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CATHODE RAY TUBE

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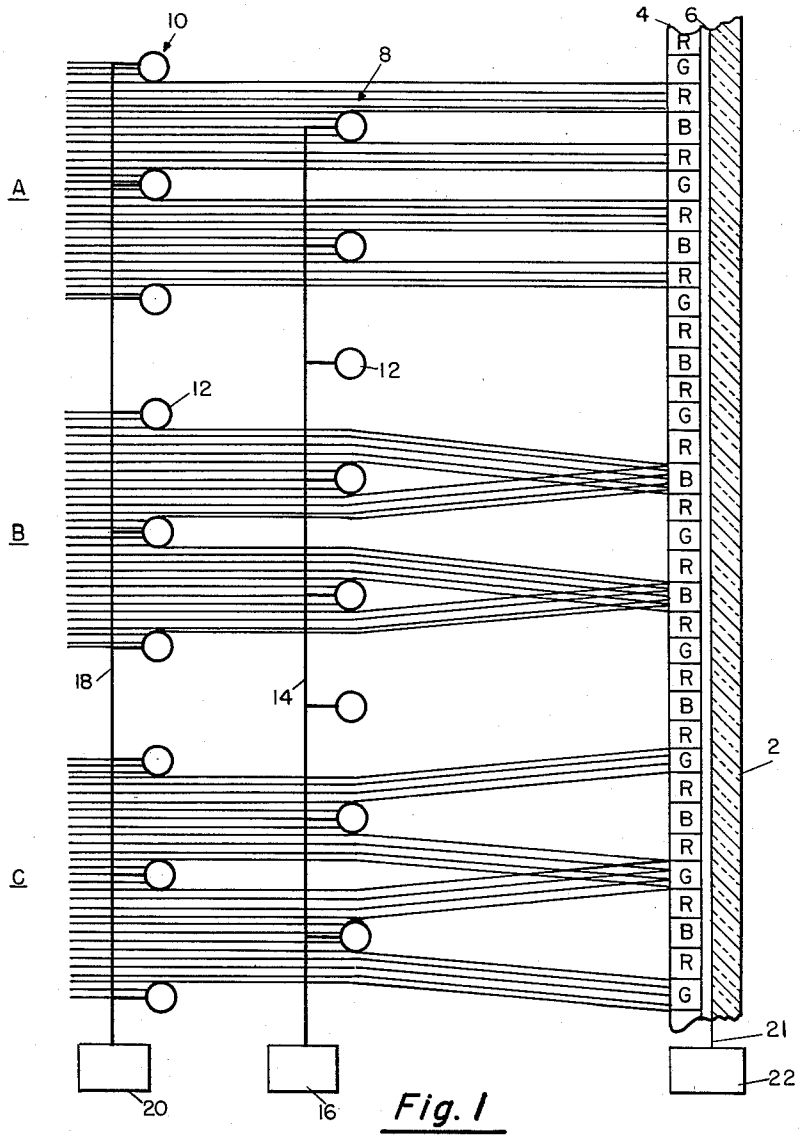


Fig. 1

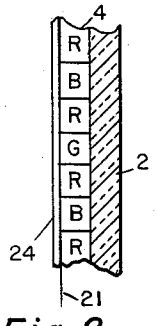


Fig. 2

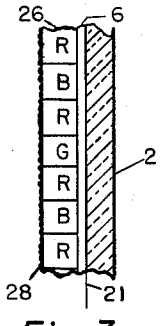


Fig. 3

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CATHODE RAY TUBE

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The present invention relates to cathode ray tubes and particularly to cathode ray tubes for television transmission and reception.

An object of the invention is to provide an improved cathode ray tube for transmitting color signals or converting such signals into corresponding colors.

Another object of the invention is to provide a cathode ray tube having linear strips, corresponding to red, blue and green colors and an improved electron beam deflection means for directing the electrons of the beam on to the respective color strips.

These and other objects are attained in accordance with the present invention by providing a cathode ray tube with a screen comprising successively arranged strips of luminescent materials which when activated by electron bombardment emit red, blue and green colors and an arrangement of potential conductors adjacent the screen comprising a pair of parallel grids spaced from the screen and an electrical conductive coating in contact with the screen.

For a better understanding of the invention reference may be had to the following description taken in connection with the drawing in which Figure 1 is a diagrammatic representation of a fragmentary center portion of the screen and grid of a cathode ray tube embodying the present invention; Figure 2 is a diagrammatic representation of one modification of the screen of Figure 1 and Figure 3 is a diagrammatic representation of another modification of the screen of Figure 1.

Referring now to the drawing and particularly to Figure 1, there is illustrated the image producing portion of a cathode ray tube comprising a transparent glass portion or face **2**, a luminescent screen **4** including successively adjacent strips of red, blue and green fluorescent materials arranged with alternate strips of green and blue strips of luminescent materials spaced between red strips of luminescent material, as shown, and an intermediate layer **6** of light-transmitting, electrically-conductive material. Spaced from and in front of the image producing portion are a pair of spaced grids **8** and **10** each comprising a plurality of wires **12**. As shown, the wires of grid **8** are connected to a common conductor **14** which in turn is connected to a source of electrical potential **16**. In a like manner the wires of grid **10** are connected to a common conductor **18** which in turn is connected to a source of electrical potential **20**. The wires of the grids **8** and **10** have a diameter which is substantially the same as the width of the respective strips of luminescent material. The grids are arranged in the tube with the wires **12** of grid **8** aligned with respect to the path of the electron beam opposite the strips of blue luminescent material and the wires **12** of the grid **10** are likewise aligned opposite the strips of green luminescent material. With this arrangement of the grids **8** and **10**, it will be seen as illustrated at A that spaces or gaps between the offset wires in the spaced grids substantially equal to the width of the strips of red luminescent material are formed opposite the red strips, exposing the red strips to the path of the electron beam while the wires **12** mask the green and blue strips from the path of the beam.

To provide suitable control of the electron beam for scanning the respective color strips, the light-transmitting layer **6** of electrically-conductive material is connected through a conductor **21** to a source of electrical potential **22**. This source of potential is varied simultaneously with the sources **16** and **20** to obtain beam deflection for scanning in a manner which will be described hereinafter in connection with a description of the operation of the tube.

In Figure 2 there is illustrated one modification of the present invention in which the screen **4** of successively arranged strips of luminescent material is formed on the transparent portion **2** of the tube and an electron-permeable electrically conducting coating **24** is formed on the luminescent strips to be intermediate the strips and the grids. As in the illustration shown in Figure 1, the coating **24** is connected by the conductor **21** to the source of potential **22**. With this arrangement, the coating **24** functions as a light reflecting layer in a manner well known in the art as well as a means for controlling beam deflection simultaneously with the grids as described above.

Figure 3 illustrates a modification in which a layer of light-transmitting, electrically conductive material **6** is attached to the face **2** of the tube as in the device of Figure 1. With this arrangement there is formed on the electrically conductive layer a plurality of adjacent strips **26** of light filterable material corresponding in color sequence to the arrangement of the strips of luminescent material in Figures 1 and 2. In this manner a luminescent material **28** emitting white light under electron bombardment may be formed on the face of the colored strips **26** opposite the grid structure, as shown. In connection with this modification, it will be understood that an electron-permeable conductive layer may be substituted for the light-transmitting, electrically-conductive layer of Figure 2.

In connection with the arrangement of the color strips, as shown, it will be understood that a suitable screen may be formed with other arrangements of the red, blue and green strips of luminescent, photosensitive or filter materials.

In operation as shown at A of Figure 1 equal potentials are applied to the respective grids **8**, and **10** and the conductive layer **6**. Under these conditions, the electron beam is directed toward the grid structure and the wires **12** of the grids **8** and **10** act to mask the green and blue luminescent strips from the beam. At the same time the portions of the beam pass between the wires **12** and impinge on the red strips of luminescent material to provide the red component in a projected image.

To obtain convergence of the unmasked portions of the beam after passage through the grid structure to provide the blue color component in a projected image, as shown at B, the grids **8** and **10** may be operated at a positive potential with respect to the electrically conductive layer **6**. In this connection, convergence may also be obtained where the electrical potential applied to grid **8** is positive with respect to grid **10** and the potential applied to grid **10** is positive with respect to the potential applied to the electrically conductive layer **4**. In this connection, it will be understood that the respective applied potentials may be adjusted with respect to each other to compensate for minor variations in the convergence angle.

To obtain divergence of the unmasked portions of the beam after passage through the grid structure, to provide the green color component in a projected image as shown at C, grid **10** may be operated at a positive potential with respect to grid **8** and the electrically conductive layer **6**. Divergence may also be obtained by applying a

positive potential to grid 10 with respect to the electrically conductive layer 6 which is also maintained at a potential which is positive with respect to the potential applied to grid 8. In this connection, it will be understood that the respective applied potentials may be adjusted with respect to each other to compensate for minor variations in the dinvergence angle.

It will be further understood that convergence or divergence may be obtained by other combinations and variations of applied potentials to the grids and electrically conductive layer.

With a cathode ray tube having a grid arrangement such as has been described, the respective grids are capable of operation at substantially higher voltage potentials without electrical breakdown between grids. Further, with this arrangement, substantially greater angles of convergence and divergence are attainable because of the considerable higher operating potentials applicable to the grids and the electrically conductive layer adjacent the screen. Still further, by utilizing the electrically conductive layer adjacent the screen, the post accelerating effect of voltage potentials applied to the layer obtain greater color brilliance from any of the color components of the screen.

What I claim and desire to obtain by Letters Patent of the United States is:

1. An electron discharge device comprising an envelope having a target face, a screen on said face, said screen comprising a plurality of parallel extending strips of different light translating materials, an electrically conductive layer on said screen, means for providing an electron beam for scanning said screen, a pair of axially spaced grids positioned in said envelope between said screen and said means, each of said grids comprising a plurality of wires each having substantially the same width as one of said strips and extending in a direction substantialiy parallel to said strips with the wires of the respective grids being alternately positioned with respect to each other to mask alternate strips of said screen from the path of said beam, said grids lying in different surfaces parallel to said screen with one of said surfaces being closer to said screen than the other of said surfaces, and means for attaching a source of electrical potential to each of said grids and said layer.

2. An electron discharge device comprising an envelope having a target face, a screen on said face, said screen comprising a plurality of parallel extending strips of different luminescent materials, an electrically conductive layer on said screen, means for providing an electron beam for scanning said screen, a pair of axially spaced grids positioned in said envelope between said screen and said means, each of said grids comprising a plurality of wires each having substantially the same width as one of said strips and extending in a direction substantially parallel to said strips with the wires of the respective grids being alternately positioned with respect to each other to mask alternate strips of said screen from the path of said beam, said grids lying in different surfaces parallel to said screen with one of said surfaces being closer to said screen than the other of said surfaces, and means for attaching a source of electrical potential to each of said grids and said layer.

3. An electron discharge device comprising an envelope having a target face, a screen on said face, said screen comprising a plurality of parallel extending strips

of different luminescent materials, an electrically-conductive light-transmitting layer interposed between said screen and said face, means for providing an electron beam for scanning said screen, a pair of axially spaced grids positioned in said envelope between said screen and said means, each of said grids comprising a plurality of wires each having substantially the same width as one of said strips and extending in a direction substantially parallel to said strips with the wires of the respective grids being alternately positioned with respect to each other to mask alternate strips of said screen from the path of said beam, said grids lying in different surfaces parallel to said screen with one of said surfaces being closer to said screen than the other of said surfaces, and means for attaching a source of electrical potential to each of said grids and said layer.

4. An electron discharge device comprising an envelope having a target face, a screen on said face, said screen comprising a plurality of parallel extending strips of different luminescent materials, an electron-permeable, electrically conductive layer on said screen, means for providing an electron beam for scanning said screen, a pair of axially spaced grids positioned in said envelope between said screen and said means, each of said grids comprising a plurality of wires each having substantially the same width as one of said strips and extending substantially parallel to said strips with the wires of the respective grids being alternately positioned with respect to each other to mask alternate strips of said screen from the path of said beam, said grids lying in different surfaces parallel to said screen with one of said surfaces being closer to said screen than the other of said surfaces, and means for attaching a source of electrical potential to each of said grids and said layer.

5. An electron discharge device comprising an envelope having a target face, a screen on said face, said screen comprising a plurality of parallel extending strips of different light filtering material and a layer of luminescent material extending across said strips, an electrically conductive layer on said screen, means for providing an electron beam for scanning said screen, a pair of axially spaced grids positioned in said envelope between said screen and said means, each of said grids comprising a plurality of wires each having substantially the same width as one of said strips and extending in a direction substantially parallel to said strips with the wires of the respective grids being alternately positioned with respect to each other to mask alternate strips of said screen from the path of said beam, said grids lying in different surfaces parallel to said screen with one of said surfaces being closer to said screen than the other of said surfaces, and means for attaching a source of electrical potential to each of said grids and said layer.

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