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Yamazaki et al.

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[54] **POST-DEFLECTION FOCUSING TYPE COLOUR CATHODE RAY TUBE**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ..... **313/85 S**, 313/70 C, 313/92 B

[51] **Int. Cl.** **H01j 29/46**

[58] **Field of Search** ..... 313/92 B, 85 S, 70 C

[56] **References Cited**

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[57] **ABSTRACT**

In a post-deflection focusing type colour cathode ray tube of the type comprising a shadow mask, a phosphor film formed on the inner surface of the face plate of the tube, a metal back electrode formed on the phosphor film for establishing a high intensity electric field between the metal back electrode and the shadow mask, and an electrode film formed on the inner surface of the funnel of the tube, a source of potential is connected between the shadow mask and the electrode film for applying a potential to the electrode film about 30 to 800 volts higher than the potential of the shadow mask.

2 Claims, 3 Drawing Figures

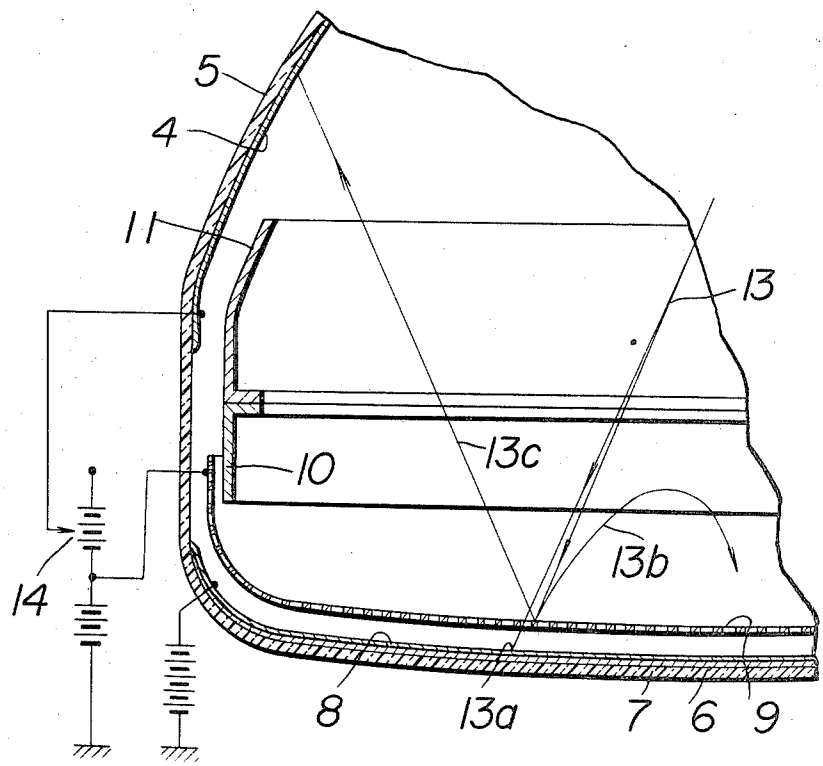


FIG. 1

(PRIOR ART)

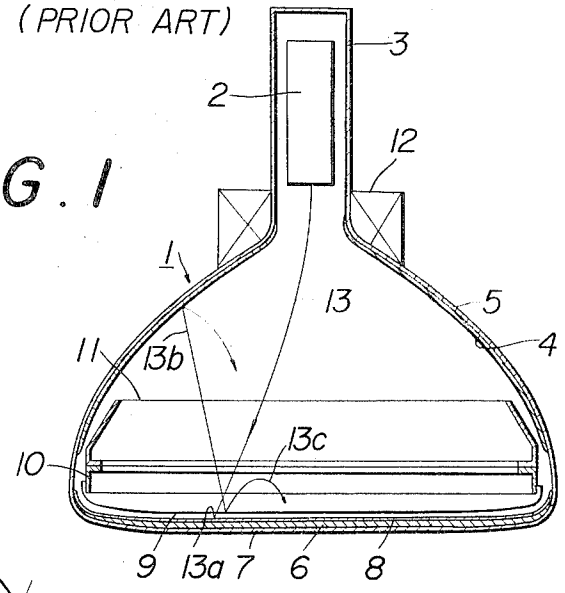


FIG. 2

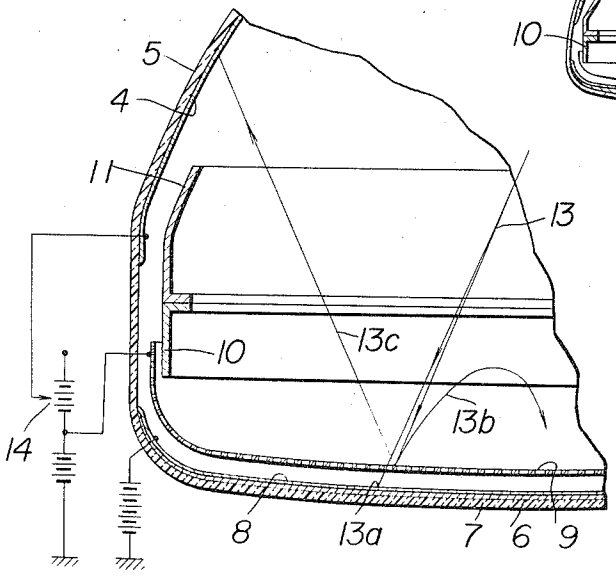
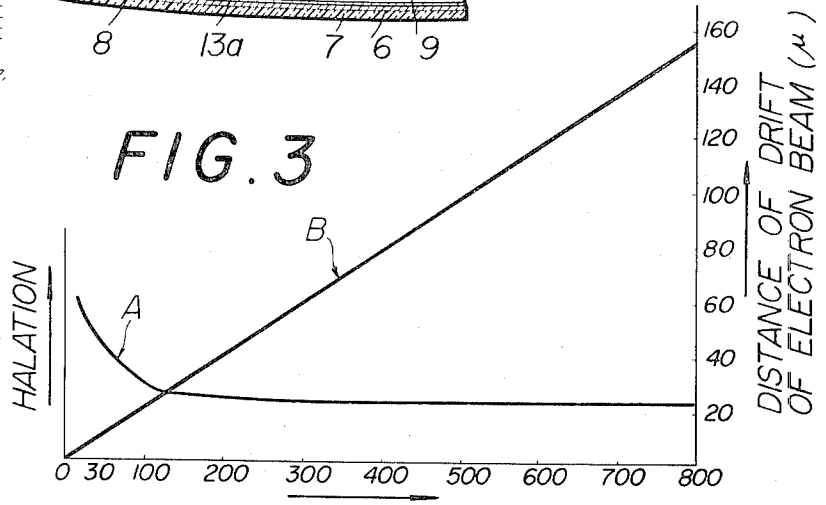


FIG. 3



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POST-DEFLECTION FOCUSING TYPE COLOUR CATHODE RAY TUBE

BACKGROUND OF THE INVENTION

This invention relates to a post-deflection focusing type colour cathode ray tube having a high degree of colour purity.

As diagrammatically shown in FIG. 1 of the accompanying drawing, a conventional post-deflection focusing type colour cathode ray tube comprises an evacuated envelope **1** having a neck **3** in which is disposed an electron gun **2**, a funnel **5** having an inner surface coated with an electrode film **4**, and a face plate **7** having an inner surface coated with a phosphor film **6**. A metal back electrode **8** is applied on the surface of the phosphor film on the side thereof facing to the electron gun **2**. A shadow mask **9** is located closely adjacent the metal back electrode **8**, and the shadow mask **9** is supported by a supporting frame **10**. An electrostatic shielding cylindrical electrode **11** is mounted on the supporting frame **10** on the side thereof facing to the electron gun. Further, a deflection coil **12** is disposed to surround neck **3**.

As is well known in the art, the electron beam **13** emitted from the electron gun **2** is deflected by the deflection coil **12** to scan across shadow mask **9**. A portion **13***a* of the electron beam **13** passes through the perforations of the shadow mask **9** to reach the phosphor film **6**, whereas another portions **13***b* and **13***c* of the electron beam are reflected by the surface of the shadow mask **9** and these reflected portions contain secondary electrons emitted when these portions collide upon the surface of the shadow mask. Portion **13***c* of the electron beam returns back to the shadow mask but portion **13***b* collides upon the electrode film **4** on the inner surface of the funnel to emit secondary electrons. In the post-deflection focusing type colour cathode ray tube, since there is an intense focusing electric field between shadow mask **9** and metal back electrode **8**, there is a tendency that the electron beam reflected by the shadow mask, the secondary electrons emitted by the collision of the electron beam upon the shadow mask and the secondary electrons which are emitted by the reflected electron beam upon the electrode film **4** are forced to pass through the perforations of the shadow mask to reach phosphor film **6** by the action of the focusing electric field thereby causing the phenomenon of halation which degrades the colour purity.

Various approaches have been proposed to eliminate the phenomenon of halation caused by forced back electrons. According to one approach, the cylindrical electrode **11** which is provided to shield the interior of envelope **1** from external electrostatic field is used to absorb and collect the secondary electrons emitted by the collision of the reflected electron beam **13***c* upon the electrode film **4**. According to another approach, the same potential of 26 KV, for example, is impressed upon the metal back electrode **8** and the electrode film **4** to apply a potential of 13 KV to the shadow mask. Another approach involves the application to the electrode film **4** a potential of a value intermediate the potentials of the metal back electrode and shadow mask **9** thereby attracting the secondary electrons emitted from the electrode film **4**.

Although these prior art approaches can substantially eliminate the phenomenon of halation caused by the secondary electrons emitted by the electrode film **4**, thereby avoiding degradation of the colour purity, since electric fields are established between the shadow mask and the cylindrical electrode **11** and the electrode film **4** on the inner surface of funnel **5**, the electric field distribution between shadow mask **9** and electrode film **4** is distorted thus disturbing the locus of the electron beam **13**. Consequently, the electron beam **13a** is caused to drift on the phosphor film **6** over a distance of about 700 to 1000 microns thus failing to attain the object of colour purity.

SUMMARY OF THE INVENTION

It is an object of this invention to provide an improved post-deflection focusing type colour cathode ray tube having a high degree of colour purity.

A further object of this invention is to provide an improved colour cathode ray tube capable of preventing the phenomenon of halation caused by the secondary electrons emitted by the electrode film on the inner surface of the funnel of the cathode ray tube.

Still further object of this invention is to provide a new and improved colour cathode ray tube which can minimize the drift of the electron beam.

According to this invention, there is provided a post-deflection focusing type colour cathode ray tube of the type comprising a shadow mask, a phosphor film formed on the inner surface of the face plate of the tube, a metal back electrode formed on the phosphor film for establishing a high intensity electric field between the metal back electrode and the shadow mask, and an electrode film formed on the inner surface of the funnel of the tube, characterized in that the potential of the electrode film is made higher about 30 to 800 volts than that of the shadow mask by means of a source of potential connected between the electrode film and the shadow mask.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings,

FIG. 1 shows a diagrammatic longitudinal section of a conventional post-deflection focusing type colour cathode ray tube;

FIG. 2 shows a section of a portion of an improved post-deflection focusing type colour cathode ray tube embodying the invention and

FIG. 3 is a graph showing the relationship between the potential difference across the shadow mask and the metal back electrode and the degree of halation and the distance of drift of the electron beam.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the novel post-deflection focusing type colour cathode ray tube is shown in FIG. 2 in which elements of the tube corresponding to those shown in FIG. 1 are designated by the same reference numerals. A source of variable DC voltage **14** is connected between the electrode film **4** on the inner surface of the funnel and the shadow mask **9** so as to maintain the shadow mask at a positive potential with respect to electrode film **4**. The degree of halation and the distance of the drift of the electron beam when the potential difference between shadow mask **9** and electrode film **4** was varied were measured and the results are plotted in FIG. **3**. As can be noted from the characteristic curve A shown in FIG. **3**, when the potential difference is increased in the positive direction, the hala-

tion decreases gradually until a saturated condition is reached at a voltage of about 150 volts. Thereafter, the halation remains constant irrespective of the increase in the potential difference. With a potential difference of 30 volts, the degree of halation is much smaller than that at smaller potential differences. Accordingly, for the purpose of decreasing only the halation caused by the reflected electron beam and the secondary electrons, a voltage difference of more than 30 volts is sufficient. However, as shown by curve B shown in FIG. 3, the distance of the drift of the electron beam increases in direct proportion to the increase in the potential difference. The larger is the drift of the electron beam on the phosphor film, the smaller is the degree of colour purity. Accordingly, the upper limit of the potential difference necessary to obtain the desired colour purity must be determined by taking into consideration the distance of the electron beam drift and the permissible allowance of the colour purity.

As shown in FIG. 3, the electron beam drifts over a distance of about 160 microns at the potential difference of 800 volts so that this value of the potential difference can be used for a colour cathode ray tube having a permissible allowance of the purity of 80 microns. Further, as the electron beam drifts over a distance of about 60 microns at a potential difference of 300 volts, this value of the potential difference can be used for a colour cathode ray tube having a permissible allowance of the purity of 30 microns. Since the permissible allowance of the purity of ordinary colour cathode ray tubes ranges from 30 to 80 microns, unless the potential difference is made smaller than 800 volts, the permissible allowance of the purity is exceeded thus degrading the colour purity even when the potential difference is applied to a colour cathode ray tube having a minimum permissible allowance of the purity. It was found that the lower limit of the potential difference between the shadow mask and the electrode film is about 30 volts for the purpose of preventing the halation caused by the reflected electron beam and the secondary electrons and that the upper limit is about 800 volts by considering the distance of the electron beam drift and the permissible allowance of the purity.

As can be noted from curve A shown in FIG. 3, a potential difference of 500 volts is sufficient to decrease the halation to the minimum or saturated value and with this potential difference the drift of the electron beam is smaller than those at higher potential differences so that most satisfactory colour purity can be obtained. It is also evident that the colour purity can be adjusted to any desired value by varying the DC voltage of source **14**.

As above described, in accordance with this invention, the potential of the electrode film on the inner surface of the funnel of a colour cathode ray tube is made higher by 30 to 800 volts than the potential of the shadow mask for the purpose of preventing the halation caused by the reflected electron beam and by the secondary electrons thereby providing a high degree of colour purity within the permissible allowance of the colour purity without the necessity of changing the construction of the post-deflection focusing type colour cathode ray tube and without disturbing the electric field distribution for the electron beam.

What is claimed is:

1. In a post-deflection focussing type colour cathode ray tube of the type comprising an envelope including a neck, a funnel and a face plate, an electron gun contained in the neck for emitting an electron beam, means for controlling the travel of said electron beam, a shadow mask electrode upon which said electron beam impinges having a plurality of perforations and supported by a supporting frame adjacent the face plate between said electron gun assembly and said face plate, a tri-color phosphor film provided on the inner surface of said face plate to luminesce in color when impinged upon by said electron beam which has passed through the perforations of the shadow mask, said luminescence subject to halation from secondary electrons, a metal back electrode formed on said phosphor film for creating a high intensity electric field between said shadow mask electrode and said metal back electrode, and an electrode film formed on the inner surface of the funnel, the improvement which comprises a source of potential, and means connecting said source between said shadow mask electrode and said electrode film for applying a potential to said electrode film about 30 to 800 volts higher than the potential of said shadow mask electrode to absorb secondary electrons at said electrode film without unacceptable degradation of color purity due to drift of the electron beam impinging on said phosphor film.

2. The post-deflection focusing type colour cathode ray tube according to claim **1** wherein said source of potential is a DC source of variable voltage.

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