

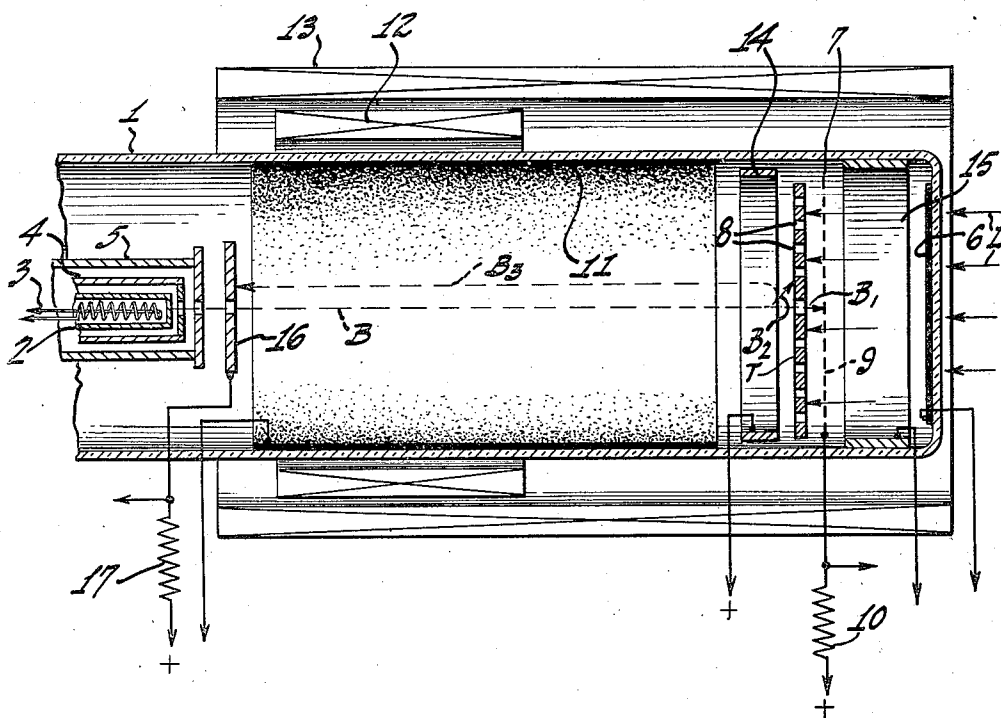
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TELEVISION PICKUP TUBE

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TELEVISION PICKUP TUBE

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2 Claims. (Cl. 250—164)

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This invention relates to television cathode ray beam pick-up tubes and particularly to the type having a perforated target of insulation with the charge image on the side opposite the gun and next to the so-called signal screen electrode.

Electrons of the beam pass through the perforations to the signal screen in proportion to the charge image. Thus, the charged target acts as a grid in controlling the passage of the beam electrons to the signal screen and the tube has very great sensitivity. The image is discharged by the attraction of part of the electrons to the rear charged surface, but it is only partially discharged. This can be readily demonstrated by scanning the beam through the target to the signal screen with the imaging light shut off after it has produced a charge image on the target. It will be found that the tube, nevertheless, will continue to send strong signals for several seconds as the beam is scanned thereover. Due to this defect, the tube has not gone into use in spite of its high sensitivity.

It is an object of this invention to provide a perforated target in which the beam is substantially fully discharged in one scansion of the beam.

Another object of the invention is to provide a perforated target of semi-conducting material giving full sensitivity by grid action, with discharge of the target by the passage of a sufficient number of the beam electrons directly through the semi-conducting material to the charges of the image on the other side.

Other objects of the invention will appear in the following description, reference being had to the drawing, in which the single figure of the drawing is a partial axial section of a tube employing my invention.

In my application filed September 20, 1940, Serial No. 357,543, now abandoned, I have disclosed a thin two-sided target film of glass that is sufficiently conducting to permit passage of electrons therethrough to the charge image on the other side for discharge thereof in one frame scansion, but sufficiently non-conducting to prevent spreading of the charge image over the target surface during a frame scansion. Reference is made to that application and to my continuing application filed November 28, 1945, Serial No. 631,441, for a full disclosure of this target and its action.

In the present invention the film target of glass is perforated to permit passage of the beam electrons to the signal screen under control of the charge image and thus to increase the sensitivity

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of the tube. Referring to the drawing, the evacuated envelope 1 contains a cathode ray beam gun having a cathode 2 and heater 3, with a surrounding perforated grid 4, around which is the perforated first anode 5. At the other end of the tube is a photocathode 6 adapted to emit photoelectrons in proportion to the light imaged thereon. Spaced from the photocathode is my improved target of semi-conducting material having sufficient perforations 8 to have the desired grid action in controlling the passage of the beam electrons to the signal screen 9. This screen may be connected to the output resistance 10, to which the first stage of the amplifier (not shown) may be connected.

The usual wall coating anode 11 may be placed on the inside of the envelope 1 between the target and the first anode. Deflecting unit 12 is placed outside the envelope. This may have the usual coils producing fields at right angles to each other and to the axial focusing field produced by coil 13. Adjacent the gun side of the target is placed the decelerating ring electrode 14 having a suitable potential. On the other side of the target is the electrode 15 for accelerating the photoelectrons from photocathode 6 to the target.

The tube shown is of the image orthicon type and part of the beam electrons return toward the first anode, on which they may impinge to bombard secondary electrons for passage into a multiplier around the first anode, as in the application of Paul K. Weimer, filed September 16, 1944, Serial No. 554,494, now U. S. Patent 2,433,941, issued January 6, 1948, but for simplification I have shown a signal electrode 16 through which the outgoing beam B passes, while the return beam impinges outside the perforation. Since the return beam is also modulated oppositely to the beam electrons B₁ passing through the perforations or the beam electrons B₂ landing on the target, the signal may be taken off the resistance 17, as will be understood.

The operation is, briefly, as follows:

The light L, producing an image on the photocathode 6, causes it to emit photoelectrons proportional thereto from the elemental areas and these are focused by the magnetic field of coil 13 on the rear surface of target T, being accelerated thereto by the anode 15. Secondary electrons are bombarded from the target surface and these are collected by screen 9. Due to the high resistance of the glass film 7, the charge does not spread over the surface during a frame scansion time.

As the beam B is scanned over the target, it

is first accelerated and then decelerated to about zero velocity at the target, as it has approximately the potential of the cathode 2. Part of beam electrons B₁ pass through the perforations 8 to the signal screen 9. Due to the grid action of the charged perforated target, the number of beam electrons B₁ of each perforation is proportional to the image charge therearound. Part of the beam electrons B₂ land on the target. These also are proportional to the image charge opposite the landing area and the beam electrons B₃ unable to land return toward the first anode and are collected by electrode 16, being also modulated by the charge image.

The charge image on the rear face of the target 7 is discharged by electrons B₂, which pass through the semi-conducting target 7 to the rear surface, as explained in my said two applications. This discharge is substantially complete and no charge remains when the beam B₂ arrives at the elemental area in the next scansion. This discharge action does not seriously affect the grid action of the charged target, so that the signal taken off the resistance 10 is fully modulated and the high sensitivity is retained.

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 television cathode ray beam pick-up tube comprising a gun, a perforated target of semi-conducting material, a signal screen electrode adjacent one side of said target, a photocathode, an anode for producing a charge image on the side

of the target adjacent the screen from photoelectrons emitted by said photocathode, field producing means for scanning a cathode ray beam over the other side of the target with part of the beam electrons passing through the perforations to the screen electrode and part landing on the front elemental areas of the target in sufficient quantity to discharge the image charge on the opposite elemental areas by passage through the target within a frame time.

2. A television cathode ray beam pick-up tube comprising a gun, a perforated target of semi-conducting material, a signal screen electrode adjacent one side of said target, a photocathode, an anode for producing a charge image on the side of the target adjacent the screen from photoelectrons emitted by said photocathode, field producing means for scanning a cathode ray beam over the other side of the target with part of the beam electrons passing through the perforations to the screen electrode and part landing on the front elemental areas of the target in sufficient quantity to discharge the image charge on the opposite elemental areas by passage through the target within a frame time, and an anode for causing the remaining part of the beam electrons to return toward said gun.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
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