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PHOTOELECTRIC TUBE

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Fig. 1

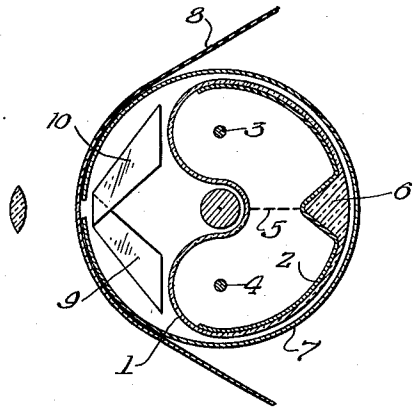


Fig. 2

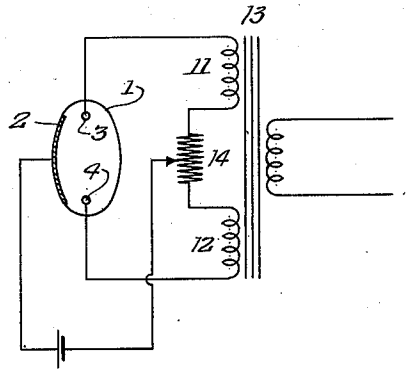
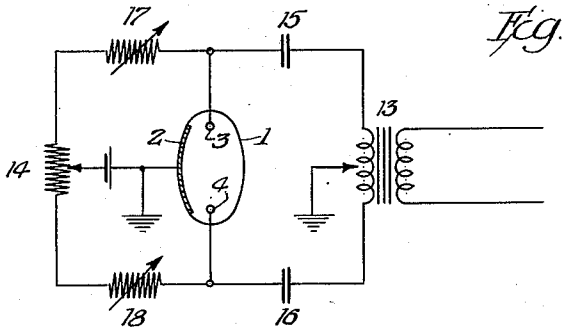


Fig. 3



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PHOTOELECTRIC TUBE

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3 Claims. (Cl. 250—27.5)

This invention relates to improvements in photoelectric tubes.

In the reproduction of sound films having the records thereon produced by balanced tube systems, it is one of the requirements that the light impulses passing from the sound records through an especially designed optical slit equipment should be received separately from each other and should be converted into electric currents for sound reproduction.

It is an object of the present invention to eliminate the necessity of using two separate photoelectric tubes which had heretofore been employed for separatively receiving and separately converting the light impulses from a film produced by the balanced tube system. This object of the invention is obtained by employing a photoelectric tube having a single extended cathode and at least two separate anodes in place of a plurality of photoelectric tubes heretofore used in balanced tube receiving systems, which were provided with separate cathodes and a single anode.

Owing to this improvement the object is attained of reducing the space requirements for the entire sound head as compared with those volumes of sound heads in which separate sets of photoelectric tubes or tubes with separate cathodes had been utilized.

Photoelectric tubes with a multiplicity of cathodes in the interior and particularly with that type of cathodes which appeared as layers on the wall of the envelope are very difficult to produce. It is difficult to produce at locally separated areas of the wall of the envelope, cathode layers of the same physical qualities and having, therefore, the same sensitiveness to light.

The principal object of the present invention, therefore, is to provide for the balanced tube system a photoelectric tube wherein a single cathode is employed in association with two locally spaced anodes,—the electrodes all being located within the same evacuated envelope.

Several embodiments of the invention are described in the following specification in which reference is made to the accompanying drawing. In the drawing:

Fig. 1 shows a sectional view of a photoelectric tube of this type with a diagrammatic representation of the sound record and its support;

Fig. 2 is a circuit diagram illustrating the connection of this tube, and

Fig. 3 is a modification of this circuit diagram.

The photoelectric tube comprises an envelope 1 having on one wall thereof and extending over a fairly large area of said wall a layer 2 of a metal which under predetermined conditions known in the art is sensitive to light and is adapted to emit electrons to an opposite electrode. These opposite electrodes in the form of the anodes 3 and 4 are provided within the envelope 1 suitably spaced from the cathode, and each of these anodes may, therefore, be described as being located in a section of the envelope separate from the other section. The two anodes 3 and 4 must be disposed within said envelope 1 in such manner that they are struck solely by the electrons emitted by that portion of the cathode which is to cooperate with the respective anode.

For the purpose of more sharply separating the sections in which the cooperating electrodes are located, a protective grid or screen 5 may be disposed in the interior of the tube. This grid or screen constitutes an electrostatic shield of the two sections of the tube with respect to each other.

It is, furthermore, essential to provide means for preventing the portions of the cathode pertaining to the different sections from being struck by dispersed light or light which also is intended for the other portion of the cathode. These vagrant rays of light might induce, for instance, detrimental reflections on the wall of the envelope or on other parts of the photoelectric tube. It is, therefore, preferable to separate the two sections of the tube from each other by a light intercepting screen and the grid or screen 5 constituting the electrostatic shield between the two sections may at the same time be constructed to form a light intercepting screen.

A further assurance of directing rays of light to that cathode portion only to which they should have been directly applied is furnished by the shape of the wall on which the cathode layer is applied. As shown in Fig. 1, the wall portion of the tube to which the cathode layer adheres is formed with a rib or projection which is also overlaid by the cathode layer, and the oppositely directed surfaces of this rib 6, therefore, serve for reflecting the electrons of one section, as for instance, the section containing the electrode 3 towards the cathode portion which is associated with the electrode 3 or directing these electrons immediately towards the anode 3 while without the provision of this reflecting projection 6 there might be danger that electrons from the cathode portion associated with the anode 3 would be directed against the anode 4 in the other section of the tube.

The type of photoelectric tube, as illustrated in Fig. 1, is particularly useful for photoelectric

sound production and scanning devices. The figure, therefore, illustrates diagrammatically a tubular support 7 for the sound record 8, the sound record being relatively movable to a slit provided in the support 7 and through which the light modulations due to the sound recordings on the film 8 affect the interior of the support 7. Optical means illustrated by way of example as a pair of prisms 9 and 10 direct these modulated rays of light into the separate sections of the photoelectric tube to energize thereby the cathode portions of these tube sections only without at the same time affecting other sections of the photoelectric tube.

In the use of the tube, the circuit connection illustrated by way of example in Figs. 2 and 3, for instance, may be employed.

In Fig. 2 the anodes 3 and 4 are respectively connected with the primary windings 11 and 12 respectively of a transformer 13. The cathode is connected with the source of voltage, as for instance a battery, and at the same time with a tap located on the primary of the transformer between the primary sections 11 and 12. For the purpose of rendering the anode voltage adjustable, the lead extending from this tap to the cathode may be connected at the tap with a variable potentiometer 14.

In the circuit arrangement, as illustrated in Fig. 3, the two anodes 3 and 4 of the photoelectric tube are also connected with the primary of a transformer. In order to protect the transformer against the influence of the circuit of the photoelectric tube which circuit will flow even though the cathode is not energized by light striking the same, condensers 15 and 16 are interposed in the leads between the anodes 3, 4 and the transformer. An adjustment of the anode voltage in this modified circuit arrangement is effected by connecting in parallel to the anodes 3 and 4 a loop containing the variable resistances 17, 18 and the potentiometer 14, with which last named potentiometer, the voltage source to the cathode is connected.

It is obvious that in this last described embodiment, the anodes 3 and 4 may be connected with two balanced amplifier tubes directly, the condensers 15, 16 being also interposed as a protective measure in this connection.

We claim:

1. A photoelectric tube, comprising an envelope, a cathode layer on the wall of said envelope, the wall of the envelope having an inwardly projecting rib over which the cathode layer extends, the inner surfaces of the rib being angularly disposed with respect to each other and with respect to the cathode layer, and anodes mounted adjacent different portions of the cathode and opposed to different surfaces of the rib.

2. A photoelectric tube, comprising an envelope, a cathode layer on the wall of said envelope, the wall of the envelope having an inwardly projecting rib over which the cathode layer extends, the inner surfaces of the rib being angularly disposed with respect to each other and with respect to the cathode layer, and being reflective of light striking the angular surface portions toward different portions of the cathode layer, and anodes mounted in opposition to the angular surface portions of the rib.

3. The combination with a tubular support for a film having a sound record thereon, of a photoelectric tube disposed within said tubular support, said photoelectric tube comprising an envelope of kidney shaped transverse cross-section, each lobe of the kidney defining one section of the tube, the convex wall of the envelope connecting the lobes of the kidney extending substantially parallel to the inner wall of said tubular support and having at its center portion a rib projecting inwardly towards the center portion of the opposed concave wall of the envelope, a cathode layer covering the inner face of the convex wall of the envelope, and also covering the surface of said rib, an anode in each lobe section of the envelope, a screen dividing said envelope into two sections and mounted at the smallest passage within the envelope, between said rib and the center portion of said concave wall, and optical means within said tubular support for directing the light beam passing through the sound record into the separate sections of said photoelectric tube.

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