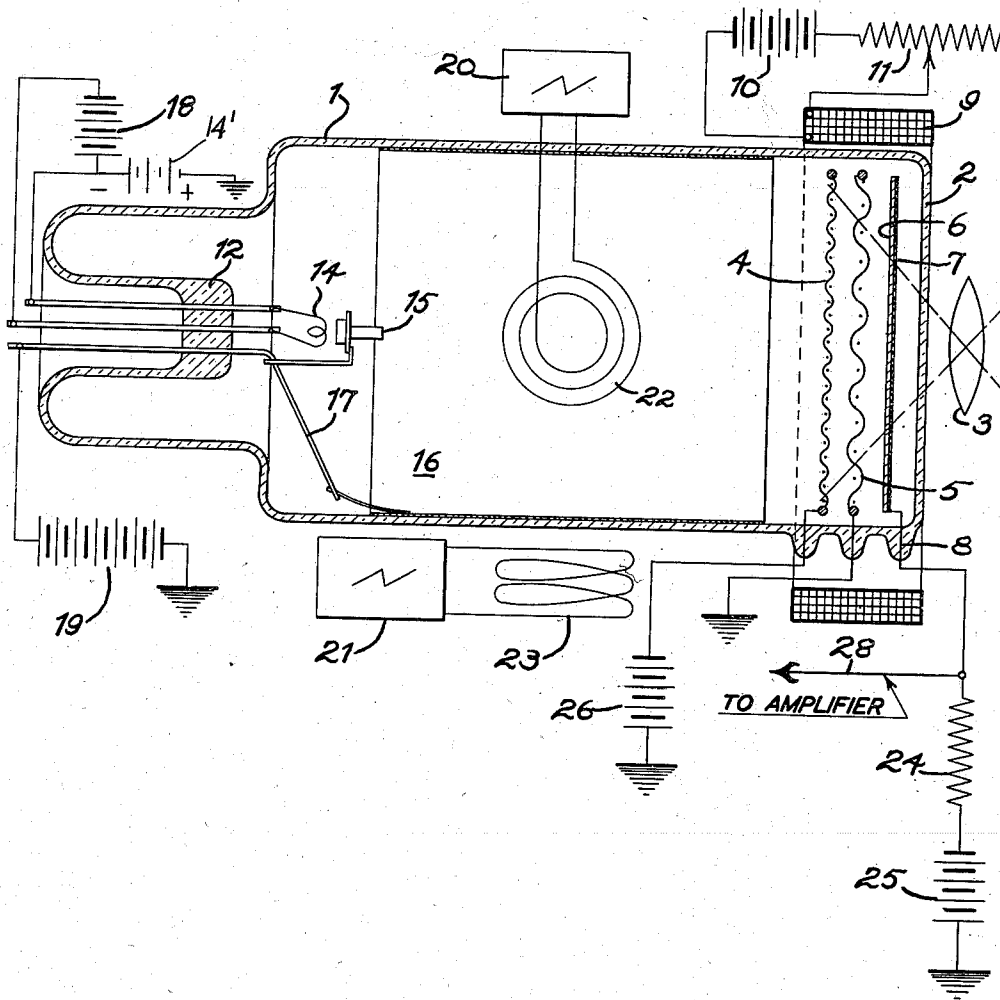


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BEAM SCANNING DISSECTOR

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BEAM SCANNING DISSECTOR

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5 Claims. (Cl. 178-7.2)

This invention relates to systems of electrical picture transmission such as television, phototelegraphy and the like, and particularly to systems wherein the picture field is scanned in order to dissect it into elementary units.

This application is a continuation in part of my prior application, Serial No. 30,116, filed July 6, 1935.

One of the principal objects of the present invention is to provide a television transmitter or pickup device having high sensitivity, which is relatively simple to construct and free from inherent distortions, and which has the advantages of the "electron storage" systems of scanning the object to be pictured, but without the disadvantages of those types of scanning device which utilize photoelectric surfaces formed from isolated droplets or mosaics of emissive material.

My invention possesses numerous other objects and features of advantage, some of which, together with the foregoing, will be set forth in the following description of specific apparatus embodying and utilizing my novel method. It is therefore to be understood that my method is applicable to other apparatus, and that I do not limit myself, in any way, to the apparatus of the present application, as I may adopt various other apparatus embodiments, utilizing the method, within the scope of the appended claims.

According to my invention, I form a current image of the picture to be transmitted and direct this against a suitable target, to form thereon a charge pattern which is then scanned by a cathode ray beam to release the charges on elementary areas of the target and so produce a television signal.

The invention also consists in apparatus for carrying out the above method and details and arrangements in connection therewith, as will be apparent from the description given hereafter.

The drawing is an axial sectional view of a tube embodying a preferred form of the apparatus of my invention, the auxiliary circuits, connections and apparatus therefor being shown schematically.

Carrying my invention into effect in one convenient manner, I provide an evacuated envelope 1, usually of glass, one end of which is provided with a window 2, through which an image of the object to be analyzed is projected by means of lens system 3, and this image is focussed on a photoelectric apertured screen 4. This apertured screen may well be made of silver wire which is, during the course of processing, oxidized and sensitized with various photoelectric

materials, preferably caesium. Between the photoelectric screen 4 and the window 2, I prefer to locate two additional and parallel electrodes, a collecting screen 5, and a charge storage electrode 6. The collecting screen may be of relatively large mesh as compared to the mesh of the photoelectric screen 4. The charge storage electrode 6 is preferably formed of a thin sheet of mica or other thin dielectric, such as glass or quartz. This electrode is backed on the side facing the window 2 with a transparent or semi-transparent coating 7 of a conductor, and contact is made thereto so that an exterior lead 8 may be used to place a charge thereon. This coating may be a thin, sputtered coating of silver platinum, nickel, etc., as is well known in the art. The three electrodes, photoelectric screen 4, collecting screen 5, and charge storage electrode 6, are placed relatively close together, and are surrounded on the outside of the envelope 1 by a focusing coil 9, energized by a focusing source 10 under the control of the resistor 11. At the opposite end of the tube I prefer to mount an electrode gun on a re-entrant stem 12, this gun comprising an electron emitting cathode 14 held at a negative potential to ground by source 14', and an apertured anode 15, the two cooperating to produce, when energized, an electron beam of small cross-section. I also prefer to provide a metalized coating 16 on the wall of the tube between the gun anode and a point adjacent the photoelectric screen 4, this coating being connected to the anode 15 through a link 17.

Exteriorly of the tube a cathode source 18 is utilized to heat cathode 14, and a gun anode source 19 is connected to the anode 15 and film 16. Scanning oscillators 20 and 21, preferably giving a saw tooth wave form, energize magnetic scanning coils 22 and 23, positioned so that their fields will cause the beam emitted from gun anode 15 to scan successive elementary areas of a picture area on charge storage electrode 6, passing through the intermediate screens. The transparent coating 7 on charge storage electrode 6 is connected through an output resistor 24 to ground through an output battery 25, the negative end of which is connected to the resistor. Collecting electrode 5 is grounded, whereas the photoelectric cathode 4 is connected to ground through a photo source 26, the negative end of which is connected to the photoelectric screen.

It will be obvious that other connections will serve the purpose, the main object being to maintain the collecting screen 5 more positive than

either of the adjacent electrodes whereby it may act as an accelerating electrode, and to have the output resistor 24 in a position where it can register differences of potential between the translucent film 7 and accelerating electrode collecting screen 5.

In operation, the image of the object to be analyzed is focussed on photoelectric screen 4 and low velocity electrons are emitted therefrom. These electrons constitute an electron image which is accelerated toward charge storage electrode 6 by the action of the accelerating electrode 5, and as a result of the low velocity electron image striking the insulating surface of the charge storage electrode, there is deposited thereon a corresponding charge pattern; and the displacement current through the translucent film on this electrode, due to the accumulation of this charge, causes a constant current component to flow through the resistor 24, from which an output lead 28 may be connected to an amplifier in accordance with the usual practice. Simultaneously with the foregoing action, the electron gun, energized, for example, with a 4000 volt anode potential, directs a beam of high velocity electrons through photoelectric screen 4 and through collecting screen 5, to finally land against the surface of the charge storage electrode 6, on which is already deposited the charge image. The point of impact of this beam emits secondary electrons and thus swings positive to a definite equilibrium value. The secondary electrons emitted are collected on the collecting screen 5, which is more positive, as stated above, than the other two associated electrodes.

As the beam from the gun is scanned over the charge image, each successive area of the charge image is thus brought to its positive equilibrium value of potential. This destroys the image character of the aggregate charges on the surface of the charge storage electrode, successively releasing the positive charges on the translucent film bound by the negative charges on the insulating surface, and causing a pulsating current through the resistor in the opposite direction to the constant component due to the accumulation of these charges. The charge on each elementary area of the charge storage electrode at the instant before it is scanned is proportional to the product of intensity of the light on the corresponding element of the cathode and the time which has elapsed since it was last scanned, and, since the intervals between scans are uniform, it follows that the charge released from each element of the charge storage electrode when scanned is directly proportional to the illumination of an elementary area of the picture to be transmitted, and hence the voltages appearing across output resistor 24 will constitute an analysis or, if desired, a television signal which may be amplified and transmitted in the usual manner.

I claim:

1. A beam scanning dissector comprising an envelope containing a planar apertured photoelectric member, a thin transparent screen of insulating material positioned parallel to said member on one side thereof, a thin translucent and conducting coating on the face of said screen away from said member, means for projecting an optical image through said coating and screen onto said member to cause electronic emission therefrom, means for directing said electrons against the uncoated face of said member to form a charge image thereon, a cathode and

anode cooperating to project an electron beam of elementary cross-section through said member to impact the uncoated face of said screen carrying said charge image, said beam containing electrons of sufficient velocity to create secondary electrons upon impact with said screen whereby said charge image is neutralized, and means connected to said coating for utilizing changes in the charge on said uncoated face.

2. A beam scanning dissector comprising an envelope containing a planar apertured photoelectric member, a thin transparent screen of insulating material positioned parallel to said member on one side thereof, a thin translucent and conducting coating on the face of said screen away from said member, means for projecting an optical image through said coating and screen onto said member to cause electronic emission therefrom, means for directing said electrons against the uncoated face of said member to form a charge image thereon, a cathode and anode cooperating to project an electron beam of elementary cross-section through said member to impact the uncoated face of said screen carrying said charge image, said beam containing electrons of sufficient velocity to create secondary electrons upon impact with said screen, an open mesh electrode between said screen and said member, and an output circuit connected between said coating and said electrode.

3. A beam scanning dissector comprising an envelope containing a planar apertured photoelectric member, a thin transparent screen of insulating material positioned parallel to said member on one side thereof, a thin translucent and conducting coating on the face of said screen away from said member, means for projecting an optical image through said coating and screen onto said member to cause electronic emission therefrom, means for directing said electrons against the uncoated face of said member to form a charge image thereon, a cathode and anode cooperating to project an electron beam of elementary cross-section through said member to impact the uncoated face of said screen carrying said charge image, said beam containing electrons of sufficient velocity to create secondary electrons upon impact with said screen whereby said charge image is neutralized, means connected to said coating for utilizing changes in the charge on said uncoated face, and means for collecting emitted secondaries.

4. A beam scanning dissector comprising an envelope containing a planar apertured photoelectric member, a thin transparent screen of insulating material positioned parallel to said member on one side thereof, a thin translucent and conducting coating on the face of said screen away from said member, means for projecting an optical image through said coating and screen onto said member to cause electronic emission therefrom, means for directing said electrons against the uncoated face of said member to form a charge image thereon, a cathode and anode cooperating to project an electron beam of elementary cross-section through said member to impact the uncoated face of said screen carrying said charge image, said beam containing electrons of sufficient velocity to create secondary electrons upon impact with said screen whereby said charge image is neutralized, means connected to said coating for utilizing changes in the charge on said uncoated face, and means for directing said beam over successive elemental areas of the charge image on said screen.

5. A beam scanning dissector comprising an envelope having therein a planar apertured photoelectric member, a thin transparent screen of insulating material positioned parallel to said member on one side thereof, a thin translucent conductive coating on the face of said screen away from said member, means for projecting an optical image through said coating and screen onto said member to cause electronic emission therefrom, means for directing said electrons against the uncoated face of said member to form a charge image thereon, an electron gun arranged when energized to project a cathode

ray beam of elementary cross-section through said member to impact the uncoated face of said screen carrying said charge image, said beam having sufficient velocity to create secondary electrons upon impact with said screen in number sufficient to neutralize said charge image, means connected to said coating for utilizing changes in the charge on said uncoated face, and means for directing said beam over successive elemental areas of the charge image on said 5 screen. 10

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