of the order of the active area of the cathode surface, namely, the photo-sensitive exposed area of surface 14.

A portion, at least of the electrons within the pocket or crater 15 will tend not to pass immediately through the opening 16, but will tend to travel back and forth between the enclosing sides of the pocket or crater. This traveling back and forth will produce a greater number of collisions with the gaseous medium within the pocket or crater with the result that the gaseous medium in the pocket will be more intensely ionized than the medium on the exposed surface of the cathode.

The discharge of electrons will start by illumination of the photo-sensitive surface 14. The gaseous medium will be ionized by the discharge, and the positive ions will then start to bombard the photo-sensitive surface 14. It is the effect of this bombardment that has decreased the life of the photo-glow tubes of the prior art.

Because of the more intense ionization of the gaseous medium within the pocket 15, the discharge will transfer to these regions, with the result that the positive ions will impinge, to a large extent at least, upon the walls of the crater or pocket. These walls will withstand the ion bombardment better than the photo-sensitive surface 14.

The voltage used across the discharge space may be such as to insure the transfer of this discharge to the pockets 15.

A modification is disclosed in Fig. 3 in which the photo-sensitive surface 14 is the same as in Fig. 2, but the pocket 15 is also coated or lined with the photo-sensitive surface 20. This photo-sensitive surface 20 may be a photo-electric material or compound which will withstand ion bombardment better than the photo-sensitive surface 14. A very sensitive photo-sensitive material such as caesium may be used at surface 14 to start the discharge and then a less sensitive, but more rugged photo-sensitive material, such as potassium or sodium and its compounds, may be used to take up the discharge after it is once started.

Many changes, of course, may be made in the shape and arrangement of the elements. I have illustrated a plurality of craters or pockets, although one large pocket with a small opening might be utilized. I have also disclosed a cylindrical pocket about three times as deep as its diameter. Other proportions of width and depth may be used, as well as other configurations such

as a widening or narrowing pocket with depth. "Substantially enclosed" as used in the following claims in connection with the gaseous medium means such confinement in the space that an electron will travel back and forth and cause more intense ionization by reason of its substantial enclosure therein. By "crater" is meant such an enclosure that a discharge will transfer thereto by reason of the more intense ionization in said enclosure. Accordingly, I desire only such other limitations to be imposed upon the following claims as are necessitated by the prior art.

I claim as my invention:

1. A discharge device comprising a container having a gaseous medium therein, a plurality of electrodes, the active discharge area of one of said electrodes comprising an exposed surface and a surface substantially enclosed except on the side nearest the other said electrode, said exposed surface consisting of a more photo-sensitive material than does said enclosed surface.

2. A discharge device comprising a container having a gaseous medium therein, a plurality of electrodes, the active discharge area of one of said electrodes comprising an exposed surface and a surface substantially enclosed except on the side nearest the other said electrode, the area of the substantially enclosed surface being substantially of the order of the area of the exposed surface, said exposed surface consisting of a more photo-sensitive material than does said enclosed surface.

3. A discharge device comprising a container having a gaseous medium therein, a plurality of electrodes, one of said electrodes having a photo-sensitive surface and a plurality of craters having open ends facing the other said electrode therein, the interior walls of said craters being less photo-sensitive than said surface.

MYRON J. BROWN.