

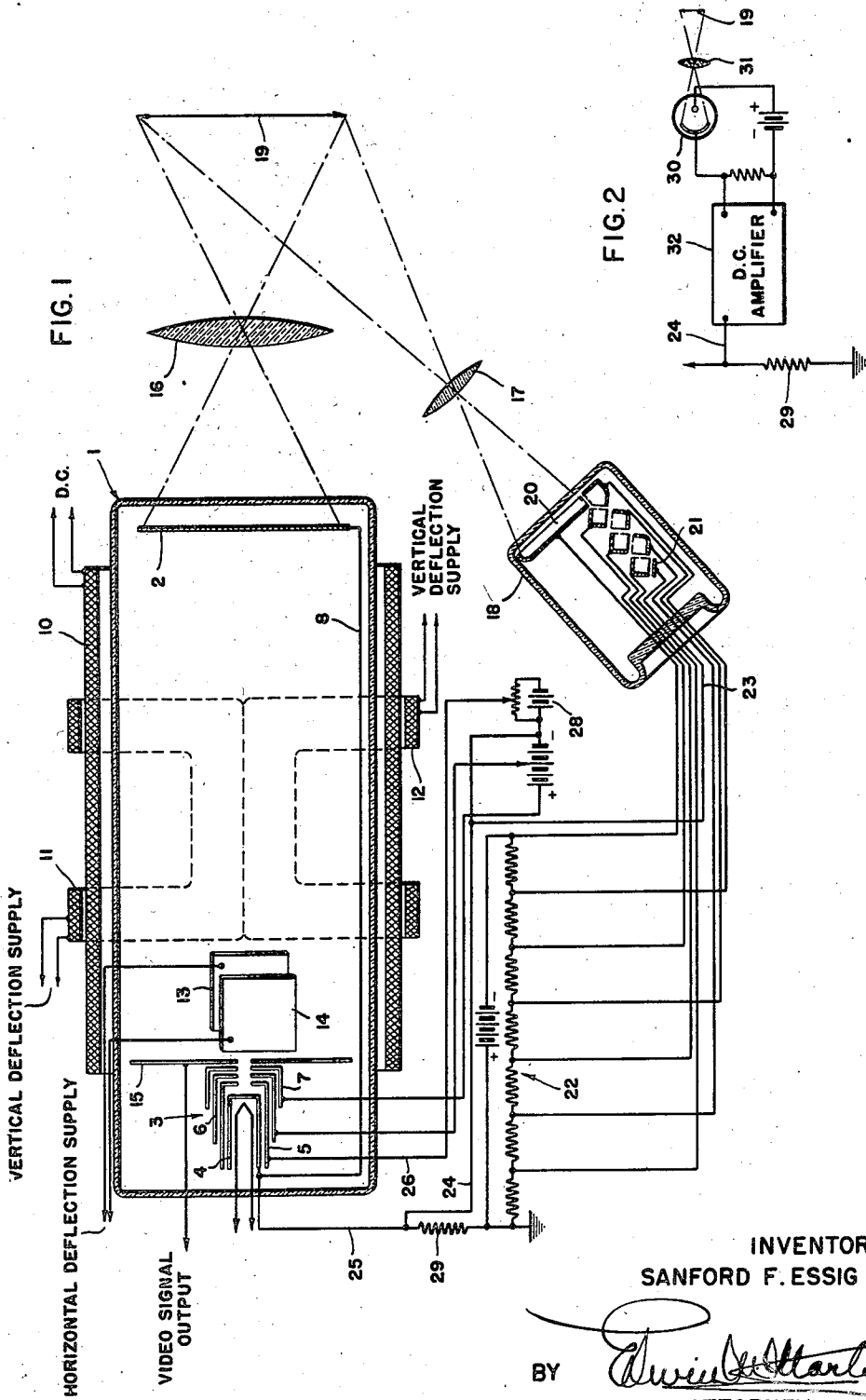
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TELEVISION CONTROL SYSTEM

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TELEVISION CONTROL SYSTEM

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This invention relates to a control system for television transmitters, and particularly to automatic control means for a low velocity electron scanning beam as used in certain type television transmitter tubes.

Television transmitter tubes of the low velocity electron beam scanning type are well known in the art. They have inherently a 100% storage efficiency of the light impinging upon the photosensitive mosaic electrode. This type of transmitter tube, which is sometimes referred to as an "orthicon," utilizes a low velocity electron beam for scanning the photosensitive mosaic screen in order to prevent emission of secondary electrons from the mosaic electrode in contradistinction to certain types of high velocity electron scanning beam transmitter tubes sometimes referred to as iconoscopes. However, the low velocity type tube has a serious drawback. Light impinging upon the photosensitive islands of the mosaic screen produces photoelectric electrons in direct proportion to the amount of light. The emission of the photoelectrons depletes the amount of electrons of the island and hence gives a positive charge to the island. The low velocity scanning beam serves for neutralizing the positive electric charges of each island or for giving it a desired normal electric potential. When the mosaic screen is flooded with light, the electrons supplied to an individual island from the electron scanning beam will normally not be sufficient to restore the electric charges to the photosensitive island and to bring the mosaic potential back to normal. The effect is that the orthicon becomes paralyzed, and it may take several scans to restore the electron deficiency to the photosensitive islands of the screen. This has been a serious drawback for the commercial utilization of the low velocity electron scanning beam transmitter type tubes.

It is an object of the present invention, therefore, to provide a scanning beam control system for a television transmitter tube of the low velocity scanning beam type to prevent paralysis of the television transmitter tube when the intensity of the light increases above a normal level.

In accordance with the present invention, there is provided automatic means for controlling the intensity of the low velocity electron scanning beam of a low velocity electron beam type of television transmitter tube. The intensity of the electron scanning beam is varied directly in proportion to the average amount of light projected from the scene or object to be transmitted on the transmitter tube. In this manner, paralysis

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of the transmitter tube is prevented because the number of electrons of the scanning beam will automatically be kept equal to or larger than the largest number of photoelectrons freed from any of the photosensitive islands due to the action of the light falling thereon. Preferably a photoelectric cell is used which receives light from the scene or object to be transmitted. This photoelectric cell, in turn, is used for modifying the normally negative biasing potential applied to the electron scanning beam for controlling the intensity thereof. The photoelectric current derived from the photoelectric cell may be amplified and the amplified current be used for controlling the biasing potential applied to the electron scanning beam. Alternatively, a photocell multiplier may be used instead of the photoelectric cell and amplifier arrangement.

For a better understanding of the invention, together with other and further objects thereof, reference is made to the following description, taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

In the accompanying drawing,

Fig. 1 is a schematic diagram, certain parts being shown in section, of a television picture transmitting device employing the present invention.

Fig. 2 is a schematic circuit diagram of a modified control means for the electron scanning beam of an orthicon in accordance with the invention.

Referring now more particularly to Fig. 1, there is provided a television transmitter tube including an evacuated envelope 1. Envelope 1 encloses at one end a photosensitive mosaic electrode 2. Electron gun structure 3 is arranged in envelope 1 opposite photosensitive mosaic electrode 2. Electron gun structure 3 is designed for producing a low velocity electron scanning beam and directing it towards photosensitive electrode 2. To this end, electron gun 3 includes cathode 4 from which electrons may be drawn. Control electrode 5 is spaced from cathode 4 and connected to the usual biasing battery as shown in the drawing. First anode 6 is maintained positive with respect to cathode 4 and second anode 7 is maintained more positive than first anode 6. Photosensitive mosaic electrode 2 and cathode 4 are connected by lead 8 to maintain them at the same electric potential. Hence the electron scanning beam generated by electron gun 3 will impinge upon photosensitive mosaic electrode 2 with practically zero velocity.

Magnetic coil 10 is supplied from a direct cur-

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rent source as indicated in the drawing and serves for producing an axial magnetic field in order to focus the scanning beam generated by electron gun 3. Two magnetic coils 11 and 12 are arranged opposite each other and surround envelope 1 to generate a transverse magnetic field. Coils 11 and 12 are fed from a vertical deflection supply for imparting the vertical deflection to the electron scanning beam. Horizontal deflection of the electron scanning beam is obtained by curved deflection plates 13 and 14 which are connected with a horizontal deflection supply, as is conventional for an orthicon.

Collecting electrode 15 is kept at a positive potential for collecting the electrons which have been reflected from photosensitive electrode 2 and returned by the electric and magnetic fields maintained in envelope 1. These returned electrons are picture signals representative of the scene to be transmitted. Collecting electrode 15 is connected with the video signal output which may then be amplified and transmitted for picture reproduction.

The scene or object to be transmitted has been diagrammatically indicated by arrow 19 and is projected by lens system 16 on photosensitive mosaic electrode 2. Mosaic electrode 2 is transparent as is well understood in the art, and carries a great number of electrically insulated photosensitive islands. According to the amount of light impinging on each of the islands a photoelectric current is produced which gives a positive charge to each island representative of the picture to be transmitted. The low velocity electron beam produced by electron gun 3 serves for neutralizing these positive charges or for giving each island a normal electric potential. The electrons returned from mosaic screen 2 are representative of the brightness values of the picture to be transmitted, and are then collected by collecting electrode 15.

In accordance with the invention, the average light of scene or object 19 is projected by lens system 17 on photocell multiplier 18. Photocell multiplier 18 includes photosensitive member 20 which converts light values into electron streams. The thus produced electrons are collected and multiplied in a number of multiplier stages in a conventional manner, and the multiplier electron stream is collected by collector plate 21. The biasing potentials for the various stages of the electron multiplier are obtained from potential divider 22 and the battery connected thereto. Collector plate 21 is connected by lead 23 with lead 24 which, in turn, is connected through lead 25 with electron gun cathode 4. Lead 26, connected with battery 28, serves for normally maintaining control electrode 5 at a negative potential with respect to electron gun cathode 4.

When the average amount of light received by photocell multiplier 18 exceeds a predetermined level, the multiplied photoelectric current collected by collector plate 21 effects a voltage drop across resistor 29 and thereby reduces the negative biasing potential between electron gun cathode 4 and control electrode 5. This, in turn, increases the intensity of the electron scanning beam issuing from electron gun 3 in direct proportion to the average amount of light collected by lens system 17 from scene 19 and projected on photocell multiplier 18. Hence, it will be seen that an automatic control of the intensity of the electron scanning beam is obtained by means of photocell multiplier 18.

In accordance with the present invention, photo-

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tocell multiplier 18 may be replaced by a photoelectric cell connected to a direct current amplifier. Such an arrangement has been shown in Fig. 2. Photocell 30 receives its light from scene 19 through lens system 31. The output of photoelectric cell 30 is connected in a conventional manner with a direct current amplifier schematically indicated at 32. The output of amplifier 32 is connected with lead 24 and thence through lead 25 with cathode 4 as illustrated in Fig. 1. This embodiment of the invention will operate in the same manner as the photocell multiplier described hereinbefore provided the connections are chosen so that an increase of light will increase the intensity of the electron beam.

While there has been described what is at present considered the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A television transmitter comprising a photosensitive electrode, an electron gun for directing a low velocity beam of electrons towards said electrode, means for projecting an optical image of a scene to be transmitted on said electrode to establish discrete positive charges thereon corresponding to said optical image, means for focusing said electron beam and for directing it over predetermined paths between said electron gun and said electrode, means for utilizing the effect of said electron beam on said electrode to develop picture signals, and automatic means for varying the intensity of said electron beam in direct relation to the average amount of light projected on said electrode.

2. A television transmitter comprising a photosensitive electrode, an electron gun including a cathode and an anode for directing a low velocity beam of electrons toward said electrode, means for projecting an optical image of a scene to be transmitted on said electrode to establish discrete positive charges thereon corresponding to said optical image, means for focusing said electron beam and for directing it over predetermined paths between said electron gun and said electrode, means for utilizing the effect of said electron beam on said electrode to develop picture signals, automatic means for varying the intensity of said electron beam in direct relation to the average amount of light projected on said electrode including a photosensitive device, and means for projecting light from said scene on said photosensitive device.

3. A television transmitter comprising a photosensitive mosaic electrode, an electron gun including a cathode and control member for directing a low velocity beam of electrons towards said mosaic electrode, means for normally maintaining a predetermined negative biasing potential between said electron gun cathode and said electron gun control member, means for projecting an optical image of a scene to be transmitted on said mosaic electrode to establish discrete positive charges thereon corresponding to said optical image, means for focusing said electron beam and for directing it over predetermined paths between said electron gun and said mosaic electrode, means for utilizing the effect of said electron beam on said electrode to develop picture signals, and automatic means for varying the intensity of said

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electron beam in direct relation to the amount of light projected on said mosaic electrode including a photosensitive device, means for projecting light from said scene on said photosensitive device, and means operatively connected with said photosensitive device for decreasing said biasing potential directly proportional to the amount of light projected on said photosensitive device from said scene.

4. A television transmitter comprising a photosensitive mosaic electrode, an electron gun including a cathode and control member for directing a low velocity beam of electrons towards said mosaic electrode, means for normally maintaining a predetermined negative biasing potential between said electron gun cathode and said electron gun control member, means for projecting an optical image of a scene to be transmitted on said mosaic electrode to establish discrete positive charges thereon corresponding to said optical image, means for focusing said electron beam and for directing it over predetermined paths between said electron gun and said mosaic electrode, means for collecting electrons of said beam not reaching said mosaic electrode, automatic means for varying the intensity of said electron beam in direct relation to the amount of light projected on said mosaic electrode including a photoelectric cell, means for projecting light from said scene on said photoelectric cell, and a direct current amplifier connected with said photoelectric cell for decreasing said biasing potential in direct relation to the amount of light projected into said photoelectric cell from said scene.

5. A television transmitter comprising a photosensitive mosaic electrode, an electron gun including a cathode and control member for directing a low velocity beam of electrons towards said mosaic electrode, means for normally maintaining a predetermined negative biasing potential between said electron gun cathode and said electron gun control member, means for projecting an optical image of a scene to be transmitted on

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said mosaic electrode to establish discrete positive charges thereon corresponding to said optical image, means for focusing said electron beam and for directing it over predetermined paths between said electron gun and said mosaic electrode, means for collecting electrons of said beam not reaching said mosaic electrode, automatic means for varying the intensity of said electron beam in direct relation to the amount of light projected on said mosaic electrode including a photocell multiplier, and means for projecting light from said scene on said photocell multiplier, said photocell multiplier being operatively connected with said electron gun cathode for decreasing said biasing potential in direct relation to the amount of light projected on said photocell multiplier from said scene.

6. The method of transmitting a television picture which comprises developing an electric charge image representative of a scene to be transmitted, producing a low velocity beam of electrons and directing it over predetermined paths to scan said electric charge image, utilizing the effect of said electron beam on said electric charge image to develop picture signals representative of the scene to be transmitted, and varying the intensity of said electron beam in direct relation to the average amount of light of said scene.

7. The method of transmitting a television picture which comprises developing an electric charge image representative of a scene to be transmitted, producing a low velocity beam of electrons, directing said electron beam over predetermined paths to scan said electric charge image, utilizing the effect of said electron beam on said electric charge image to develop picture signals representative of said scene, deriving a signal representative of the average brightness of said scene, and utilizing said signal to vary the intensity of said electron beam in direct relation to said average brightness.

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