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[54] **SHIELDING MEMBER BETWEEN ONLY THE CONTROL AND SIDE BEAMS IN A COLOR CATHODE RAY TUBE**

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[52] **U.S. Cl.** **313/428,** 335/211, 313/431

[51] **Int. Cl.** **H01j 29/70**

[58] **Field of Search** 335/210, 211, 212; 313/78, 313/79, 80, 77

[56] **References Cited**

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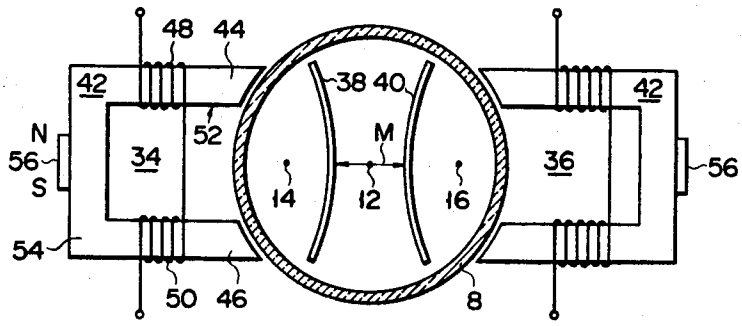
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Attorney, Agent, or Firm—Flynn and Frishauf

[57] **ABSTRACT**

A color cathode ray tube has a beam convergence device for converging and compensating a central beam and a pair of side beams which have the central beam interposed therebetween. Said central and side beams are projected from three electron guns which are aligned in line and provided inside the neck portion of the tube envelope. The beam convergence device includes a pair of convergence magnetic field generators mounted on the outer surface of the neck portion of the tube envelope and a pair of magnetic field shielding plates arranged between the central beam and one of side beams and between the central beam and the other of side beams respectively so as to oppose to the respective one of the paired convergence magnetic field generators, the respective one of magnetic field shielding plates having a convex surface projecting in the direction of the central beam. The color cathode ray tube thus constructed is prominent and successful in that by means of the pair of magnetic field shielding plates, the influence of magnetic field applied to the convergence magnetic field generator from the electromagnetic deflection device is made more uniform.

10 Claims, 3 Drawing Figures



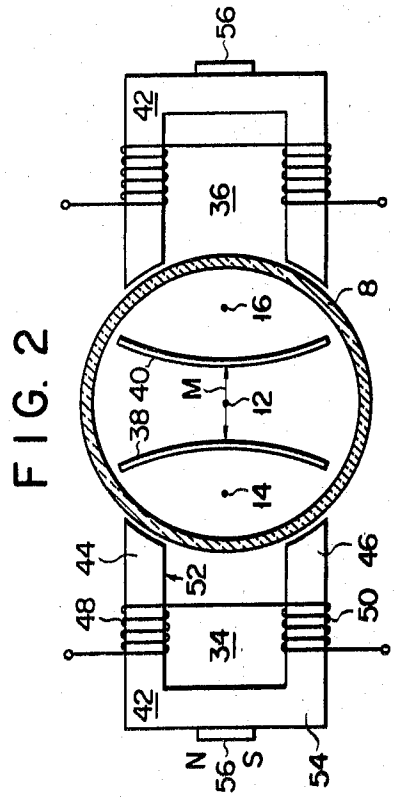


FIG. 2

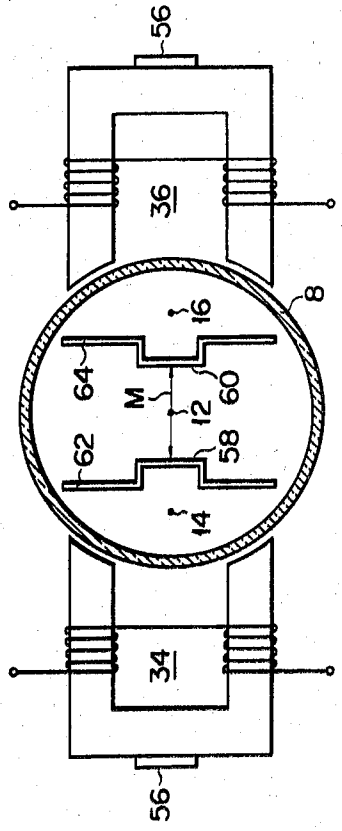


FIG. 3

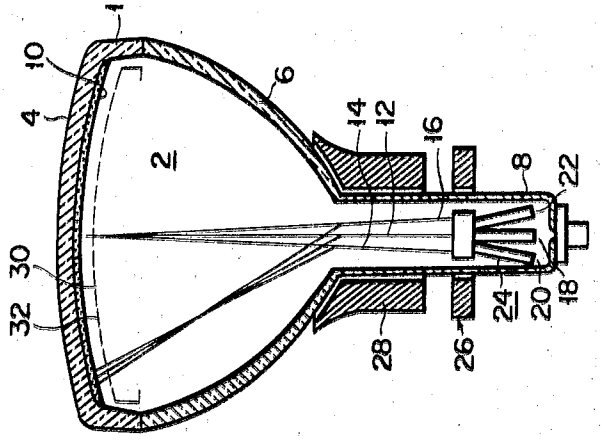


FIG. 1

SHIELDING MEMBER BETWEEN ONLY THE CONTROL AND SIDE BEAMS IN A COLOR CATHODE RAY TUBE

The present invention relates to a color cathode ray tube having an electron gun device in which electron guns are aligned in line.

In order that a central beam and a pair of side beams having the central beam interposed therebetween, said beams being projected from the electron gun device in which three unit electron guns are aligned in line, may be converged on a screen of the color cathode ray tube, a beam convergence device has been hitherto provided on the outer surface of the neck portion of the tube envelope. Further, there has been conventionally provided an electromagnetic deflection device on the neck and funnel portions of the tube envelope with a certain space from the electron gun device, but in the conventional color cathode ray tubes it could not be avoided to result in such a disadvantage that three beams projected from the electron guns were not finely converged on the screen of the tube, to thereby degrade the image quality thus provided, for the reason that the vertical and horizontal deflection magnetic fields emanated from the electromagnetic deflection device give bad influences to the beams passing through the convergence device, that is, non-uniform magnitudes of magnetic fields to the central and side beams.

Therefore, the object of the present invention is to provide a color cathode ray tube of an in-line type having a simple beam convergence device capable of attaining a good beam convergence without being influenced by the non-uniform magnitudes of magnetic fields applied to each of the beams by the electromagnetic deflection device.

SUMMARY OF THE INVENTION

According to the present invention there is provided a color cathode ray tube comprising: an electron gun device mounted inside the neck portion of the envelope, said electron gun device comprising three electron guns aligned in line and projecting a central beam and a pair of side beams having the central beam interposed therebetween; a beam convergence device disposed along the passage, through which the beams pass, so as to converge and compensate each of the beams onto the screen of the tube; and an electromagnetic deflection device for deflecting in the vertical and horizontal directions relative to the screen the beams having passed through the beam convergence device, wherein said beam convergence device includes a pair of convergence magnetic field generators disposed outside of the neck portion of the tube envelope and a pair of magnetic field shielding plates positioned inside the neck portion of the tube between the central beam and one of the side beams and between the central beam and the other of the side beams respectively, to correspond to the respective one of the convergence magnetic field generators, each of said plates having a surface portion projecting in the direction of the central beam, whereby the influences applied to the convergence magnetic field generators by the vertical and horizontal deflection magnetic fields emanated from the electromagnetic deflection device are uniformed relative to each of the central and side beams by means of the pair of magnetic field shielding plates.

The present invention can be more fully understood from the following detailed description when taken in connection with the accompanying drawing, in which:

FIG. 1 is a vertical section showing an embodiment of the color cathode ray tube of the present invention;

FIG. 2 is a cross sectional view taken along the portion of the tube where the beam convergence device as shown in FIG. 1 is positioned; and

FIG. 3 is also a cross sectional view of a color cathode ray tube according to another embodiment of the invention taken at a beam convergence device.

In FIG. 1 the color cathode ray tube **2** according to the present invention is provided with a tube envelope comprised of a face plate **4**, a funnel portion **6** and a neck portion **8**; a color fluorescent screen **10** coated on the inner surface of the face plate **4**; an electron gun device **24** mounted inside the neck portion **8** of the tube envelope and comprising three unit electron guns **18, 20, 22,** which are aligned in line, to project a central beam **12** and side beams **14, 16** with the central beam **12** interposed therebetween; a beam convergence device **26** arranged along the outer peripheral neck portion **8** to converge and compensate each of the beams **12, 14, 16** onto the screen **10**; an electromagnetic deflection device **28** for deflecting in the vertical and horizontal directions relative to the screen **10** the beams having passed through the beam convergence device **26**; and a shadow mask **32** nearly abutting the inner surface of the screen **10** and having a plurality of holes for letting the beams pass therethrough. As shown in FIG. **2,** the beam convergence device **26** includes a pair of convergence magnetic field generators **34, 36** disposed outside the neck portion **8** along the in-line-aligned beams **12, 14, 16** so as to oppose to each other with the neck portion **8** interposed therebetween, and a pair of magnetic field shielding plates **38, 40** positioned on both sides of the central beam **12** and within the two side beams **14, 16** respectively so as to oppose the respective one of the paired convergence magnetic field generators **34, 36,** each of said plates having a convex surface projecting in the direction of the central beam **12.** The magnetic field shielding plates **38, 40** are designed to have the respective tops of their convex surfaces come nearest to the central beam **12,** that is, to make the smallest the distances between the respective tops of convex surfaces and the central beam **12.** Since the convergence magnetic field generators **34, 36** have the same structure, there is described only one of them, for example, **34.** The convergence magnetic field generator **34** comprises a dynamic convergence device **52** having coils **48, 50** wound around the respective legs **44, 46** of an U-shaped core **42** and a permanent magnet **56** of, for example, N–S polarity as shown in FIG. **2** constituting a static convergence device mounted on the central outer side of connecting portion **54** of legs **44, 46.** Magnetic field shielding plates **38, 40** are primarily aimed at preventing the convergence magnetic fields applied to the side beams **14, 16** from each of the convergence magnetic field generators **38, 40** from influencing the central beam **12.** Moreover, in the case of the above-mentioned embodiment, the shielding plates make it possible to make uniform the influences applied to the central and side beams **12, 14, 16** from the convergence magnetic field generators **34, 36** without being subjected to any influ-

ences caused by the vertically and horizontally deflecting magnetic fields from the electromagnetic deflection device **28,** and to accord the raster of the central beam **12** to those of the side beams **14, 16** on the screen. The vertically deflecting magnetic field emanated from the electromagnetic deflection device **28** is arranged to be applied in the direction of the in-line-aligned beams **12, 14, 16,** while the horizontally deflecting magnetic field in the direction rectangular to the in-line-aligned beams.

By constructing the beam convergence device **28** as stated above, the magnetic reluctance becomes smallest at the smallest distance M between the respective tops of convex surfaces of the shielding plates **38, 40** under the condition where the vertically deflecting magnetic field generated from the electromagnetic deflection device **28** is applied in the direction across the magnetic field shielding plates **38, 40,** thus enhancing the magnetic flux density, which crosses the passage for the central beam **12,** to such extent that it comes uniformed to the magnetic flux density crossing the passages for the side beams **14, 16.** On the other hand, the horizontally deflecting magnetic field is impressed so as to pass between the two magnetic field shielding plates **38, 40** and effects a strong influence at the smallest distance M between the two shielding plates **38, 40,** with the result that the central beam **12** is influenced to the same extent as the side beams **14, 16.** As stated above, the influences due to the vertically and horizontally deflecting magnetic fields emanated from the electromagnetic deflection device **28** are nearly uniformed and applied to the central and side beams **12, 14, 16,** thus making it possible to accord the size of raster of the central beam **12** to those of rasters of the side beams **14, 16** on the screen **10.**

FIG. **3** shows another embodiment of the present invention in which same parts and members have the same reference numerals as in FIG. **2,** description thereof being omitted. This embodiment includes magnetic field shielding plates **62, 64** having step-like convex or projecting portions **58, 60** projecting in the direction of the central beam **12** and the same effects attained by the embodiment as shown in FIG. **2** can be achieved by making the distance M the smallest, said distance M being provided between the top surfaces of step-like portions of the shielding plates.

What is claimed is:

1. A color cathode ray tube comprising:

a tube envelope having a neck portion;

an electromagnetic deflection device for generating horizontal deflection flux and vertical deflection flux for horizontally and vertically deflecting electron beams;

a beam convergence device for generating a convergence magnetic field;

an electron gun device mounted inside the neck portion of said tube, said electron gun device including an in-line electron gun assembly for projecting a central electron beam and a pair of side electron beams, said three electron beams being disposed on a plane perpendicular to the horizontal deflection flux generated by said electromagnetic deflection device; and

a pair of magnetic shielding members positioned only between the central electron beam and each of the side electron beams, respectively, said shielding members running in the convergence magnetic field of said convergence device and extending along the lines perpendicular to said plane of said electron beams such that said three electron beams are open to said horizontal deflection flux, thereby not shielding the horizontal deflection magnetic flux acting on said side beams, each of said shielding members having a raised portion protruding in the direction of said central electron beam.

2. A color cathode ray tube according to claim **1** wherein each of said magnetic shielding members are curved plates, each plate being curved such that its outermost extending surface portion corresponds to said raised central portion.

3. A color cathode ray tube according to claim **1** wherein said magnetic shielding members are smoothly curved and are generally in the shape of an arc of a circle.

4. A color cathode ray tube according to claim **1** wherein each of said magnetic shielding members has a step-like protrusion extending therefrom and which corresponds to the respective raised central portions.

5. A color cathode ray tube comprising:

a tube envelope having a neck portion;

an electromagnetic deflection device for generating horizontal deflection flux and vertical deflection flux for horizontally and vertically deflecting electron beams;

a beam convergence device for generating a convergence magnetic field;

an electron gun device mounted inside the neck portion of said tube, said electron gun device including an in-line electron gun assembly for projecting a central electron beam and a pair of side electron beams, said three electron beams being disposed on a plane perpendicular to the horizontal deflection flux generated by said electromagnetic deflection device; and

a pair of magnetic shielding members positioned only between the central electron beam and each of the side electron beams, respectively, said shielding members running in the convergence magnetic field of said convergence device and extending along the lines perpendicular to said plane of said electron beams, each of said shielding members having a raised portion protruding in the direction of said central electron beam for reducing the reluctance between said raised portions against the rear portion of the deflection magnetic field intruding between said pair of magnetic field shielding plates.

6. A color cathode ray tube according to claim **5** wherein each of said magnetic shielding members are curved plates, each plate being curved such that its outermost extending surface portion corresponds to said raised central portion.

7. A color cathode ray tube according to claim **5** wherein said magnetic shielding members are smoothly curved and are generally in the shape of an arc of a circle.

8. A color cathode ray tube according to claim **5** wherein each of said magnetic shielding members has a step-like protrusion extending therefrom and which corresponds to the respective raised central portions.

9. A color cathode ray tube according to claim **1** wherein said shielding members are respective plates.

10. A color cathode ray tube according to claim **5** wherein said shielding members are respective plates.

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