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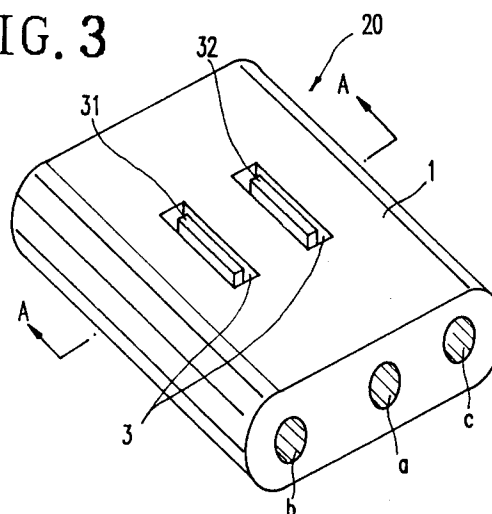
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DE ES FR GB IT(71) Applicant: **ORION ELECTRIC CO., LTD.**
165, Kongdan-dong
Kumi-shi, Kyungsangbuk-do 730-030 (KR)(72) Inventor: **KIM, Kyung, Ho**
978-1L, Chilgok Taekjigaebal 1-jigoo
Kwaneum-dong Book-gu Daegu-shi 702-240
(KR)(74) Representative: **Schmidt, Horst, Dr. et al**
H. Schmidt & B. Müller,
Postfach 44 01 20
D-80750 München (DE)(54) **ELECTRON GUN FOR COLOR IMAGE RECEIVING TUBE.**

(57) The focusing characteristic of this electron gun is not impaired by the aberration caused by the deviation of the centers of the holes on both sides of the main lens, through which the electron beams are passed, and the astigmatism of the electron beams due to the uneven magnetic field such as of a deflecting yoke when the electron gun is in operation. In the focusing electrode (1) of the electron gun, a plurality of focusing grooves are formed in parallel with the direction in which the electron beams are passed. A plurality of additional electrode members, each consisting of a flat thin plate, are inserted into the focusing grooves, respectively.

FIG. 3**EP 0 628 983 A1**

FIELD OF THE INVENTION

This invention relates to an electron gun assembly for a color image receiving tube. Specifically, the invention relates to an electron gun assembly which prevents a lowering of the focusing characteristic of a color image receiving tube from being disturbed by aberrations caused by deviation of the centers of electron beams through holes of a main lens and by the occurrence of uneven magnetic field phenomena upon electron beams, such as deflection yoke, during the operation of the electron gun assembly.

BACKGROUND OF THE INVENTION

Generally, a color image receiving tube comprises a panel **11** on which a fluorescent film **12** is coated and a funnel **13** attached to the back of the panel **11** as shown in Fig. 1. Inside the image receiving tube, an electron gun assembly **8** emitting thermion and a shadow mask **14** distinguishing colors are installed. A deflection yoke **15** is mounted on the outer surface of the funnel **13** in order to deflect the electron beams.

The electron gun assembly **8** is comprised of a cathode electrode heated and operated by a heater, a controlling electrode, a screen electrode, a focus electrode, an anode electrode and a shield cup which are placed in series in front of the cathode electrode.

Each electrode is placed apart from each other at regular intervals and supported by bead glass in the shape of a pole or a plate. Each electrode has three electron beam passage holes.

Further, at least two electrostatic lenses are formed in the electron gun assembly; one is a pre-focus lens formed by the potential differences between the applied voltage of the screen electrode and the applied voltage of the focus electrode, and the other is a main lens formed by the potential differences between the applied voltage of the focus electrode and the applied voltage of the anode electrode. The pre-focus lens helps prevent the electron beam which emits toward the main lens from scattering, while the main lens converges the electron beam on the screen.

If the central axis of the electron beam does not impact upon the center axis of the main lens, a halo phenomena results at the beam spots on the screen and the resolution of the color image receiving tube diminishes.

Fig. 2 is a perspective view of the focus electrode used in the prior art for a electron gun assembly. In the electrode body **1**, three electron beam through holes **a**, **b** and **c** are arranged parallel to each other at regular intervals. If both external electron beams converge on the screen under

each of the electron beam through holes of the focus electrode and the anode electrodes are not in accord with each other, an aberrations occur due to the distortion of the main lens, on the electron gun assembly of the prior art when both external electron beams are passing through the main lens, thereby creating a focusing characteristic of low quality.

An object of this invention is to provide an electron gun assembly that prevents the lowering of the focusing characteristic of a color image receiving tube caused by the aberration of the electron beam which is in turn caused by the deviation of the center of electron beam through holes of the main lens and by uneven magnetic field phenomena such as a deflection yoke.

DISCLOSURE OF THE INVENTION

To achieve the electron gun assembly for a color image receiving tube according to the present invention can be improved the focusing characteristic on the entire screen since the central axis of the electron beam through holes in the focus electrode is accord with the central axis of the electron beam through holes in the anode electrode. Voltage of a magnitude greater than that applied to the focus electrode is applied to additional electrode members. Such additional electrode members are arranged in parallel with and between the paths of the electron beams in the focus electrode so that the electron beam is converged accurately on the screen.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side view of a conventional color image receiving tube.

Fig. 2 is a perspective view of a focus electrode according to the prior art.

Fig. 3 is a perspective view of a focus electrode according to the present invention.

Fig. 4 shows distribution of electric field around the A-A line cross section of Fig. 3.

Fig. 5A shows the cross sections of the electron beam passing through the main lens of the prior art.

Fig. 5B shows the cross sections of the electron beam passing through the main lens of the invention .

DETAILED DESCRIPTION OF THE INVENTION

An embodiment of the invention has been described with reference to the accompanying drawings.

An embodiment of the invention has been illustrated as an electron gun assembly suitable to the

separation type of cathode ray tubes, however this invention can be applied to electron gun assemblies of other types of cathode ray tubes as well.

Fig. 3 shows a perspective view of the focus electrode according to the present invention. In order to enhance the focusing characteristic of the electron beam, focusing grooves **3** are formed on the focus electrode body **1** in parallel with the path of the electron beam and additional electrode members, each consisting of a flat thin plate, **31** and **32** which are inserted into the focusing grooves **3**, respectively.

Two focusing grooves **3** are made on the one surface of the focus electrode body either on the upper surface, or on the lower surface. The invention is not restricted to inserting additional electrode members **31** and **32** into the focusing grooves **3**, nor is it restricted to their installation in the focus electrode.

The additional electrode members **31** and **32** are preferably rectangular, thin plates of uniform length and breadth. However, they can be made in various shapes.

The voltage V_a is applied to the additional electrode members **31** and **32**, respectively and this voltage V_a is higher than the voltage V_b applied to the focus electrode body **1**.

Accordingly, when the electron gun assembly is operated, the electron beam is affected by the electric field formed around the focus electrode as shown in Fig. 4.

The additional electrode members cause the effect at the four electrode lenses which generates the astigmatism on the electron beam. Such additional electrode members generate an electric force which causes outside electron beams to move toward the central electron beam.

Therefore, since both outside electron beams converge before they pass through the main lens, the cross-sectional shape of the electron beam affected by the astigmatism passing through the main lens as shown in Fig. 5B is of greater uniformity than the cross-sectional shape of the electron beam in Fig. 5A. As a result, the electron beams show less aberration.

Further, an astigmatism resulting from an uneven magnetic field such as deflecting yoke is offset by the astigmatism caused by the additional electrode members, thereby remarkably improving the focusing characteristic around the screen.

Accordingly, the application of dynamic focus voltage to the additional electrode members **31**, **32**, causes the focusing characteristics of the entire surface of the screen to improve remarkably thereby enabling an in-line type electron gun assembly having greater picture definition and high picture resolution.

INDUSTRIAL APPLICATION FIELD

As described above, the present invention has improved the convergence and focusing characteristics of the electron beam by means of converging electron beams before their passage through the main lens. Using plate electrodes to correct the deviational errors of the electron beam caused by deflection yokes, the present invention has enhanced the focusing characteristic of the electron gun assembly.

Claims

1. An in-line type electron gun assembly for a color image receiving picture tube comprised of a plurality of electrodes characterized in that additional electrode members **31**, **32** are inserted parallel to the path of electron beam and between electron beam paths in the focus electrode.

FIG. 1

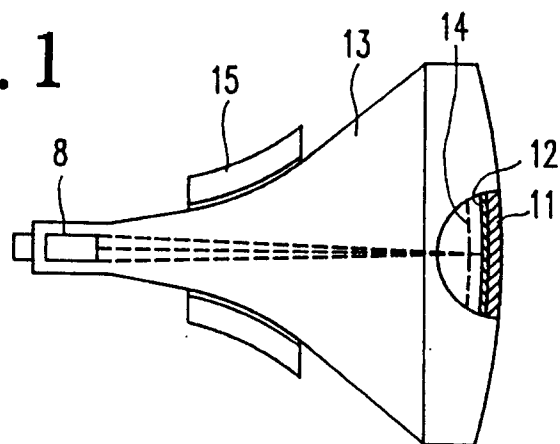


FIG. 2

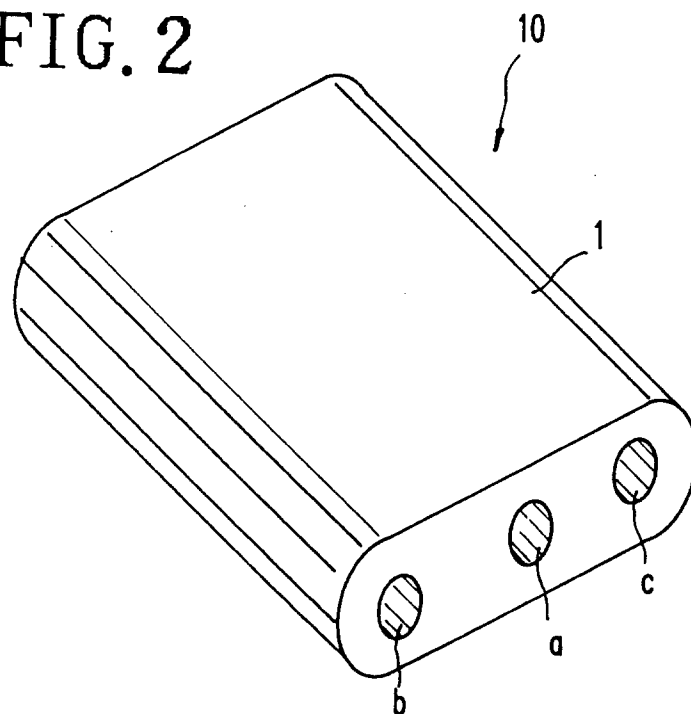


FIG. 3

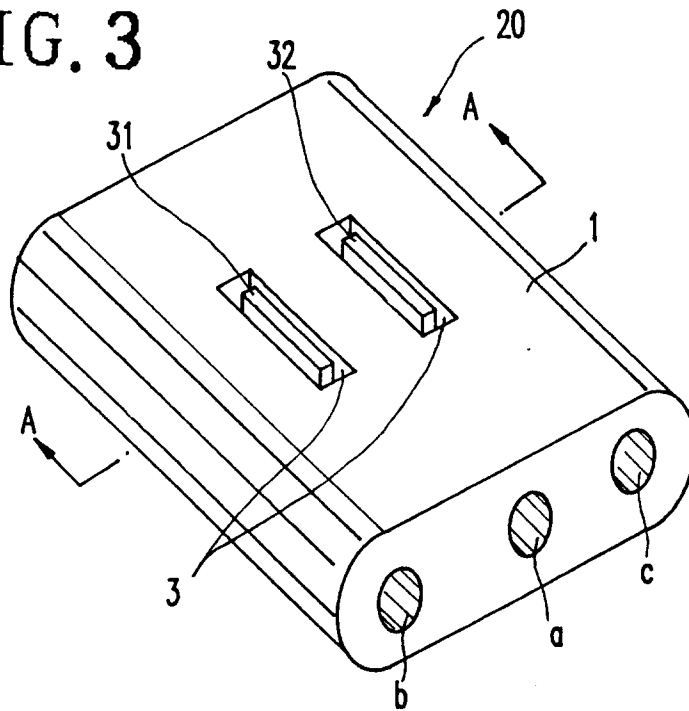


FIG. 4

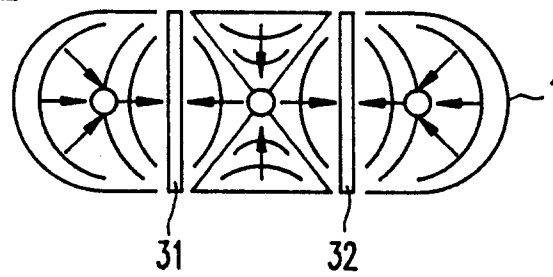


FIG. 5A ◁ 0 ▷

FIG. 5B ○ ○ ○

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR93/00118

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl⁵ H01J29/50

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int. Cl⁵ H01J29/48-29/51

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1926 - 1993

Kokai Jitsuyo Shinan Koho 1971 - 1993

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP, A, 52-92473 (Mitsubishi Electric Corp.), August 3, 1977 (03. 08. 77), Lines 14 to 19, upper left column, page 3, lines 4 to 8, lower left column, page 5, Figs. 4, 7, (Family: none)	1
Y	JP, A, 59-139535 (Hitachi, Ltd.), August 10, 1984 (10. 08. 84), Lines 4 to 7, upper right column, page 3, Fig. 4, (Family: none)	1
Y	JP, B1, 48-23854 (Sony Corp.), July 17, 1973 (17. 07. 73), Line 37, column 8 to line 5, column 9, Fig. 10, (Family: none)	1
A	JP, A, 62-237641 (Mitsubishi Electric Corp.), October 17, 1987 (17. 10. 87), Line 15, lower left column to line 9, lower right column, page 2, Fig. 1 & US, A, 4886999	1

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

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Name and mailing address of the ISA/

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