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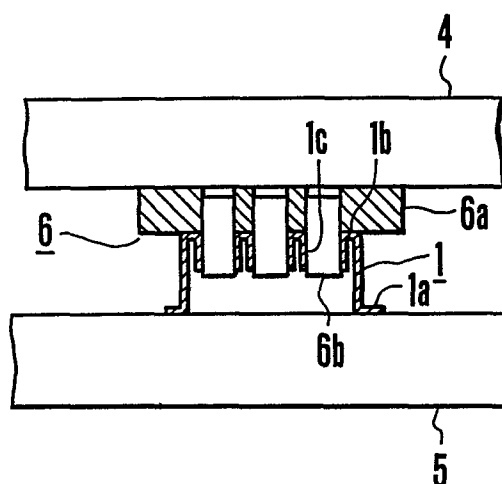
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Designated Contracting States: **DE FR GB IT**

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Electron gun electrode and method of manufacturing the same.

An improved electron gun electrode (1, 2) and a method of manufacturing the same are proposed. In the electron gun electrode, a lens formation surface (1b) perpendicular to the axis of an electron beam aperture (1c) has a flat polished surface. According to the method of manufacturing the electrode (1, 2) at least two cores (6b) of a jig (6) are fitted into said electron beam apertures (1c) and the flange surface (1a) is polished perpendicularly to the axes of said electron beam apertures (1c). Subsequently, the bottom surface (1b) is polished using the polished flange surface (1a) as a reference surface.



Electron Gun Electrode and Method of
Manufacturing the Same

The present invention relates to a cathode ray tube especially a color picture tube in-line electron gun electrode and a method of manufacturing the same.

As one of the requirements for an electron gun
5 assembly, a lens formation surface must be parallel to an ideal plane perpendicular to the axis of an electron gun assembly. In particular, when the electron gun electrode is prepared by laser-welding electrode halves, the parallelism of the lens formation surface of each electrode
10 half with respect to the ideal plane determines the precision of the electron gun electrode and hence the electron gun assembly.

Fig. 1 is a longitudinal sectional view of a conventional in-line convergence electrode. The
15 convergence electrode is assembled such that a cylindrical upper convergence electrode half 1 is welded by laser radiation at a plurality of positions with a cylindrical lower convergence electrode half 2 at their flange surfaces 1a and 2a, respectively. Reference numeral 3 denotes a
20 welded portion; 1b and 2b, bottom surfaces of the upper and lower convergence electrode halves 1 and 2, respectively.

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The bottom surfaces 1b and 2b have electron beam apertures 1c and 2c, respectively. An axis λ of the apertures 1c and 2c is parallel with the axis of the electron gun assembly.

The upper and lower convergence electrode halves 1 and 2 are prepared by press drawing a stainless steel plate having a thickness of about 0.3 mm, and resultant structures must be heat-treated in a hydrogen atmosphere at a temperature of 1,000 to 1,100°C so as to perform degassing and eliminate stress. Under these circumstances, errors in parallelism of the lens formation surfaces are caused by pressing and heat treatment. In particular, the error of the cylindrical electrode half along the major axis is larger than that along the minor axis thereof, thereby causing an error in parallelism between the upper and lower surfaces of the electrode half.

It is, therefore, an object of the present invention to provide an electron gun electrode and a method of manufacturing the same, wherein parallelism between upper and lower surfaces of each electron gun half is improved.

According to an aspect of the present invention, there is provided an electron gun electrode wherein a lens formation surface perpendicular to an axis of an electron beam aperture comprises a flat polished surface.

According to another aspect of the present invention, there is provided a method of manufacturing an

electron gun electrode wherein a jig is used to fit cores thereof in electron beam apertures to form the polished surface described above.

Fig. 1 is a sectional view of a conventional
5 electron gun electrode;

Fig. 2 is a sectional view showing deformation of a flange of an upper electrode half so as to explain the degradation of parallelism in an electron gun electrode; and

10 Fig. 3 is a sectional view showing the main part of a polishing machine according to an embodiment of the present invention.

The present invention will be described in detail with reference to a preferred embodiment in conjunction
15 with the accompanying drawings.

In order to best understand the present invention, a parallelism error in a conventional upper electrode half will be described. Fig. 2 is a central sectional view showing an upper convergence electrode half
20 1 obtained by drawing in the same manner as in Fig. 1. Part of a flange surface 1a of the half 1 is deformed by a height h2. In this manner, a parallelism error in the flange surface 1a occurs with respect to a plane A - A' perpendicular to the axis of each electron beam aperture
25 1c.

In order to correct such an error, the flange surface 1a is polished by a portion corresponding to the height h_2 , and the flange surface 1a can be precisely parallel to the ideal plane. The flange surface of the lower electrode half can also be polished to obtain a convergence electrode having polished surfaces as the lens formation surfaces.

A method of polishing the surface described above will be described with reference to Fig. 3. Referring to Fig. 3, reference numerals 4 and 5 denote bases of a commercially available polishing machine, respectively. This polishing machine has a mechanism for rotating the upper and lower bases 4 and 5 while the lower and upper surfaces of the upper and lower bases 4 and 5 are kept to be parallel with high precision. The upper base 4 has a mechanism for vertically moving the lower surface of the upper base 4 and the upper surface of the lower base 5 relative to each other while the upper and lower surfaces are kept parallel with high precision. The upper base 4 has a compressing mechanism for compressing an electrode half toward the lower base 5.

The electrode half 1 is held between the upper and lower bases in the polishing machine to polish the flange surface 1a and a bottom surface 1b. In order to stably and precisely polish each surface, a polishing jig 6 is mounted on the lower surface of the upper base 4. The polishing jig 6 has at least two (three in this embodiment)

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cores 6b extending vertically on a table 6a fixed on the base 4. A diameter of each of the cores 6b is smaller by 0.01 mm than that of the beam aperture 1c. The tolerance of the diameter of the core 6b is 0.01 mm in the same as in the beam aperture 1c.

In operation, the cores 6b of the polishing jig 6 are fitted in the electron beam apertures 1c, respectively. The flange surface 1a deformed as shown in Fig. 2 is fixed on the base 5. The upper and lower bases 4 and 5 are rotated relative to each other while a pressure of 0.3 to 0.4 kg/cm² is applied to the surface to be polished. The polished flange surface 1a becomes precisely parallel to the ideal plane perpendicular to the axis of the electron beam aperture 1c.

Subsequently, the bottom surface 1b is polished using the polished flange surface 1a as a reference surface, thereby obtaining a flat bottom surface 1b which is precisely parallel to the ideal plane.

In the embodiment described above, the flange surface is polished to be perpendicular to the axis of the electron beam aperture, and then the polished flange surface is used to as the reference surface to polish the bottom surface, thereby obtaining the flat flange and bottom surfaces precisely parallel to the ideal plane perpendicular to the axis of the electron beam aperture. However, when recent laser welding is performed, the flange surface often need not have higher precision than that of

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the bottom surface. It is important to obtain the flat bottom surface as the lens formation surface precisely parallel to the ideal plane. In this case, only the bottom surface is polished.

5 The above embodiment is exemplified by the cylindrical electrode. However, the present invention is not limited to the cylindrical electrode, but can be extended to a sheet-like electrode. A lens formation surface of the sheet-like electrode is polished to obtain
10 the same effect as in the above embodiment.

As is apparent from the above description, the lens formation surface is polished to be parallel to the ideal plane perpendicular to the axis of the electron beam aperture, thereby improving the precision of the electron
15 gun using such an electrode. The surface to be polished can be easily formed using a jig for guiding the electron beam aperture.

In this manner, when the lens formation surface is polished to obtain a smooth, flat surface, the lens
20 characteristics themselves are also improved.

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What is claimed is:

1. An electron gun electrode for a cathode ray tube, wherein a lens formation surface of an electrode which is perpendicular to axes of electron beam apertures comprises a smooth, flat polished surface.
- 5 2. An electrode according to claim 1, wherein a flange surface of said electrode which constitutes a surface opposite to said lens formation surface comprises a smooth, flat polished surface.
- 10 3. A method of manufacturing an electron gun electrode of a cathode ray tube which has a lens formation surface with electron beam apertures, comprising the steps of fitting at least two cores of a jig in said electron beam apertures and polishing said lens formation surface perpendicularly to axes of said electron beam apertures.
- 15 4. A method according to claim 3, wherein the step of polishing said lens formation surface comprises the step of rotating said lens formation surface while applying a pressure of 0.3 to 0.4 kg/cm² on said lens formation surface.

5. A method according to claim 3, wherein each of said cores has a diameter smaller by 0.01 mm than that of each of said electron beam apertures.

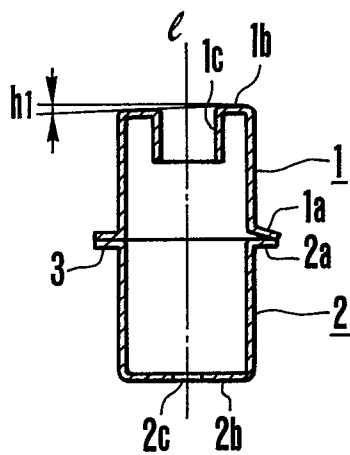


FIG. 1

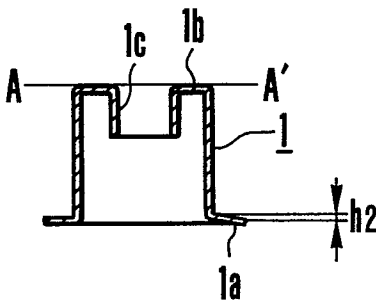


FIG. 2

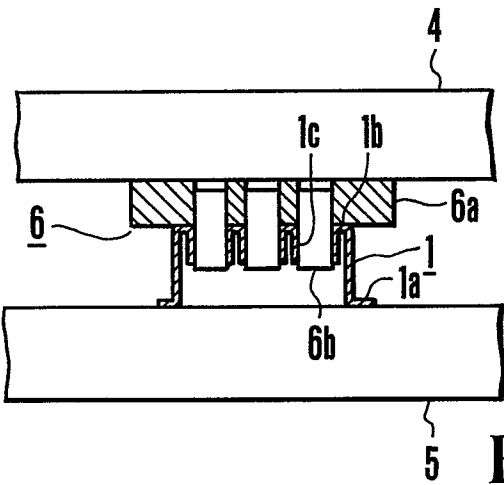


FIG. 3



European Patent
Office

EUROPEAN SEARCH REPORT

Application number

0164230

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 85303457.7
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ⁴)
A	PATENT ABSTRACTS OF JAPAN, unexamined applications, E section, vol. 6, no. 99, June 8, 1982 THE PATENT OFFICE JAPANESE GOVERNMENT page 138 E 111 * Kokai-no. 57-32 536 (HITACHI) * ---	3,1	H 01 J 9/14 H 01 J 29/50
A	<u>GB - A - 2 068 163</u> (HITACHI) * Fig. 8-9; page 3, lines 7-37; claims 1,2,7-10 * ----	1,3	TECHNICAL FIELDS SEARCHED (Int. Cl.⁴) H 01 J 9/00 H 01 J 29/00 H 01 J 1/00 H 01 J 3/00 B 21 D 22/00 B 21 D 28/00
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
VIENNA		22-07-1985	BRUNNER
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			