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(71) Applicant: **SAMSUNG ELECTRON DEVICES CO., LTD.**
575, Shin-ri, Taean-eub
Hwaseong-gun, Kyunggi-do(KR)

(72) Inventor: **Yong-Du, Sin**
Ra-107,Haebaragi Apt. Suan-Dong
Tongrae-ku Pusan(KR)
Inventor: **Lee, Suk-jae**
6-305, Woosin Apt. 1426-1 Hwamyeong-dong
Puk-ku Pusan(KR)
Inventor: **Lim, Hyeong-seob**
1007-15, Kuseo 2-dong Kumjeong-ku
Pusan(KR)

(74) Representative: **Rodhain, Claude et al**
Cabinet Claude Rodhain 30, rue la Boétie
F-75008 Paris(FR)

(54) **Color cathode ray tube lacking inner shield.**

(57) A color cathode ray tube (10b) lacking an inner shield (16) is disclosed which is characterized in that the inner surface of the funnel is coated with a conductive layer (18b), the conductive layer being made of a high permeability metal or an alloy of high permeability metals, or being made of a high permeability metal or an alloy of high permeability metals and a high resistance material.

According to the present invention, the inner shield is totally removed, and therefore, the manufacturing process for the products is simplified and the manufacturing cost is saved.

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COLOR CATHODE RAY TUBE LACKING INNER SHIELD

Field of the Invention

The present invention relates to a color cathode ray tube lacking the inner shield, and particularly to an improved color cathode ray tube which holds a sufficient shielding effect against the geomagnetic field even without the inner shield which is for shielding the geomagnetic field.

Background of the invention

The ordinary color cathode ray tube illustrated in Figure 1 includes a funnel 12, a panel 11, an electron gun 13, an inner shield 16, a frame 20, and a shadow mask 21, while the inside and outside of the funnel 12 are respectively coated with graphite conductive layers 18, 19 as shown in Figure 2, thereby forming a capacitor of a certain predetermined capacitance.

As shown in figure 2, the inner graphite layer 18a is electrically connected to an anode cup 17 to which a high voltage is supplied from the external. Thus the inner graphite layer 18a serves not only as a part of the capacitor, but also as a conductor for conducting a high voltage from the anode cup 17 through a retainer 14 of the electron gun to the electron gun 13.

The frame 20 is coupled with an inner shield 16 for protecting the electron beam from the geomagnetic field, and this inner shield 16 is installed in such a manner that it should surround the periphery of the deflection region. The functions of a color television set or a computer monitor are adjusted in consideration of the surrounding geomagnetic field, and the inner shield is installed to prevent the aggravation of the image quality when the color television set or the computer monitor are moved to a place where the intensity of the geomagnetic field is different. Therefore, if the products are to be used in the regions where the intensity of the geomagnetic field is almost same, then the inner shield will not be needed.

However, it is unforecastable where the products will be moved and used after the manufacturing of them, and therefore, there arises the demand that the products have to be usable under a wide range of the geomagnetic intensities, thus all the color cathode ray tubes being provided with an inner shield with a very low exception.

The color cathode ray tubes manufactured based on the above described need have the constitution as described above, and in the case of the Japanese Doshiba company as disclosed in Japanese Utility Model Publication No. Sho57-25495, the inner shield is divided into two halves within a certain size to economize it, as well as minimizing the transfer of the electron beam, while the inner shield disclosed in Japanese Utility Model Publication No. Sho-63-20044 has a limited size, particularly a limited height. Thus, in adopting an inner shield in a color cathode ray tube, it has to be developed in a structure meeting the economy and other feasibility, and therefore, the provision of this inner shield is a troublesome task, as well as increasing the manufacturing cost.

In providing the inner shield, there are also other problems such as the pollution of the interior of the cathode ray tube due to the inner graphite layer. That is, parts of the inner graphite layer can be detached from the inner surface of the funnel, and can adhere on the shadow mask or the electron gun, thereby blocking the holes of the shadow mask, or causing an arcing phenomenon.

Summary of the invention

The present inventor could develop a new type of cathode ray tube capable of overcoming the above described disadvantages due to the inner shield and the inner graphite layer after consideration of the necessity of the inner shield and the inner graphite layer.

Therefore, it is the object of the present invention to provide a color cathode ray tube in which the inner shield is removed, the geomagnetic field shielding effect can be realized even without the inner shield, and no problem can be caused due to the particles of the graphite in the interior of the tube.

In achieving the above object, the cathode ray tube according to the present invention comprises an external tube obtained by combining panel and funnel, an electron gun, a shadow mask frame assembly, and inner and outer conductive layers coated on the inside and outside of the funnel,
wherein the conductive layers are formed by depositing a high permeability metal element or alloy.

The conductive layers made of a high permeability metal element or alloy thereof contains a proper amount of a high resistance material, and Fe, Ni, Mn and the like are preferred as the high permeability metal, while titanium oxide(TiO_2) is used as the high resistance material.

Brief description of the drawings

The above object and other advantages of the present invention will become more apparent by describing the preferred embodiments of the present invention with reference to the attached drawings in which:

Figure 1 is a partly cut-out side view of the conventional cathode ray tube;
Figure 2 is an enlarged view of the portion A of Figure 1;
Figure 3 is a sectional view of the cathode ray tube according to a preferred embodiment of the present invention;
Figure 4 is an enraged view of the portion B of Figure 3;
Figure 5 is an enlarged view of the portion C of Figure 3; and
Figure 6 is a sectional view of the cathode ray tube according to another preferred embodiment of the present invention.

Description of the preferred embodiments

Example 1

As shown in Figure 3, the inner surface of a funnel 12 of cathode ray tube 10b is coated with a metal coating layer 18b which contains at least the following ingredients:

Steel(Fe)	10 - 87 wt%
Nickel(Ni)	11 - 89 wt%
Manganese(Mn)	0.38 - 0.58 wt%

It is desirable that the above specified elements are deposited under vacuum in the state of an alloy, and the heater for heating during the deposition should be desirably a bornite heater containing boron B as the principal ingredient, while a microwave-induced heating method can be adopted depending on the circumstances. The range of the deposition should cover the whole area which surround the deflation region of the electron beams, but excluding the neck portion of the funnel where the electron gun 13 is installed.

Further, the portion where an anode cup 17 of the funnel 12 is exposed, and a part of the regions surrounding the above mentioned portion should not be coated with the metal coating layer as shown in Figure 4, while the metal coating layer 18b and the anode cup 17 should be electrically connected through a separate high resistance layer R1. The contact portion of an electron gun retainer 14 disposed near the neck portion, and a part of the surrounding region thereof should also be coated with a high resistance layer R2 of the same kind, as shown in Figure 5, so that the metal coating layer 18b and the electron gun 13 should be electrically connected through the high resitance layer R2. However, the high resistivity layers R1, R2 can be selectively formed on the either one of the portion depending on their resistance values.

Example 2

Unlike in the case of Example 1, the metal elements Fe, Ni and Mn are mixed with a high resistance material, so that the resultant metal coating layer 18c should have a high resistance. Titanium oxide(TiO_2) can be used as the high resistance material, and the cathode ray tube 10c manufactured based on this method has constitution as illustrated in Figure 6. That is, the whole inner surface of the funnel 12 is covered with the metal coating layer 18c, so that the anode cup and the electron gun should be directly connected through the metal coating layer 18c.

Here, the content of titanium oxide TiO2 should be such that it forms an actual resistance value equivalent to the designed resistance value between the anode cup and the electron gun, but the value of its content can be easily calculated by considering the fact that the current level between the two electrodes is generally about 150-220mA, and by considering the voltages applied thereto and the required current value.

The cathode ray tube according to the present invention constituted as described above lacks the inner shield and dispenses with the conventional inner graphite layer totally or partially, with the result that the manufacturing process becomes simple, and that the problems due to the detached particles of graphite can be overcome.

According to the experiment carried out by the present inventor, it has been confirmed that the cathode ray tube of the present invention has a geomagnetic field shielding effect same as that of the inner shield type conventional cathode ray tubes. Meanwhile, there was an apprehension that an aggravation of the image quality might be caused due to the disturbing of the electron beams because the metal coating layer has a gloss, but no visible effect was resulted.

Therefore, according to the present invention, the inner shield which is a relatively large component and a relatively high cost part in a cathode ray tube is removed, with the result that the manufacturing cost of the products can be saved, and that the productivity can be improved owing to the simplification of the manufacturing process.

Further, because the inner graphite layer is totally removed or deposited on an extremely limited area, the product rejection rate due to the particles of graphite can be reduced, and the factory pollution by the dust of graphite can be almost avoided.

Claims

1. A color cathode ray tube (10b) lacking an inner shield (16) comprising an external tube obtained by combining a panel (11) and a funnel (12), an electron gun (13), and a shadow mask frame assembly (21), the inner surface of said funnel being coated with a conductive layer (18b),
characterized in that said conductive layer is made of a high permeability metal element or an alloy of high permeability metals.

2. The color cathode ray tube lacking an inner shield as claimed in claim 1, wherein said alloy as the material of said conductive layer contains as the principal ingredients ;
Fe in the amount of 10-87 wt%,
Ni in the amount of 11-89 wt%, and
Mn in the amount of 0.38-0.58 wt%.

3. The color cathode ray tube lacking an inner shield as claimed in claim 1, wherein said conductive layer is coated on the region of said funnel excluding the exposed region of an anode cup (17) and a part of the surrounding region thereof and/or the exposed region of said electron gun retainer (14) and a part of the surrounding region thereof ; and the uncoated regions are deposited with high resistance material (R2), so that a high voltage can be transmitted from said anode cup through said high resistance material layer to said electron gun.

4. A color cathode ray tube (10b) lacking an inner shield (16) comprising an external tube obtained by combining a panel (11) and a funnel (12), an electron gun (13), and a shadow mask frame assembly (21), the inner surface of said funnel being coated with a conductive layer (18b),
characterized in that said conductive layer is made of a high permeabiltiy metal or an alloy of high permeability metals and a high resistivity material.

5. The color cathode ray tube lacking an inner shield as claimed in claim 4, wherein said alloy of the high permeabiltiy metal elements contains as the principal ingredients :
Fe in the amount of 10-87 wt%,
Ni in the amount of 11-89 wt%, and
Mn in the amount of 0.38-0.58 wt%.

6. The color cathode ray tube lacking an inner shield as claimed in claim 4, wherein said high resitance material contains titanium oxide ($TiO2$) as the principal ingredient.

FIG.1 (Prior Art)

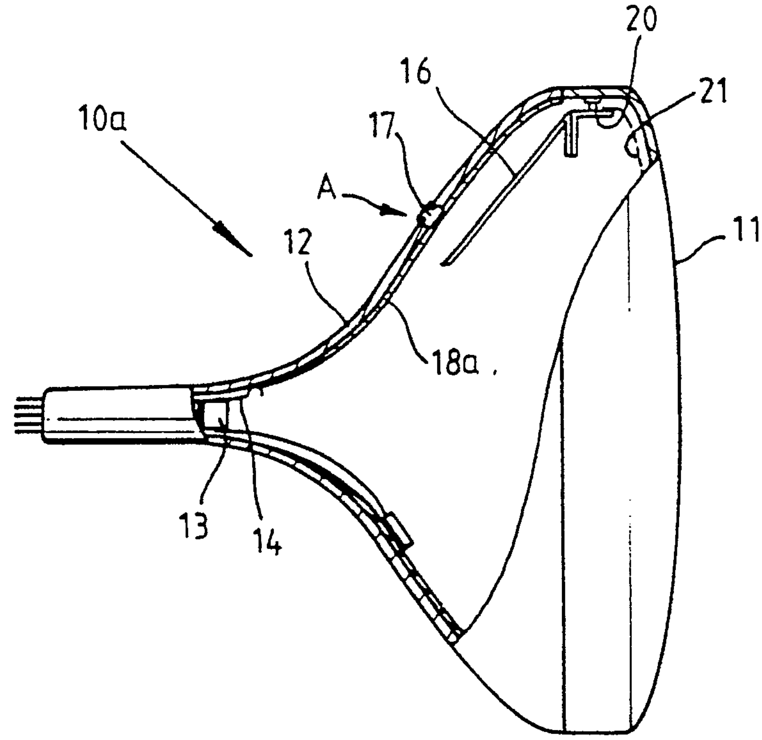

FIG.2 (Prior Art)

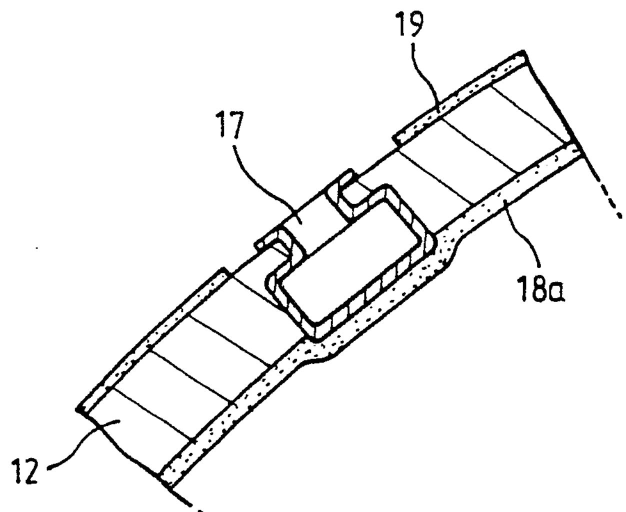

FIG.3

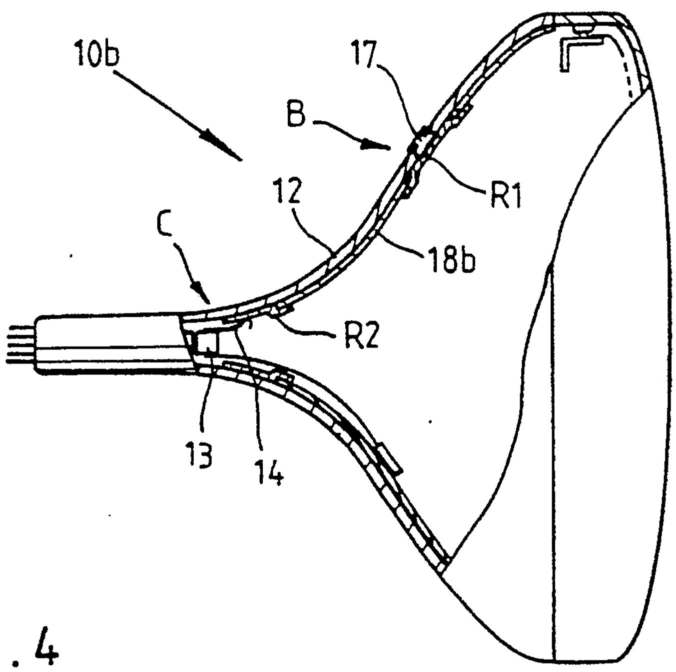

FIG.4

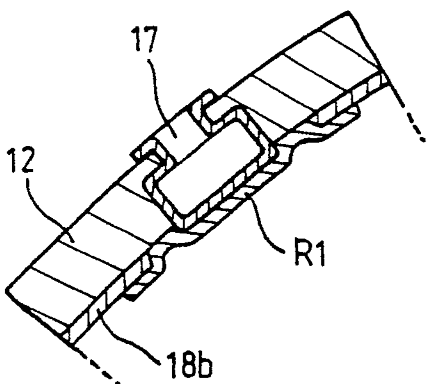

FIG.5

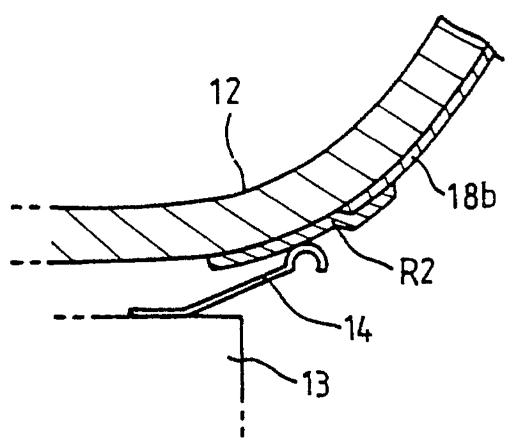

FIG.6