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CATHODE-RAY TUBE

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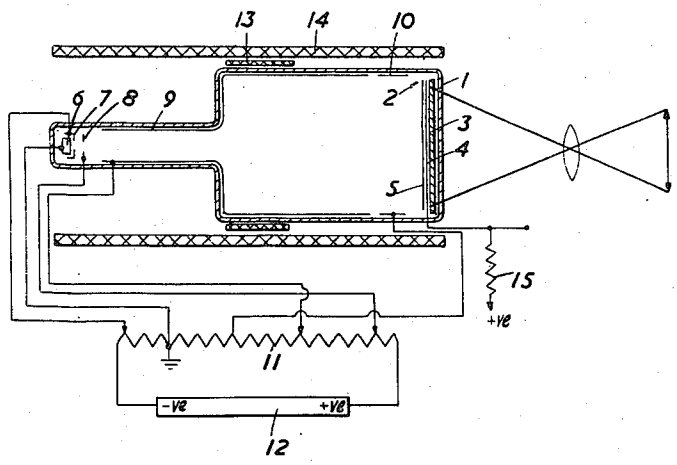

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CATHODE-RAY TUBE

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1 Claim. (Cl. 250—153)

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This invention relates to circuit arrangements embodying cathode ray tubes of the type which employ a target electrode which is scanned by an electron beam for the purpose of generating signals which are suitable for example for use in television transmitting systems.

Various forms of such cathode ray tube have been proposed and in United States Patents Nos. 2,211,146 and 2,177,736, it has been suggested to employ a target electrode comprising a layer of material exhibiting a photo-conductive effect. The manufacture of such layers is described in an article in the Proceedings of the Physical Society, volume 50, 1938, page 374. In these prior proposals the target electrode was arranged to be scanned with a high-velocity scanning beam so that the elements of the target electrode attained an equilibrium potential corresponding substantially to the velocity of the scanning beam. Scanning of target electrodes with a high-velocity scanning beam is known to be undesirable owing to the spread of secondary electrons released by the scanning beam together with irregularity in secondary electron emission causing background "noise" and it is the object of the present invention to provide an improved cathode ray tube employing a target electrode of the photo-conductive type in which this disadvantage is substantially reduced.

According to the invention, there is provided a circuit arrangement embodying a cathode ray tube having a target electrode comprising a photo-conductive layer provided on a conductive signal electrode and arranged to receive an optical image, means for scanning said layer with a low-velocity scanning beam so that the equilibrium potential of the scanned surface of said layer corresponds substantially to that of the cathode which generates said scanning beam and means for maintaining said signal electrode at a positive potential with respect to the potential of said cathode.

In order that the said invention may be clearly understood and readily carried into effect it will now be more fully described with reference to the accompanying drawing which illustrates a cathode ray tube according to one embodiment of the invention and circuit connections therefor.

As shown in the drawing, the cathode ray tube 1 comprises a target electrode 2 composed of a transparent insulating layer 3, such as glass or mica, on one side of which is deposited a semi-transparent signal plate 4. On the top of this signal plate 4 is deposited a layer of photo-conductive material 5, such as zinc selenide. The

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layer of zinc selenide is arranged to be scanned by a low-velocity scanning beam which is generated by a suitably disposed electron gun. The electron gun comprises a cathode 6, a cathode shield 7, an apertured anode 8 and a further electrode 9 consisting of a metallic wall coating. The cathode 6 may be maintained at earth potential, the shield 7 at a negative potential thereto, the anode 8 at a positive potential and the electrode 9 usually at a slightly lower positive potential than the anode 8. Near to the target electrode 2 is a decelerating electrode 10 which is maintained at a less positive potential than the electrode 9. The electrodes 6—10 are conventionally shown as deriving their potentials from a potentiometer 11 connected across a source of potential 12. The electron beam from the gun is accelerated by the anode 8 and decelerated by the electrodes 9 and 10 and is scanned over the surface of the target electrode 2 by scanning coils indicated at 13. The electron beam is focussed by and is arranged to scan the surface of the target electrode in the presence of a longitudinal magnetic field set up by a solenoid 14 and the arrangement is such that the beam is caused to impinge on the target electrode substantially normally throughout the whole scanning cycle in known manner.

When using a cathode ray tube according to the invention for the generation of signals suitable for television transmission, the signal plate 4 is connected to a signal resistance 15 and is maintained at a slightly positive potential of the order of a few volts with respect to the cathode 6 of the electron gun, the magnitude of said positive potential determining the sensitivity of the tube. An image of the object for transmission is projected through the insulating layer and through the transparent signal plate on to the layer of zinc selenide. In the absence of illumination, the surface of the layer 5 scanned by the cathode ray beam will be charged to the potential of the cathode of the electron gun and a potential difference will thus be set up through the target electrode. When light falls on an elementary area of the layer 5, this area becomes conductive to a degree depending on the intensity of illumination and the potential of the surface begins to rise towards the potential of the signal plate 4. When the scanning beam impinges on such an area of the layer 5, electrons from the scanning beam will reduce the potential of said area to cathode potential and thus produce a signal which is set up across said signal resistance 15. Owing to the low-velocity scanning beam employed,

emission of secondary electrons from the target electrode is substantially avoided, thus obviating the well known background or tilt signals and other disadvantages which occur with the use of high-velocity scanning beams. Furthermore, stable operation of a tube according to the invention should result, since the potential rise of the target electrode due to the illumination cannot exceed the potential of the signal plate 4 and due to the fact that the first crossover point of the secondary emission characteristic of a photo-conductive layer is considerably higher than that of photo-emissive layers, being between 20 and 100 volts. A tube constructed as described above is suitable for use in television transmission and is also suitable to radar daylight viewing apparatus where a target electrode having a long lag is desirable.

If desired electrons which are not employed for the purpose of restoring the elements of the target electrode to cathode potential can be returned in known manner to an electron multiplier and employed for the generation of picture signals. Since there is no surface in the tube which requires to be treated with caesium or other materials of low work function the secondary emission ratio of the target electrode can be maintained low and hence a better modulation of the electron beam can be obtained rendering it eminently suitable for use where the unrequired electrons are returned to a multiplier.

What I claim is:

A circuit arrangement embodying a cathode ray tube having a target electrode comprising a photo-conductive layer provided on a conductive signal electrode and arranged to receive an optical image, including means for scanning said layer with a low-velocity scanning beam with the equilibrium potential of the scanned surface of said layer corresponding substantially to that of the cathode which generates said scanning beam, and means for maintaining said signal electrode at a positive potential with respect to the potential of said cathode.

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