

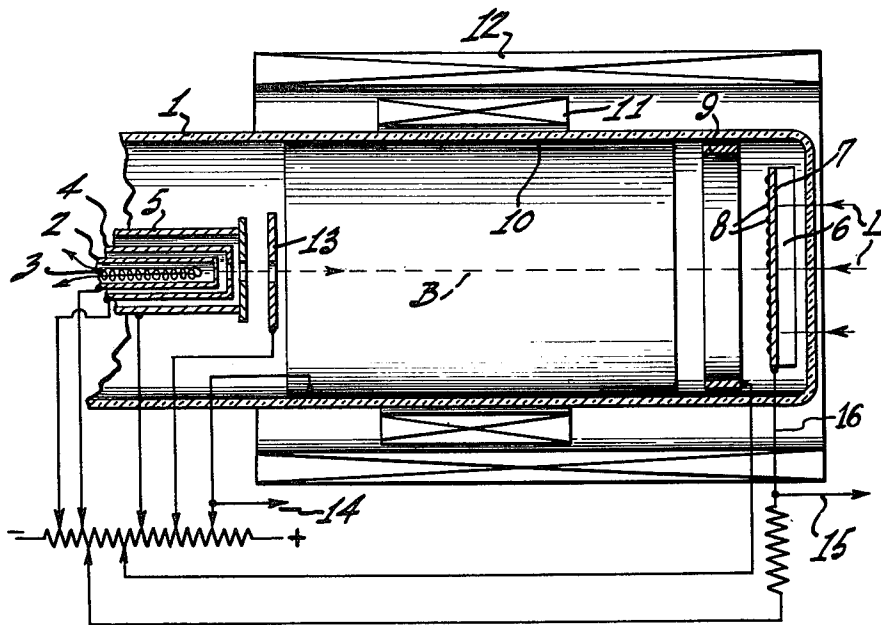
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TELEVISION PICKUP TUBE

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TELEVISION PICKUP TUBE

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This invention relates to cathode ray beam pick-up tubes. Heretofore, targets of pick-up tubes have been made to have a grid-like action on the landing of a cathode ray beam on an electrode by use of a perforated insulation target having the charge image on the side adjacent the signal screen and remote from the gun. The cathode ray beam passes through the perforations to the signal screen in proportion to the charge image on the elemental areas at the perforations. A grid action gives high sensitivity, but the discharge of the picture charge by some of the beam electrons swerving around to the target after passing therethrough is insufficient for full discharge. For this reason, this type of tube has not been very successful.

In my U. S. Patent No. 2,458,205, I have overcome this difficulty by making the perforated target of semi-conducting material, so that the charge image is discharged by the electrons landing on the target and passing through by conduction to the charged areas in a frame time.

In the present invention I secure similar efficient grid-like action of the target without using perforations at all.

It is an object of the invention to provide a target having alternately positioned non-conducting sensitive areas and conducting areas, so that the electrons emitted by, or reflected from, the latter areas are grid-controlled by the charges on the former.

Other objects of the invention will appear in the following description, reference being had to the drawing, in which:

The single figure is a partial axial section of a tube employing my invention.

My invention is not limited to any particular type of tube, but by way of example I have shown a tube in which the cathode ray beam lands on the target at low velocity. In the drawing, the tube is shown with any type of evacuated container 1, in which is incorporated a cathode 2 having a heater 3. Around the cathode 2 is positioned the usual perforated grid 4, which is surrounded by the first anode 5, which also is perforated. At the other end of the tube is located impermeable target 6 consisting of a translucent insulating material such as thin mica, on which is coated a thin translucent conducting film 7 such as platinum. On the surface of the platinum film is placed a multiplicity of active particles 8 capable of emitting either photoelectrons or secondary electrons, as may be desired. The thickness of the mica and the conducting film and the size of the active particles are

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greatly exaggerated for clearness of illustration. The particles 8 are made of insulating material such as for example, boron oxide which may be applied in any manner as suggested, for example, in Patent 2,178,081 to Fiore or Patent 2,175,689 to Gallup. The insulator particles 8 are photosensitized in any well known manner, as for example, that in which a thin film of silver is deposited over the metal particles and then oxidized and caesiated as disclosed in the above cited patent to Fiore, 2,178,081. The insulator particles 8 need not be confined to a boron oxide but may be of any other appropriate insulating as described in the above cited Gallup Patent 2,175,689. The photoactive particles should be of such size and so spaced that a particle and its surrounding conducting film of metal is at least as small as at the cathode beam at the target. Adjacent the active particles 8 on the target is placed a decelerating electrode 9 and between this and the first anode 5 is located the usual wall coating electrode 10. Around the outside of the tube is placed the deflecting unit 11, which may be comprised of the usual two coils having fields at right angles to each other and to the field of the axial focusing coil 12. A collecting disc 13 may be positioned adjacent the end of the anode 5. This disc has a perforation large enough for passage of the beam B, but small enough so that the return electrons may land outside of the perforation. The potentials of the various electrodes will be well known to those skilled in the art, but I will say that for obtaining grid-like action by the particles 8 of the electrons leaving the metal film 7, the metal film may be operated slightly positive in respect to the cathode 2, for example, about one to ten volts positive thereto.

The operation may be briefly described as follows:

In normal tube operation, the cathode ray beam B is scanned over the surface of the target electrode 7—8. Due to the decelerating potentials applied to the electrodes 9 and 7, the beam is retarded to a low velocity of several volts and strikes the target surface 7—8 with such low energy that the secondary emission ratio initiated from the insulator particles 8 and the metal surface 7 is less than unity. Thus, when the tube is in darkness, the low velocity electron beam will drive the insulator particles 8 to cathode potential. Due to the fact that the film 7 is several volts positive relative to cathode potential, the electron beam will pass between the insulator particles 8 and strike the metal film to

initiate a secondary emission. However, the insulator particles are negative to the conducting film 7, and the secondary emission from film 7 is suppressed by the negative field formed by the insulator particles 8. Thus, in the condition when no light strikes the target surface the electron beam B is almost wholly absorbed by the positive conductive film 7. However, there is a slight orthicon action in which a very small portion of the beam is turned back and reflected by the insulator particles 8, which are at cathode potential. This return portion of the beam is absorbed by the collecting anode 13.

When a visual scene is focussed by any suitable means, upon the target and the photosensitive particles 8, there is a photoemission from the particles 8 which establishes a potential distribution over the target surface corresponding to the distribution of light and shade in the picture imaged thereon. The sensitive insulator particles 8 which are struck by light will be driven positively by the photoemission therefrom. As the electron beam scans such lighted surfaces of the target, the secondary emission initiated from the conductive film 7 will be urged away from the target by these positive areas and into the collecting field of electrode 13. However, those insulator particles 8 on the areas of the target upon which no light strikes, are maintained at zero or cathode potential and continue to suppress secondary emission from the target surface. Thus, as the electron beam scans the target, upon which the distribution of light and shade is focussed, there is generated a secondary emission corresponding in intensity to the amount of positive potential at each point. Also, during the scanning action of the electron beam, part of the beam is utilized to discharge the picture charge distribution on the insulator particles 8. The scanning action of the electron beam thus initiates a secondary electron emission which, when collected by the positive electrode 13 will produce in the circuit of electrode 13, a video signal corresponding to the intensity of the lighted areas of the target surface. The signal produced by the electrons leaving the target can be taken off electrode 13 at conductor 14, or off conductor 15 connected to the target film 7. The only difference is that the picture taken off conductor 15 is of opposite polarity, that is, the lights and shades are reversed. This, of course, is not of great significance, as the picture can be reversed by electrical circuits of the amplifier if desired.

While certain specific embodiments have been illustrated and described, it will be understood that various changes and modifications may be made therein without departing from the spirit and scope of the invention.

What I claim as new is:

1. A signal generating device comprising an electron gun including a cathode electrode for producing an electron beam along a path, an imperforate target electrode positioned transversely to said beam path, means for scanning said electron beam over a surface of said target, said target electrode surface including alternate conductive areas and photosensitized insulation areas, said conductive areas adapted to emit electrons under electron bombardment, means con-

nected to said conductive areas for maintaining said conductive areas at a potential positive relative to cathode potential during tube operation, a decelerating electrode between said electron gun and said target electrode for reducing the velocity of the electron beam striking the target electrode, and a collector electrode opposite said target electrode for collecting secondary electrons from said target.

2. A signal generating device comprising an electron gun including a cathode electrode for producing an electron beam along a path, an imperforate target electrode positioned transversely to said beam path, means for scanning said electron beam over a surface of said target, said target electrode including a conductive film on said surface thereof, and spaced photosensitized particles of insulating material on said conductive film, said conductive film adapted to emit secondary electrons under electron bombardment, and a collector electrode opposite said target electrode for collecting secondary electrons from said target.

3. A signal generating device comprising an electron gun including a cathode electrode for producing an electron beam along a path, an imperforate target electrode positioned transversely to said beam path, means for scanning said electron beam over a surface of said target, said target electrode including a transparent support and a transparent conductive film on a surface of said support, spaced transparent particles of insulating material on said conductive film, said insulator particles being photosensitive, means for scanning said electron beam over said conductive film, said conductive film adapted to emit secondary electrons under electron bombardment, and means responsive to the secondary emission from said conductive film for producing a signal.

4. A target electrode for an electron discharge device, said electrode comprising an imperforate support plate having a conductive surface, photoemissive particles of insulating material spaced on said conductive target surface, the exposed portions of said conductive target surface having a secondary electron emission characteristic under electron bombardment.

5. A target electrode for a signal generating device, said electrode comprising an imperforate transparent support plate, a transparent conductive film on one surface of said support plate, photoemissive particles of insulating material spaced on the surface of said conductive film, the exposed surface of said conductive film having a secondary electron emission characteristic under electron bombardment.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,135,149	Rutherford	Nov. 1, 1938
2,156,435	Schroter et al.	May 2, 1939
2,190,695	Bruining et al.	Feb. 20, 1940
2,199,438	Lubszynski	May 7, 1940
2,238,381	Batchelor	Apr. 15, 1941
2,291,577	Farnsworth	July 28, 1942
2,415,842	Oliver	Feb. 18, 1947
2,423,124	Teal	July 1, 1947