

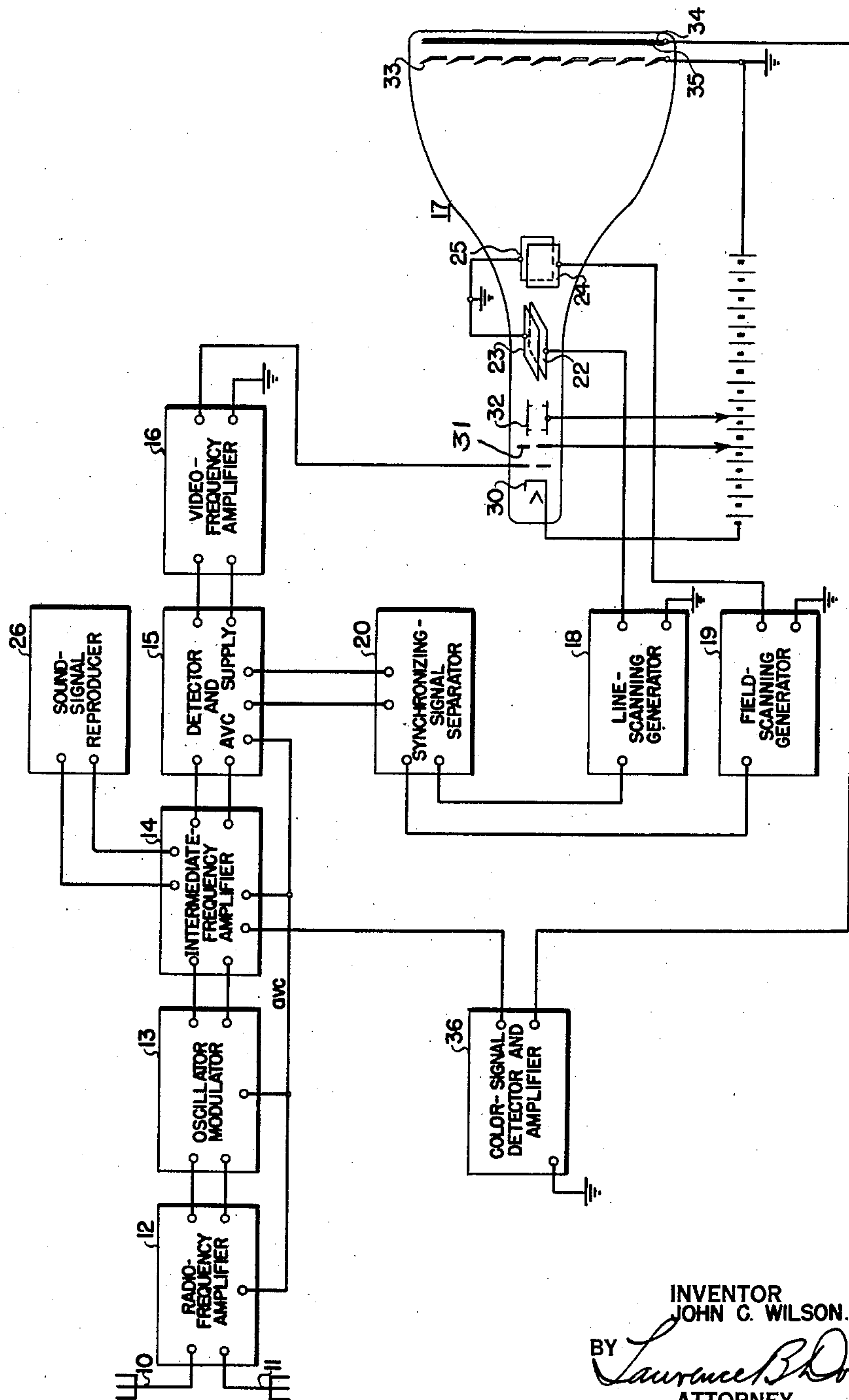
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COLOR-TELEVISION SIGNAL-TRANSLATING STAGE

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This invention relates to color-television signal-translating stages and, particularly, to such stages of the type including a cathode-ray tube having an electrode adapted to be scanned by electrons of variable velocity.

In some television signal-translating systems it is desirable to scan an electrode of a cathode-ray tube with a beam of electrons of controllable velocity. Hitherto, it has not been possible to secure a satisfactory scan under such conditions for the reason that the deflection of the cathode-ray beam of such tube by the scanning field is dependent upon the velocity of the electrons in the beam. Thus, in general, if an electrode in a cathode-ray tube is being scanned and the voltage of an accelerating electrode is changed to vary the velocity of the electron beam, the area of the electrode which is scanned simultaneously changes due to the different effect of the scanning field on the electron beam of different velocity. Specifically, if the voltage of the electron-scanning beam is raised and the beam velocity is thereby increased, the deflection caused by a given scanning field is decreased, resulting in a scanned raster of decreased size on the scanned electrode, and vice versa.

It is an object of the present invention, therefore, to provide an improved color-television signal-translating stage of the general type under consideration which is not subject to one or more of the above-mentioned disadvantages of arrangements of the prior art.

It is another object of the invention to provide an arrangement for use as a color-television signal-translating stage which is effective to scan an electrode in a cathode-ray tube with an electron beam of variable velocity and in such manner that the scanning deflection of the electron beam is independent of the velocity of the electrons incident on the electrode scanned.

It is still another object of the invention to provide an improved color television signal-reproducing system.

In accordance with the invention, a color-television signal-translating stage comprises a cathode-ray tube, an electron gun structure in the tube for forming and accelerating an electron beam, a first scanned electrode, and means for applying a substantially constant voltage to the first electrode and for producing low-velocity electrons in the vicinity of the first electrode. The stage also comprises means for developing a deflecting field for the beam between the electron gun structure and the first electrode to scan the first electrode with the beam, a second scanned

electrode adapted to fluoresce with a color dependent upon the velocity of the electrons incident thereon and effectively screened from the electron gun structure by the first electrode, and means for applying a variable voltage to the second electrode to accelerate the low-velocity electrons to the second electrode and control their velocity at the second electrode. By this arrangement, the second electrode is scanned by electrons of variable velocity to produce a color image of the translated signal and the scanning deflection at the second electrode is independent of the velocity of the electrons incident thereon.

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

The single figure of the drawing is a circuit diagram, partly schematic, of a complete television signal receiver of the superheterodyne type embodying a television signal-translating stage in accordance with the present invention.

Referring now more particularly to the drawing, the system illustrated comprises a color television signal receiver of the superheterodyne type including an antenna system 10, 11 connected to a radio-frequency amplifier 12 of one or more stages, to which is connected in cascade, in the order named, an oscillator-modulator 13, an intermediate-frequency amplifier 14 of one or more stages, a detector and A. V. C. supply 15, a video-frequency amplifier 16 of one or more stages, and an image-reproducing device 17. A line-scanning generator 18 and a field-scanning generator 19 are coupled to an output circuit of detector 15 through a synchronizing-signal separator 20 and have output circuits coupled, respectively, to line-scanning plates 22, 23 and field-scanning plates 24, 25 of cathode-ray signal-reproducing device 17. A unidirectional voltage is derived from detector and A. V. C. supply 15 and applied to one or more of the tubes of radio-frequency amplifier 12, oscillator-modulator 13, and intermediate-frequency amplifier 14 to control the amplification of the signal-translating channel of the receiver and thereby maintain the signal input to detector 15 within a relatively narrow amplitude range for a wide range of received signal intensities. A sound-signal reproducer 26 is coupled to an output circuit of intermediate-frequency amplifier 14 for translating and reproducing sound signals accompanying the received television program. The stages or units 10-16, inclusive, 18-20, inclu-

sive, and 26 may all be of conventional well-known construction so that detailed illustration and description thereof are unnecessary herein.

Referring briefly, however, to the operation of the system described above, television signals intercepted by antenna circuit 10, 11 are selected and amplified in radio-frequency amplifier 12 and applied to the oscillator-modulator 13 wherein they are converted into intermediate-frequency signals which, in turn, are selectively amplified in intermediate-frequency amplifier 14 and delivered to detector 15. The modulation components of the signal are derived by detector 15 and are supplied to video-frequency amplifier 16 wherein they are amplified and from which they are supplied in the usual manner to a brilliancy-control electrode of image-reproducing device 17. Synchronizing components derived in detector 15 are separated from the video-frequency component of the signal in synchronizing-signal separator 20 and applied to synchronizing control elements of generators 18 and 19. The intensity of the scanning ray of device 17 is thus modulated or controlled in accordance with the video-frequency voltages impressed on the control electrode in the usual manner. Scanning potentials are generated in line-scanning and field-scanning generators 18 and 19, which are controlled by synchronizing-voltage pulses derived from separator 20, and applied to the scanning plates of image-reproducing device 17 to produce electric scanning fields, thereby to deflect the scanning ray in two directions normal to each other so as to trace a rectilinear scanning pattern and thereby reconstruct the reproduced image. The unidirectional control potential, derived from unit 15 and applied to one or more tubes of the preceding stages, serves to maintain the amplitude of the signal input to detector 15 within a relatively narrow range for a wide range of received signal amplitudes. Sound signals accompanying the received television program are reproduced in sound-signal reproducer 26 in a conventional manner.

Referring now more particularly to the portion of the system embodying the invention, the color signal-translating stage comprising cathode-ray tube 17 includes an electron gun structure for forming an electron beam. This electron gun structure includes cathode 30 and first and second accelerating anodes 31 and 32. The cathode-ray tube 17 also comprises a first scanned electrode 33 and means for applying a substantially constant voltage thereto further to accelerate the electrons of the beam. The term "constant voltage" is intended to refer to a voltage which is constant with reference to cathode 30. First electrode 33 is constructed of secondary-emissive material and the low-velocity electrons are produced in the vicinity thereof when the high-voltage scanning beam of cathode-ray tube 17 becomes incident thereon. First scanned electrode 33 comprises a plurality of elementary upset tabs or projections thereon which are effective to block the direct path of electrons from cathode 30 through elementary apertures thereof. An electrode of this general description is described in United States Patent No. 2,280,191, granted on April 21, 1942, to Rudolf C. Hergenrother, filed September 30, 1939. Deflecting plates 22, 23 and 24, 25 provide means for developing a deflecting field for the beam between the electron gun structure 30, 31, 32 and the first scanned electrode 33 to

scan the beam over the first scanned electrode 33. A second scanned electrode 34, which is effectively screened from the electron gun structure by the first scanned electrode 33, is disposed adjacent thereto. The second scanned electrode 34 comprises a backing plate of semi-transparent conductive material having on one surface thereof a coating of fluorescent material 35 adapted to fluoresce at a color dependent upon the velocity of the electrons incident thereon.

In order to vary the voltage of the second scanned electrode 34 and thereby to accelerate the low-velocity secondary electrons generated at electrode 35 to, and control their velocity at, the second scanned electrode 34, there is provided a color signal amplifier and detector 36 having an input circuit connected to intermediate-frequency amplifier 14 and an output circuit connected to second scanned electrode 34.

In considering the operation of the portion of the system constituting the present invention, it will be assumed that the received color television signal is accompanied by a color-indicating television control signal. This color-indicating signal may be a signal the amplitude of which varies in accordance with the color being transmitted through the television system at any particular instant. This variable control signal may be transmitted with the received video-frequency components of the color television signal as amplitude modulation on a suitable carrier wave in the same way that the sound signals accompanying the received television program are transmitted. The color signal detector and amplifier 36 is effective to detect these color-indicating modulation components and amplify them to provide a unidirectional operating voltage for second scanned electrode 34. By this arrangement the operating voltage of anode 34 is dependent upon the color being transmitted by the system at a particular instant and the fluorescent coating 35 is effective to fluoresce with a color dependent upon the velocity of electrons incident thereon. The voltage of second scanned electrode 34, therefore, determines the velocity of the electrons which are incident on the fluorescent material 35 and thereby determines the color of the image element reproduced.

In summary, therefore, it is seen that the arrangement of the invention comprises a color television signal-translating stage including cathode-ray tube 17 which has an electron gun structure for forming and accelerating an electron beam, this electron gun structure comprising cathode 30 and accelerating first and second anodes 31 and 32. The cathode-ray tube 17 also includes a first scanned electrode 33, means for applying a substantially constant voltage to the first electrode 33 and for producing low-velocity secondary electrons in the vicinity of the first electrode 33 or, specifically, at a point near the first electrode at which the cathode-ray beam is incident, and means including deflecting plates 22, 23 and 24, 25 for developing a deflecting field for the beam of tube 17 between the electron gun structure comprising cathode 30 and the first electrode 33 to scan the first electrode 33 with the electron beam. The stage further comprises a second scanned electrode 34, adapted to fluoresce with a color dependent upon the velocity of the electrons incident thereon and effectively screened from the electron gun structure including cathode 30 by the first electrode

33, and means, including unit 36, for applying a variable voltage to the second electrode 34 to accelerate the low-velocity secondary electrons developed at first electrode 33 to the second electrode 34 and control the velocity of these electrons at the second electrode 34. By this arrangement, the second electrode 34 is scanned by electrons of variable velocity to produce a color image of the translated signal while the scanning deflection at the second electrode is independent of the velocity of the electrons incident thereon. The projections on first electrode 33 comprise means for preventing the direct passage of electrons of the beam from cathode 30 through the first electrode 33 to the second electrode 34.

While the invention has been illustrated as used in a color television system, it will be understood that it is not limited to use in such a system but may be used in any television signal-translating stage to scan an electrode in a cathode-ray tube with an electron beam of variable velocity in such manner that the scanning deflection of the electron beam is independent of the velocity of the electrons incident on the electrode scanned.

A fluorescent material which exhibits a change of color dependent upon the velocity of electrons incident thereon, as described above, is cadmium sulphide which has a yellowish cast when low-velocity electrons are incident thereon and a bluish cast when high-velocity electrons are incident thereon.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood by 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 modifications and changes as fall within the spirit and scope of the invention.

What is claimed is:

1. A color television signal-translating stage comprising, a cathode-ray tube, an electron gun structure in said tube for forming and accelerating an electron beam, a first scanned electrode, means for applying a substantially constant voltage to said first electrode and for producing low-velocity electrons in the vicinity of said first electrode, means for developing a deflecting field for said beam between said electron gun structure and said first electrode to scan said first electrode with said beam, a second scanned electrode adapted to fluoresce with a color dependent upon the velocity of electrons incident thereon and effectively screened from said electron gun structure by said first electrode, and means for applying a variable voltage to said second electrode to accelerate said low-velocity electrons to said second electrode and control their velocity at said second electrode, whereby said second electrode is scanned by electrons of variable velocity to produce a color image of the translated signal and the scanning deflection at said second electrode is independent of the velocity of the electrons incident thereon.

2. A color television signal-translating stage comprising, a cathode-ray tube, an electron gun structure for said tube for forming and accelerating an electron beam, a first scanned electrode, means for applying a substantially constant voltage to said first electrode and for producing low-velocity electrons in the vicinity of said first electrode, means for developing a deflecting field

for said beam between said electron gun structure and said first electrode to scan said first electrode with said beam, a second scanned electrode adapted to fluoresce with a color dependent upon the velocity of electrons incident thereon and effectively screened from said electron gun structure by said first electrode, means responsive to a television signal for applying a variable voltage to said second electrode to accelerate said low-velocity electrons to said second electrode and control their velocity at said second electrode, whereby said second electrode is scanned by electrons of variable velocity to produce a color image of the translated signal and the scanning deflection at said second electrode is independent of the velocity of the electrons incident thereon.

3. A color television signal-translating stage for a television receiver comprising, a cathode-ray tube, an electron gun structure for said tube for forming and accelerating an electron beam, a first scanned electrode, means for applying a substantially constant voltage to said first electrode and for producing low-velocity electrons in the vicinity of said first electrode, means for developing a deflecting field for said beam between said electron gun structure and said first electrode to scan said first electrode with said beam, a second scanned electrode adapted to fluoresce with a color dependent upon the velocity of electrons incident thereon and effectively screened from said electron gun structure by said first electrode, means responsive to a received control signal for applying a variable voltage to said second electrode to accelerate said low-velocity electrons to said second electrode and control their velocity at said second electrode, whereby said second electrode is scanned by electrons of variable velocity to produce a color image of the translated signal and the scanning deflection at said second electrode is independent of the velocity of the electrons incident thereon.

4. A color television signal-translating stage comprising, a cathode-ray tube, an electron gun structure in said tube for forming and accelerating an electron beam, a first scanned electrode, means for applying a substantially constant voltage to said first electrode and for producing low-velocity electrons in the vicinity of said first electrode, means for modulating said beam in accordance with the translated television signal, means for developing a deflecting field for said beam between said electron gun structure and said first electrode to scan said first electrode with said beam, a second electrode adapted to fluoresce with a color dependent upon the velocity of electrons incident thereon and effectively screened from said electron gun structure by said first electrode, and means for applying a variable voltage to said second electrode to accelerate said low-velocity electrons to said second electrode and control their velocity at said second electrode, whereby said second electrode is scanned by electrons of variable velocity modulated in accordance with said television signal to produce a color image of the translated signal and the scanning deflection at said second electrode is independent of the velocity of the electrons incident thereon.

5. A color television signal-translating stage comprising, a cathode-ray tube, an electron gun structure in said tube for forming and accelerating an electron beam, a first scanned electrode including a surface of secondary-emissive material, means for applying a substantially constant voltage to said first electrode and for producing

low-velocity secondary electrons at the point at which said beam is incident on said first electrode, means for developing a deflecting field for said beam between said electron gun structure and said first electrode to scan said first electrode with said beam, a second scanned electrode adapted to fluoresce with a color dependent upon the velocity of electrons incident thereon and effectively screened from said electron gun structure by said first electrode, means for applying a variable voltage to said second electrode to accelerate said low-velocity electrons to said second electrode and control their velocity at said second electrode, whereby said second electrode is scanned by electrons of variable velocity to produce a color image of the translated signal and the scanning deflection at said second electrode is independent of the velocity of the electrons incident thereon.

6. A color television signal-translating stage comprising, a cathode-ray tube, an electron gun structure in said tube for forming and accelerating an electron beam, a first scanned electrode, means for applying a substantially constant voltage to said first electrode and for producing low-velocity electrons in the vicinity of said first electrode, means for preventing the direct passage of high-velocity electrons of said beam through said first electrode, means for developing a deflecting field for said beam between said electron gun structure and said first electrode to scan said first electrode with said beam, a second scanned electrode adapted to fluoresce with a color dependent upon the velocity of electrons incident thereon and effectively screened from said electron gun structure by said first electrode, and means for applying a variable voltage to said second electrode to accelerate said low-velocity electrons to said second electrode and control their velocity at said second electrode, whereby said second electrode is scanned by electrons of variable velocity to produce a color image of the translated signal and the scanning deflection at said second electrode is independent of the velocity of the electrons incident thereon.

7. A color television signal-translating stage comprising, a cathode-ray tube, an electron gun structure in said tube for forming and accelerating an electron beam, a first scanned electrode, means for applying a substantially constant voltage to said first electrode and for producing low-velocity electrons in the vicinity of said first electrode, means for developing a deflecting field for said beam between said electron gun structure and said first electrode to scan said first electrode with said beam, a second scanned electrode having a surface of fluorescent material adapted to fluoresce with a color dependent upon the velocity of electrons incident thereon and effectively screened from said electron gun structure by said first electrode, and means responsive to a color-

control signal for applying a predetermined voltage to said second electrode to accelerate said low-velocity electrons to said surface of fluorescent material and control their velocity at said fluorescent material, whereby said fluorescent material is scanned by electrons of variable velocity to produce a color image of the translated signal and the scanning deflection at said fluorescent material is independent of the velocity of the electrons incident thereon.

8. A color television signal-translating stage comprising, a cathode-ray tube, an electron gun structure in said tube for forming and accelerating an electron beam, a first scanned electrode, means for applying a substantially constant voltage to said first electrode for producing low-velocity electrons in the vicinity of said first electrode, means for developing a deflecting field for said beam between said electron gun structure and said first electrode to scan said first electrode with said beam, a second scanned electrode comprising a surface of fluorescent material the color of which changes with the velocity of electrons incident thereon and effectively screened from said electron gun structure by said first electrode, and means for applying a variable voltage to said second electrode to accelerate said low-velocity electrons to said second electrode and control their velocity at said second electrode, whereby said second electrode is scanned by electrons of variable velocity to produce a color image of the translated signal and the scanning deflection at said second electrode is independent of the velocity of the electrons incident thereon.

9. A color television signal-translating stage comprising a cathode-ray tube, an electron gun structure in said tube for forming and accelerating an electron beam, a first scanned electrode, means for applying a substantially constant voltage to said first electrode and for producing low-velocity electrons in the vicinity of said first electrode, means for developing a deflecting field for said beam between said electron gun structure and said first electrode to scan said first electrode with said beam, a second scanned electrode comprising a surface of fluorescent material adapted to fluoresce with a color dependent upon the velocity of electrons incident thereon and a semi-transparent conductive backing plate effectively screened from said electron gun structure by said first electrode, and means for applying a variable voltage to said backing plate to accelerate said low-velocity electrons to said fluorescent material and control their velocity at said fluorescent material, whereby said second electrode is scanned by electrons of variable velocity to produce a color image of the translated signal and the scanning deflection at said second electrode is independent of the velocity of electrons incident thereon.

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