

Description

The present invention relates to improved color picture tubes having inline electron guns, and particularly to a tube having an inline electron gun that includes means for adjusting the focus of one electron beam relative to the focus of another beam.

For a color picture tube, the resolution of the picture is dependent upon having small electron beam spot sizes at the tube viewing screen. In such a tube, an electron gun generates three electron beams which must be simultaneously focused to small spots on the screen.

In one type of electron gun having six or more electrodes, such as shown in U. S. Patent 4,558,253 or EP-A-0 275 191, issued to Bechis et al. on December 10, 1985, three inline electron beams are individually focused by first and second electrostatic lenses, but then commonly focused by a main focusing lens. Because the main lens is a single common lens and the three beams are coplanar along the horizontal axis, the main lens is horizontally asymmetric relative to the beams and the two side beams are therefore focused differently than is the center beam. Because the gun is of unitized construction and the focus electrodes are supplied by a common focus power supply, the gun must include means to bring all three beams into focus at a common focus voltage. Focusing the beams requires not only that the focus voltage be the same for each beam and that the free fall or undeflected beam requirements be met, but also that the astigmatism for each beam must be correct. Depending upon the performance requirements, the astigmatism of the side beams may be the same as or different from that of the center beam. Astigmatism is defined as the difference in the focus voltages required to focus the horizontal and vertical components of the beams, i. e., $\text{Astigmatism} = V_{\text{Horizontal}} - V_{\text{Vertical}}$ (Volts). In a non-dynamic focus type of electron gun, the astigmatism is made positive ($V_{\text{Hortz}} > V_{\text{Vert}}$) at the screen center in order to compensate for the lensing action of the deflection yoke, which over-focuses the beams upon deflection. To achieve such a positive astigmatism condition, the focus voltage is set at the value that is required to spot focus the horizontal component of the beam. The desired astigmatism for the side beams may be different than that for the center beam, but the horizontal component of spot focus voltage must be the same for all beams. In a dynamic focus gun, the astigmatism is set at zero for all three beams at the screen center. In this case, all three beams must focus at the same horizontal focus voltage condition and have zero astigmatism.

In the prior art, the final optimization of the focus voltage and the astigmatism of each beam is accomplished by simultaneously adjusting the length, width and diameter of a recess and rim of the final electrode of the main focusing lens. Because the main focusing

lens is common to all three beams, these dimensional changes are simultaneously interactive with all three beams. It is difficult, if not impossible, to find a set of dimensions in the main focusing lens electrodes which will satisfy the focusing requirements of the three beams at the same time. The present invention solves this problem by utilizing the second focus lens in a gun to do the necessary focus voltage and astigmatism correction that cannot be provided in the main focusing lens alone.

Summary Of The Invention

In accordance with the invention, a color picture tube has a viewing screen and an electron gun for generating and directing three inline electron beams, a center beam and two side beams, toward the screen. The gun includes electrodes that form three focus lenses. A first lens is located in a beam-forming region of the gun. A second lens includes at least one electrode for providing asymmetrically-shaped beams to a third lens system. The third lens is a common main focus lens for all three beams. The improvement comprises one of the electrodes of the third lens being shaped to provide a major amount of focus correction for each individual electron beam, and the one electrode of the second lens including means for providing the remaining amounts of focus correction needed to substantially totally correct each individual electron beam.

In the drawings:

FIGURE 1 is a plan view, partly in axial section, of a color picture tube embodying the invention.

FIGURE 2 is a side view, in axial section, of the electron gun shown in dashed lines in FIGURE 1.

FIGURE 3 is a front view of the face of a G6 electrode that opposes a G5 electrode in the electron gun of FIGURE 2.

FIGURE 4 is a front view of the face of the G5 electrode that opposes the G6 electrode in the electron gun of FIGURE 2.

FIGURE 5 is a front view of a G4 electrode in the electron gun of FIGURE 2.

FIGURE 6 is a graph of vertical and horizontal beam focus and astigmatism voltages versus G4 electrode aperture width.

FIGURE 7 is a graph of focus and astigmatism voltage versus G4 electrode thickness.

FIGURES 8 and 9 are front and side views, respectively, of an alternative G4 electrode.

FIGURE 10 is a side view of a second alternative G4 electrode.

FIGURE 11 is a side view of a third alternative G4 electrode.

FIGURE 12 is a side view of a fourth alternative G4 electrode.

FIGURE 13 is a side view, in axial section, of an alternative electron gun type.

FIGURE 14 is a side view, in axial section, of a second alternative electron gun type.

FIGURE 1 shows a rectangular color picture tube 10 having a glass envelope 11 comprising a rectangular faceplate panel 12 and a tubular neck 14 connected by a rectangular funnel 16. The funnel 16 has an internal conductive coating (not shown) that extends from an anode button (not shown) to the neck 14. The panel 12 comprises a viewing faceplate 18 and a peripheral flange or sidewall 20, which is sealed to the funnel 16 by a glass frit 17. A three-color phosphor screen 22 is carried by the inner surface of the faceplate 18. The screen 22 is preferably a line screen with the phosphor lines arranged in triads, each triad including a phosphor line of each of the three colors. Alternatively, the screen can be a dot screen. A multi-apertured color selection electrode or shadow mask 24 is removably mounted, by conventional means, in predetermined spaced relation to the screen 22. An improved electron gun 26, shown schematically by dashed lines in FIGURE 1, is centrally mounted within the neck 14 to generate and direct three electron beams along convergent paths through the mask 24 to the screen 22.

The tube of FIGURE 1 is designed to be used with an external magnetic deflection yoke, such as the yoke 30 shown in the neighborhood of the funnel-to-neck junction. When activated, the yoke 30 subjects the three beams to magnetic fields which cause the beams to scan horizontally and vertically in a rectangular raster over the screen 22. The initial plane of deflection (at zero deflection) is at about the middle of the yoke 30.

The details of the electron gun 26 are shown in FIGURES 2, 3, 4 and 5. The gun 26 comprises three spaced inline cathodes 34 (only one of which is shown), a control grid electrode 36 (G1), a screen grid electrode 38 (G2), an accelerating electrode 40 (G3), a plate-shaped electrode 42 (G4), a first main focus lens electrode 44 (G5), and a second main focusing lens electrode 48 (G6), spaced in the order named. Each of the G1 through G6 electrodes has three inline apertures therein to permit passage of three electron beams. The electrostatic main focusing lens in the gun 26 is formed by the facing portions of the G5 electrode 44 and the G6 electrode 48.

The G5 electrode 44 and the G6 electrode 48 are similar in construction, in that they have opposing faces that include peripheral rims 60 and 61, respectively, and apertured portions 62 and 63, respectively, set back in large recesses 64 and 66, respectively, from the rims. The portion 62 includes three inline apertures 68, and the portion 63 includes three inline apertures 69. The rims 60 and 62 are the closest portions of the two electrodes 44 and 48 to each other and have the predominant effect on forming the main focusing lens.

The G1 control grid 36 and the G2 screen grid 38

are plates, each including three small inline apertures. The face of the G2 screen grid that opposes the G3 electrode 40 preferably includes a rectangular slot (not shown) therein that surrounds the three G2 apertures. The purpose of the slot is to adjust the positions of the outer electron beams to compensate for movements of the beams caused by focus voltage variations.

All of the electrodes of the gun 26 are either directly or indirectly connected to two insulative support rods (not shown). The rods may extend to and support the G1 electrode 36 and the G2 electrode 38, or these two electrodes may be attached to the G3 electrode 40 by some other insulative means. Preferably, the support rods are of glass which has been heated and pressed onto claws extending from the electrodes, to embed the claws in the rods.

The electrodes of the electron gun 26 provide three lenses for focusing the electron beams. A first lens (L1) is located between the G2 and G3 electrodes, 38 and 40, in the beam-forming region of the gun. The first lens (L1) provides substantially symmetrical beams to a second lens. The second lens (L2) is centered in the G4 electrode 42. The second lens (L2) provides asymmetrically-shaped beams to a third lens. The third lens (L3) is located between the G5 and G6 electrodes, 44 and 48. The third lens (L3) is a low aberration main focusing lens which provides either round or asymmetrically-shaped beams of substantially constant current density to the screen 22.

As illustrated by FIGURES 3 and 4, the recess 66 in the G6 electrode 48 has a different shape than the recess 64 in the G5 electrode 44. The recess 66 in the G6 electrode 48 is configured to bring the center and side electron beams to the required free fall condition and close to the desired focusing and astigmatic condition. This is done by simultaneously adjusting: the length of the recess 66, measured in the inline direction of the apertures 69; the width of the recess 66, measured perpendicular to the inline direction at the center aperture; and the diameter of the ends of the recess 66. As stated above, the adjustment of each of these length, width and diameter dimensions is interactive with all three electron beams. Therefore, although such adjustment can provide the major amount of correction necessary for focus and astigmatism, it cannot always provide the substantially total correction desired for focus. After the adjustments are made to the shape of the G6 electrode recess 66, it is found that the side beams still need additional correction relative to the center beam. According to the present invention, this additional correction is provided by independently focusing the side beams differently than the center beam is focused in the second focus lens L2. Such correction is provided by modifying the G4 electrode 42 structure.

FIGURE 5 shows the G4 electrode 42 with three inline apertures 70, 71 and 72 therein. The general

shape of the three apertures is circular; however, smaller radius partial circles extend the aperture boundaries on each side thereof. To provide the differential focus correction necessary, the size of the side apertures 70 and 72 is slightly different than the size of the center aperture 71. It should be noted that other aperture shapes could also be used in the G4 electrode.

To determine the size difference between center and side apertures, plots of vertical and horizontal focus voltage and astigmatism voltage versus G4 electrode aperture horizontal width, measured in the inline direction of the inline apertures, are made for the center and side beams, as shown in FIGURE 6. In FIGURE 6, the vertical dimension of each of the apertures, measured perpendicularly to the inline direction of the inline apertures, is fixed at 0.158 inch (0.401 cm). The slopes of the focus voltage plots for the center and side beams do not diverge greatly. The slopes for the horizontal focus voltage plots for the center and side beams are small; however, they are large enough so that aperture dimensions, that will let each beam come into horizontal focus at the same voltage, can be independently found. From FIGURE 6, it can be seen that all of the beams can be horizontally focused at 7 kV with a center aperture horizontal width of 0.1638 inch (0.416 cm) and side aperture widths of 0.1765 inch (0.448 cm). The widths are determined by finding where each plot crosses the 7 kV line. The vertical focus voltage slopes are larger and of opposite sign than are the horizontal focus voltage slopes, which results in astigmatism of the center and side beams at these aperture widths.

The astigmatism can be found by utilizing the bottom plots showing center and side beam astigmatism. This residual astigmatism can be corrected by modification of the shape (length, width and diameter) of the recess in the G6 electrode, or it can be corrected in the G4 electrode itself by changing the thickness of the G4 electrode at its apertures.

FIGURE 7 shows plots of the center and side beam focus and astigmatism voltage versus G4 thickness. As can be seen, a change in thickness has a negligible effect on horizontal focus of the center and side beams, because their plots are relatively flat, but it does have an appreciable effect on the vertical focus of these beams, because of the positive slope. Therefore, astigmatism can be corrected, without affecting the horizontal focus condition, by varying the thickness of the electrode (because such variation only affects the vertical focus of the beams). For the conditions shown in FIGURE 7, the slope of the astigmatism as a function of G4 electrode thickness is 41 volts/mil (16.1 kV/cm) for the side beams and 28 volts/mil (11.0 kV/cm) for the center beam. If the center and side beam horizontal focus voltages are equalized to 7 kV, in accordance with FIGURE 6, the center beam astigmatism of 416 volts can be reduced to the

side beam astigmatism of 167 volts by increasing the G4 electrode thickness at the center beam by 0.0088 inch (0.22 cm).

FIGURES 8 and 9 show an alternative G4 electrode 42' which has a reduced thickness at the side apertures 70' and 72', as discussed above. In another alternative G4 electrode 42'', shown in FIGURE 10, the thickness of the electrode is reduced at the center aperture 71''. Two more alternative G4 electrodes, 142 and 242, are shown in FIGURES 11 and 12, respectively. The G4 electrode 142 is thinned on both surfaces at the side beams, and the G4 electrode 242 is thinned on both surfaces at the center aperture. The specific G4 electrode embodiment selected will depend on the plots that are developed for a particular type of electron gun.

One set of dimensions for the electron gun 26 is given in the following table. In this embodiment, the desired astigmatism is achieved using equal G4 aperture thicknesses for all three beams.

TABLE I

25	Aperture diameters of G1 and G2 = 0.028" (0.711 mm)
	Center aperture diameter at G3 entrance = 0.048" (1.219 mm)
	Outer aperture diameters at G3 entrance = 0.055" (1.397 mm)
30	Hot spacing between cathode and G1 = 0.003" (0.076 mm)
	Spacing between G1 and G2 = 0.009" (0.229 mm)
	Spacing between G2 and G3 = 0.030" (0.762 mm)
	Thickness of G1 = 0.004" (0.102 mm)
35	Thickness of G2 = 0.025" (0.635 mm)
	Thickness of G3 at entrance = 0.010" (0.254 mm)
	Aperture diameters at G3 exit = 0.148" (3.759 mm)
	Spacing between G3 and G4 = 0.050" (1.270 mm)
	Thickness of G4 = 0.020" (0.508 mm)
40	Major axis dimension of G4 center aperture = 0.168" (4.267 mm)
	Minor axis dimension of G4 center aperture = 0.158" (4.013 mm)
	Major axis dimension of G4 side apertures = 0.175" (4.445 mm)
45	Minor axis dimension of G4 side apertures = 0.158" (4.013 mm)
	Spacing between G4 and G5 = 0.050" (1.270 mm)
	Aperture diameters at G5 entrance = 0.158" (4.013 mm)
50	Center-to-center aperture spacing in G3 entrance = 0.2635" (6.693 mm)
	Center aperture diameters in G5 exit and G6 entrance = 0.160" (4.064 mm)
55	Side aperture diameters in G5 exit and G6 entrance = 0.180" (4.572 mm)
	Center-to-center aperture spacing in G5 exit and G6 entrance = 0.245" (6.223 mm)

Depth of G5 and G6 recesses = 0.115" (2.921 mm)
 Spacing between G5 and G6 = 0.050" (1.270 mm)
 Length of G5 recess = 0.755" (19.177 mm)
 Width of G5 recess = 0.326" (8.280 mm)
 Length of G6 recess = 0.748" (18.999 mm)
 Width of G6 recess at center aperture = 0.299" (7.595 mm)
 Diameter of ends of G6 recess = 0.308" (7.823 mm)

The details of another electron gun embodiment 27, which may employ the present invention, are shown in FIGURE 13. The gun 27 is similar to the electron gun 26, except that the G5 electrode is divided into two parts, a first quadrupole electrode 45 (G5B), and a combined second quadrupole electrode and first main focusing lens electrode 47 (G5T). The quadrupole electrodes form a quadrupole lens therebetween in the path of each electron beam. The purpose of the quadrupole lenses is to provide a dynamic astigmatism correction within the electron gun.

The G5B electrode 45 comprises a cup-shaped portion 54, having three apertures in the bottom thereof. A plate 56, having three inline apertures therein, closes the open end of the cup-shaped portion 54. The plate 56 includes extrusions extending therefrom in alignment with the apertures. Each extrusion includes two sector portions 58. The two sector portions 58 are located opposite each other, and each sector portion 58 encompasses approximately 85 degrees of the circumference of a cylinder.

The G5T electrode 47 also comprises a cup-shaped portion 49 having an open end thereof closed by a plate 57 that includes three inline apertures. Each aperture has extrusions that extend toward the G5 electrode 45. The extrusions of each aperture are formed in two sector portions 72. The two sector portions 72 are located opposite each other, and each sector portion 72 encompasses approximately 85 degrees of the cylinder circumference. The positions of the sector portions 72 are rotated 90° from the positions of the sector portions 58 of the G5B electrode 45, and the four sector portions are assembled in non-touching, interdigitated fashion.

Another electron gun 29 that may utilize the present invention is shown in FIGURE 14. This gun 29 is also similar to the electron gun 26, except that the electrodes are electrically connected in a different manner. Specifically, the G6 electrode is connected to the G4 electrode, and the G5 electrode is connected to the G3 electrode.

Claims

1. A color picture tube (10) having a viewing screen (22) and an electron gun (26) for generating and directing three inline electron beams, a center beam and two side beams, toward said screen, said gun including at least six electrodes (36-48)

forming three focus lenses (L1-L3) spaced in order from three cathodes (34), a first lens (L1) being in a beam-forming region of said gun, a second lens (L2) including at least one electrode (42) for providing asymmetrically-shaped beams to a third lens (L3), the third lens (L3) being a common main focus lens for all three beams, wherein

one (48) of the electrodes (44,48) of said third lens (L3) is shaped to provide a major amount of focus correction for each individual electron beam, and

said one electrode (42,42',42'',142,242) of said second lens (L2) includes means for providing the remaining amounts of focus correction needed to substantially totally correct each individual electron beam, said one electrode of said second lens being plate-shaped and including three inline apertures (70-72) therein, a center aperture (71,71',71'') and two side apertures (70,72,70',72'), for the passage of said three electron beams, the shapes of the two side apertures being different than the shape of the center aperture, or said one electrode of said second lens having a different thickness at the center aperture than at the side apertures therein.

2. The tube as defined in claim 1, further characterized by elements (45,47) between said second (L2) and third (L3) lenses for forming a quadrupole lens in the path of each electron beam.
3. The tube as defined in claim 1 or 2, characterized in that said one electrode (42,42'',242) of said second lens (L2) is thinner at the center aperture (71,71'') than at the side apertures (70,72) therein.
4. The tube as defined in claim 1 or 2, characterized in that said one electrode (42',142) of said second lens (L2) is thinner at the side apertures (70',72') than at the center aperture (71') therein.

Patentansprüche

1. Farbbildröhre (10) mit einem Betrachtungsschirm (22) und einer Elektronenkanone (26), um drei in Reihe liegende Elektronenstrahlen, einen mittleren Strahl und zwei Seitenstrahlen zu erzeugen und auf den Schirm zu richten, wobei die Kanone wenigstens sechs Elektroden (36 - 48) enthält, die drei Fokussierungslinsen (L1 - L3) bilden, die von den drei Kathoden (34) in der Reihenfolge einen Abstand aufweisen, wobei eine erste Linse (L1) sich in einem strahlformenden Bereich der Kanone befindet, eine zweite Linse (L2) wenigstens eine Elektrode (42) enthält, um asymmetrisch geformte Strahlen einer dritten

Depth of G5 and G6 recesses = 0.115" (2.921 mm)
 Spacing between G5 and G6 = 0.050" (1.270 mm)
 Length of G5 recess = 0.755" (19.177 mm)
 Width of G5 recess = 0.326" (8.280 mm)
 Length of G6 recess = 0.748" (18.999 mm)
 Width of G6 recess at center aperture = 0.299" (7.595 mm)

Diameter of ends of G6 recess = 0.308" (7.823 mm)

The details of another electron gun embodiment 27, which may employ the present invention, are shown in FIGURE 13. The gun 27 is similar to the electron gun 26, except that the G5 electrode is divided into two parts, a first quadrupole electrode 45 (G5B), and a combined second quadrupole electrode and first main focusing lens electrode 47 (G5T). The quadrupole electrodes form a quadrupole lens therebetween in the path of each electron beam. The purpose of the quadrupole lenses is to provide a dynamic astigmatism correction within the electron gun.

The G5B electrode 45 comprises a cup-shaped portion 54, having three apertures in the bottom thereof. A plate 56, having three inline apertures therein, closes the open end of the cup-shaped portion 54. The plate 56 includes extrusions extending therefrom in alignment with the apertures. Each extrusion includes two sector portions 58. The two sector portions 58 are located opposite each other, and each sector portion 58 encompasses approximately 85 degrees of the circumference of a cylinder.

The G5T electrode 47 also comprises a cup-shaped portion 49 having an open end thereof closed by a plate 57 that includes three inline apertures. Each aperture has extrusions that extend toward the G5 electrode 45. The extrusions of each aperture are formed in two sector portions 72. The two sector portions 72 are located opposite each other, and each sector portion 72 encompasses approximately 85 degrees of the cylinder circumference. The positions of the sector portions 72 are rotated 90° from the positions of the sector portions 58 of the G5B electrode 45, and the four sector portions are assembled in non-touching, interdigitated fashion.

Another electron gun 29 that may utilize the present invention is shown in FIGURE 14. This gun 29 is also similar to the electron gun 26, except that the electrodes are electrically connected in a different manner. Specifically, the G6 electrode is connected to the G4 electrode, and the G5 electrode is connected to the G3 electrode.

Claims

1. A color picture tube (10) having a viewing screen (22) and an electron gun (26) for generating and directing three inline electron beams, a center beam and two side beams, toward said screen, said gun including at least six electrodes (36-48)

forming three focus lenses (L1-L3) spaced in order from three cathodes (34), a first lens (L1) being in a beam-forming region of said gun, a second lens (L2) including at least one electrode (42) for providing asymmetrically-shaped beams to a third lens (L3), the third lens (L3) being a common main focus lens for all three beams, wherein

one (48) of the electrodes (44,48) of said third lens (L3) is shaped to provide a major amount of focus correction for each individual electron beam, and

said one electrode (42,42',42",142,242) of said second lens (L2) includes means for providing the remaining amounts of focus correction needed to substantially totally correct each individual electron beam, said one electrode of said second lens being plate-shaped and including three inline apertures (70-72) therein, a center aperture (71,71',71") and two side apertures (70,72,70',72'), for the passage of said three electron beams, the shapes of the two side apertures being different than the shape of the center aperture, or said one electrode of said second lens having a different thickness at the center aperture than at the side apertures therein.

2. The tube as defined in claim 1, further characterized by elements (45,47) between said second (L2) and third (L3) lenses for forming a quadrupole lens in the path of each electron beam.
3. The tube as defined in claim 1 or 2, characterized in that said one electrode (42,42",242) of said second lens (L2) is thinner at the center aperture (71,71") than at the side apertures (70,72) therein.
4. The tube as defined in claim 1 or 2, characterized in that said one electrode (42',142) of said second lens (L2) is thinner at the side apertures (70',72') than at the center aperture (71') therein.

Patentansprüche

1. Farbbildröhre (10) mit einem Betrachtungsschirm (22) und einer Elektronenkanone (26), um drei in Reihe liegende Elektronenstrahlen, einen mittleren Strahl und zwei Seitenstrahlen zu erzeugen und auf den Schirm zu richten, wobei die Kanone wenigstens sechs Elektroden (36 - 48) enthält, die drei Fokussierungslinsen (L1 - L3) bilden, die von den drei Kathoden (34) in der Reihenfolge einen Abstand aufweisen, wobei eine erste Linse (L1) sich in einem strahlformenden Bereich der Kanone befindet, eine zweite Linse (L2) wenigstens eine Elektrode (42) enthält, um asymmetrisch geformte Strahlen einer dritten



Linse (L3) zuzuführen, wobei die dritte Linse (L3) eine gemeinsame Haupt-Fokussierungslinse für alle drei Strahlen ist, wobei

eine (48) der Elektroden (44, 48) der dritten Linse (L3) so geformt ist, daß sie einen Haupt-Beitrag der Fokussierungskorrektur für jeden einzelnen Elektronenstrahl liefert, und

wobei die eine Elektrode (42, 42', 42'', 142, 242) der zweiten Linse (L2) Mittel enthält, um die restlichen Beiträge zur Fokussierungskorrektur zu liefern, die benötigt werden, um jeden einzelnen Elektronenstrahl nahezu vollständig zu korrigieren, wobei die eine Elektrode der zweiten Linse plattenförmig ausgebildet ist und für den Durchlaß der drei Elektronenstrahlen drei in Reihe liegende Öffnungen (70 bis 72) aufweist, eine mittlere Öffnung (71, 71', 71'') und zwei Seitenöffnungen (70, 72, 70', 72'), wobei die Form der beiden Seitenöffnungen sich von der Form der mittleren Öffnung unterscheidet, oder wobei die eine Elektrode der zweiten Linse eine unterschiedliche Dicke an der mittleren Öffnung als an den Seitenöffnungen aufweist.

2. Röhre nach Anspruch 1, gekennzeichnet durch Elemente (45, 47) zwischen der zweiten (L2) und dritten (L3) Linse, um im Wege jedes Elektronenstrahls eine Vierpol-Linse zu bilden.
3. Röhre nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die eine Elektrode (42, 42'', 242) der zweiten Linse (L2) an der mittleren Öffnung (71, 71'') dünner ist als an den Seitenöffnungen (70, 72).
4. Röhre nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die eine Elektrode (42', 142) der zweiten Linse (L2) an den Seitenöffnungen (70', 72') dünner ist als an der mittleren Öffnung (71').

Revendications

1. La présente invention décrit un tube couleur (10) doté d'un écran d'affichage (22) et d'un canon à électrons (26) générant et dirigeant vers ledit écran trois faisceaux d'électrons en ligne, un faisceau central et deux faisceaux latéraux.

Ledit canon à électrons est doté d'au moins six électrodes (36, 48) constituant trois dispositifs de focalisation (L1-L3) disposés dans l'ordre à partir de trois cathodes (34), le premier dispositif de focalisation (L1) correspondant à la zone de formation de faisceaux dudit canon, ledit deuxième dispositif de focalisation (L2) comportant au moins une électrode (42) afin de délivrer des faisceaux asymétriques à un troisième dispositif de focalisation (L3), celui-ci constituant le

dispositif de focalisation principal commun pour les trois faisceaux.

Ledit tube couleur (10) se caractérise en ce que : une (48) des électrodes (44, 48) dudit troisième dispositif de focalisation (L3) est formé de manière à assurer l'essentiel de la correction de focalisation pour chaque faisceau d'électrons ; une électrode (42, 42', 42'', 142, 242) dudit deuxième dispositif de focalisation (L2) est dotée d'un moyen assurant la correction de focalisation résiduelle nécessaire afin de corriger complètement chaque faisceau d'électrons, ladite électrode dudit deuxième dispositif de focalisation se présentant sous la forme d'une plaque avec trois ouvertures en ligne (70-72), une ouverture centrale (71, 71', 71'') et deux ouvertures latérales (70, 72, 70', 72'), permettant le passage desdits trois faisceaux d'électrons, la forme des deux ouvertures latérales étant différente de celle de l'ouverture centrale, ou ladite électrode dudit deuxième dispositif de focalisation étant d'épaisseur différente au niveau de l'ouverture centrale par rapport aux ouvertures latérales.

2. Tube couleur (10) selon la revendication 1, caractérisé en ce que les éléments (45, 47) disposés entre lesdits deuxième (L2) et troisième (L3) dispositifs de focalisation constituent un dispositif de focalisation quadripôle dans le trajet des faisceaux d'électrons respectifs.
3. Tube couleur (10) selon la revendication 1 ou 2, caractérisé en ce que ladite électrode (42, 42'', 242) dudit deuxième dispositif de focalisation (L2) est moins épaisse au niveau de l'ouverture centrale (71, 71'') par rapport aux deux ouvertures latérales (70, 72).
4. Tube couleur (10) selon la revendication 1 ou 2, caractérisé en ce que ladite électrode (42', 142) dudit deuxième dispositif de focalisation (L2) est moins épaisse au niveau des ouvertures latérales (70', 72') par rapport à l'ouverture centrale (71').

