Nov. 7, 1933. G. S. C. LUCAS 1,934,437

PHOTO ELECTRIC TUBE

Filed May 19, 1930

Fig. 5.

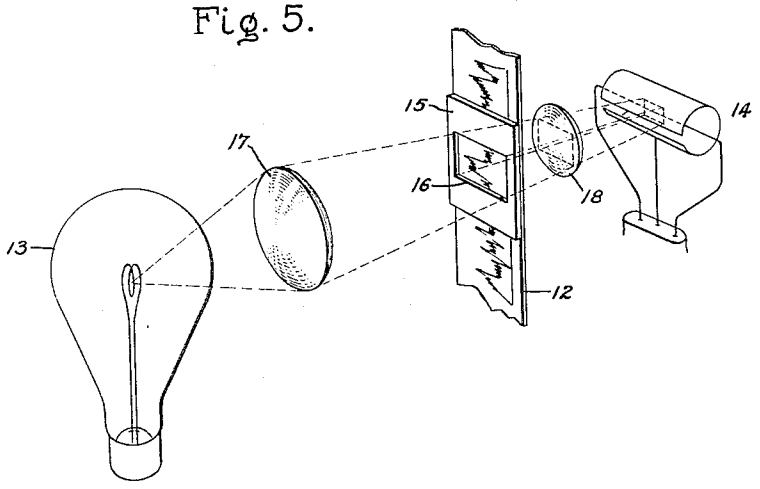


Fig. 2.

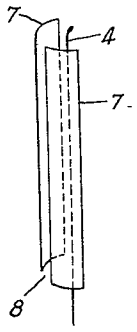


Fig. 4.

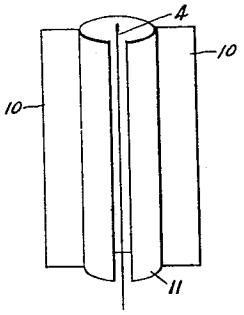


Fig. 1.

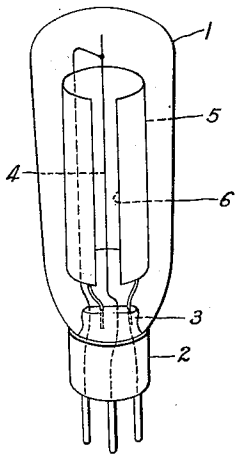
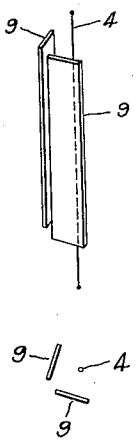


Fig. 3.



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PHOTOELECTRIC TUBE

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Application May 19, 1930, Serial No. 453,651, and in Great Britain May 28, 1929

5 Claims. (Cl. 250—27.5)

This invention relates to improvements in photo-electric tubes such as are used for the reproduction of sound from a sound record film. It is usual in reproducing sound from a film to cause the film to pass rapidly in front of a narrow slit, a beam of light passing through the film and slit and falling onto a photo-electric tube connected in a suitable amplifying circuit containing a sound reproducing device or loud speaker. In an alternative method of reproduction the beam of light passing through the film is produced optically by means of a larger slit placed at some distance from the film.

The essential feature of these methods of reproduction is that the width of the pencil of light falling on the film shall not exceed one thousandth of an inch in order that a sound record containing notes of a wave length of the order of .0035 of an inch will be faithfully reproduced.

The object of the present invention is to provide an improved type of photo-electric tube and to that end it consists in constructing the tube with a light-sensitive cathode of thin wire having a thickness at least in one plane in the neighborhood of .001 of an inch in diameter. An image of a portion of the film may thus be focussed onto the wire. In this way the only section of the film controlling the tube at any instant is the part, the image of which falls directly on the wire and since the wire is only .001 of an inch wide, the result is equivalent to having a slit .001 of an inch wide in front of the film. The cathode of the tube may therefore consist of a fine wire of light-sensitive material, well known in the art, and the anode of a cylinder surrounding the cathode having a longitudinal slit to allow the light to fall on the wire. As an alternative, the anode may be in the form of a half cylinder with a portion at the back cut away to prevent light reflected from the anode from falling on the cathode or the inside may be blackened to prevent reflection.

To enable the invention and the manner in which it is carried into effect to be readily understood, reference is directed to the following description of the accompanying drawing, in which Figs. 1 to 4 show various constructions of a photo-electric tube in accordance with the invention, and Fig. 5 illustrates the manner in which the tube may be used for reproducing sound from a photographic record thereof.

Referring to Fig. 1, I have shown the tube as consisting of an evacuated tube 1 having the usual form of base 2, the electrodes being supported from a pinch 3. In accordance with the invention, the cathode 4 consists of a thin wire of light-sensitive material and having a diameter of the order of .001" mounted concentrically within an anode 5, preferably of cylindrical form having a longitudinal slit 6 through which light may pass to reach the cathode.

In place of the cylindrical form of anode shown in Fig. 1 I may use, if desired, an anode of semi-cylindrical formation, this construction being equivalent to the use of a slit 6 of a width equal to the diameter of the anode.

In Fig. 2, the anode 7 is shown as consisting of two plates of curved formation, having between them the slit 8 through which light may pass to the cathode 4. These two plates may be so arranged as to constitute a portion of a cylindrical anode.

Fig. 3 represents an arrangement in which the two plates constituting the anode 9 are flat instead of curved as in Fig. 2.

When the photo-electric tube is to be used for reproduction from a photographic record of sound waves by electrical means, it is desirable to have means for determining when the image of a portion of the sound record is accurately focussed onto the cathode. In Fig. 4 this means is shown as comprising plates 10 extending radially from the anode 11 and located in the plane containing the cathode 4. An image of a portion of the record can thus first be formed on one of the plates before it is caused to fall upon the cathode itself.

Instead of using a thin wire of the order of .001" in diameter as the cathode, I may use a light-sensitive ribbon having a thickness of the order of .001". In this case the edge of the ribbon should be directed towards the slit in the anode, that is to say, the plane containing the smallest dimension of the cathode should be normal to the plane passing through the slit.

In Fig. 5 I have shown an arrangement in which the improved photo-electric tube may be used in reproducing sound from a photographic record thereof. This record is located on a film 12 and light from a source 13 is caused to pass through the film onto the cathode of the tube indicated at 14. A mask 15 restricts the light falling on the film to a portion only thereof determined by the size of the opening 16 in the mask. Suitable lenses shown at 17 and 18 may be used for concentrating the light from the source onto the film and for forming an image of the illuminated portion of the film on the cathode of the photo-electric tube 14. It is, of course, essential that the cathode should be arranged perpendicular to the direction of movement of the record 12.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A photo-electric tube comprising a linear light-sensitive cathode surrounded by a cylindrical anode, said anode being provided with a slit parallel to the linear cathode.

2. A photo-electric tube comprising a linear light-sensitive cathode surrounded by an anode, said anode being provided with a plate in the same plane as the linear cathode and also provided with a slit parallel to the latter.

3. A photo-electric tube comprising a linear light-sensitive cathode and a cooperating anode, said cathode having a thickness, at least in one plane, of the order of one thousandth of an inch.

4. A photo-electric tube comprising a linear light-sensitive cathode having a thickness, at least in one plane, of the order of one thousandth of an inch and a cooperating anode formed with a longitudinal slit through which the light rays are adapted to pass in order to reach the cathode, said slit being positioned to coincide with the plane perpendicular to the plane in which the thickness of the cathode is measured.

5. A photo-electric tube comprising a linear light-sensitive cathode having a thickness, at least in one plane, of the order of one thousandth of an inch, and a cooperating anode formed with a longitudinal slit through which the light rays are adapted to pass in order to reach the cathode, said slit being positioned to coincide with the plane perpendicular to the plane in which the thickness of the cathode is measured, said anode being provided with a plate located in the same plane in which the thickness of the cathode is measured.

GEORGE S. C. LUCAS.