United States Patent [19]

Kanai et al.

[11] **3,905,079**

[45] **Sept. 16, 1975**

[54] **METHOD OF MANUFACTURING COLOR SELECTIVE ELECTRODE FOR COLOR PICTURE TUBE OF BLACK MATRIX TYPE OR THE LIKE TYPE**

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[22] Filed: **Jan. 25, 1974**

[21] Appl. No.: **436,723**

[30] **Foreign Application Priority Data**

Apr. 13, 1973 Japan 48-41397

[52] **U.S. Cl.** **29/25.17;** 96/36.1; 156/8

[51] **Int. Cl.²** **H01J 9/14**

[58] **Field of Search** 29/25.17, 25.18, 25.1, 29/25.11; 96/36.1; 156/7.8

[56] **References Cited**

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Assistant Examiner—James W. Davie
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[57] **ABSTRACT**

A method of manufacturing a color selective electrode for a black matrix or like type color picture tube, in which an etchant-resistive material is used to cover parts of the main surfaces of an electrode plate having apertures formed therein so as to define predetermined dimensions for openings larger than those of the apertures for later enlargement of the openings to the predetermined dimensions of the openings by re-etching.

6 Claims, 8 Drawing Figures

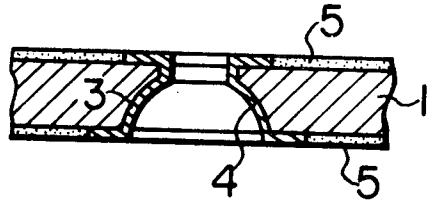


FIG. 1a

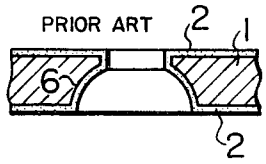


FIG. 1b

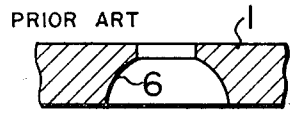


FIG. 1c

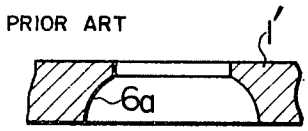


FIG. 1d

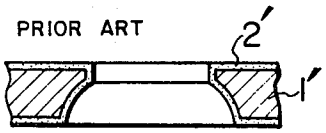


FIG. 2a

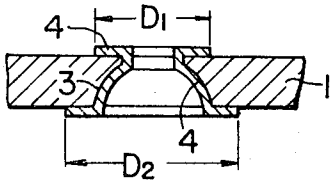


FIG. 2b

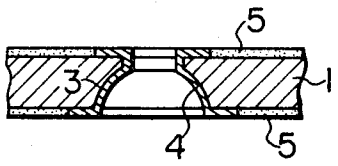


FIG. 2c

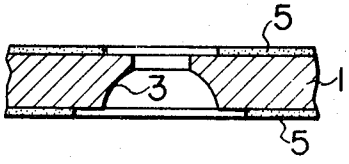
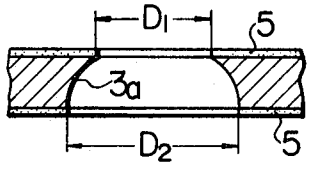


FIG. 2d



METHOD OF MANUFACTURING COLOR SELECTIVE ELECTRODE FOR COLOR PICTURE TUBE OF BLACK MATRIX TYPE OR THE LIKE TYPE

The present invention relates to a method of manufacturing a color selective electrode for a color picture tube effective for obtaining the picture quality of high color purity.

Generally, a re-etching treatment of the color selective electrode such as a shadow mask is necessary for the case in which it is required for a phosphor screen of a color picture tube to be provided, by means of a photographic technique, with a plurality of phosphor units, e.g. phosphor dots having a diameter smaller than that of the openings in the shadow mask, in particular for the case of color picture tube of the black matrix type or the color picture tube of the post-focussing type. Namely, in such color picture tubes, to form phosphor dots of a smaller diameter than that of openings in a color selective electrode being used is difficult, so that the color selective electrode, when used for forming phosphor dots, is provided with apertures which are formed by an etching treatment and have the same diameter as that of the phosphor dots, and thereafter the apertures are enlarged to the openings by means of another etching treatment. The latter etching is called re-etching.

However, the conventional re-etching process has the essential difficulty that it degrades the performance of the color picture tube by the fact that it reduces the thickness of the shadow mask so that the mechanical strength of the shadow mask is reduced and that the control of the diameter of openings in the shadow mask is difficult. For the color picture tube of the post-focussing type, to suppress the secondary electron emission from the shadow mask to prevent the deterioration of the color purity due to the scattering of the secondary electrons it is effective to coat the surfaces of the shadow mask with a material of a low secondary electron emission ratio so that it has been practiced that the surfaces of the shadow mask are coated with graphite or carbon bromide after the re-etching.

An object of the present invention is to provide a method of manufacturing a color selective electrode of a color picture tube which overcomes the above-described difficulty.

The invention will now be described by way of examples only with particular reference to the accompanying drawings, in which:

FIGS. 1*a* to 1*d* are cross-sections depicting the steps of a conventional method of manufacturing a shadow mask; and

FIGS. 2*a* to 2*d* are cross-sections depicting the steps of an embodiment of the present invention.

Referring to FIGS. 1*a* to 1*d*, an electrode plate 1 has apertures 6 formed therein and is coated with a layer 2 called a blackening film for rust prevention as shown in FIG. 1*a*. Then, the blackening film 2 is removed by a treatment called pickling as shown in FIG. 1*b*, after which the aperture size is increased by a re-etching to form openings 6 as shown in FIG. 1*c*. Finally, the electrode plate 1 is coated with a rust preventing blackening film 2′ by a chemical treatment to provide a shadow mask 1′ as shown in FIG. 1*d*.

However, the main component of the blackening film 2 is iron oxide which has a high secondary electron emission ratio. Consequently, in the post-focussing type color picture tube, the electrode plate is coated with a secondary electron emission suppressing film instead of the blackening film after the aperture size augmentation. Thus, in any case, the manufacture of the shadow mask including the re-etching process requires a high degree of technique and yet cannot provide predetermined performance due to the necessity of the control of the aperture size or the shortage of the mechanical strength resulting from the reduction of the thickness of the shadow mask after the re-etching or the necessity of such a difficult process as the application of the secondary electron emission suppressing film.

The present invention will now be described with reference to FIGS. 2*a* to 2*d*. For convenience of the description the color selective electrode is assumed to be a shadow mask, but any other type of color selective electrode, for example one having stripe openings will likewise do.

In FIG. 2*a*, parts of the main surfaces of an apertured electrode 1 and walls of apertures 3 in the electrode plate are first covered with an auxiliary film of a material 4 such as a photoresist. The apertures 3 have been formed by an etching treatment. The partial covering of the main surface of the electrode plate 1 and covering of the walls of the apertures 3 are for defining predetermined dimensions D_1 and D_2 for openings to be formed in a completed color selective electrode or in a shadow mask and therefore may be performed by means of the photographic technique. Then, a secondary electron emission suppressing material 5 such as C, CBr, CBr_2, or CBr_3 is applied to the main surfaces of the electrode plate 1 as shown in FIG. 2*b* by means of, for example, ion plating or electroplating. The material 5 must be resistive to an etchant (e.g., ferric chloride) to be used in a later etching, i.e., re-etching treatment. The thickness of the layer of the material 5 may be 1 – 4 μ. Then, the material 4 is removed from the electrode plate 1 as shown in FIG. 2*c*. The electrode plate 1 shown in FIG. 2*c* is subjected to a re-etching treatment to enlarge the apertures 3 to form openings 3*a* defined by D_1 and D_2, thereby completing a shadow mask as shown in FIG. 2*d*. The walls of the openings 3*a* may be further subjected to a rust preventing treatment such as electrolytic polishing, if necessary. It should be noted that the apertures 3 to be enlarged are etched because they are not covered with the etchant-resistive secondary electron emission suppressing film, while the other parts are not etched because of being covered with the secondary electron emission suppressing film, so that the control of the aperture size at the time of the re-etching is unnecessary and no reduction of the thickness of the shadow mask results.

We claim:

1. A method for manufacturing a color selective electrode for a color picture tube of the type having a phosphor screen provided with a plurality of phosphor units the dimensions of which are smaller than those of openings in the color selective electrode, comprising:

forming a number of apertures in an electrode plate by an etching treatment, said electrode plate having two main surfaces communicating with each other through said apertures, said apertures being smaller in dimensions than said openings;

covering the walls of said apertures and at least portions of said main surfaces with an auxiliary film to

define predetermined dimensions for said openings;

covering the remaining portions of said main surfaces of said plate with a secondary electron emission suppressing material; and

removing said auxiliary film and re-etching the resulting electrode plate to enlarge said apertures by an etchant thereby forming said openings in said electrode plate, said secondary electron emission suppressing material being resistive to the etchant used in said re-etching step,

said phosphor screen being produced by steps including photographic exposure through said apertures prior to said re-etching step.

2. A method according to claim **1,** in which said secondary electron emission suppressing material resistive to said etchant consists of a compound of carbon.

3. A method according to claim **1,** in which said apertures and openings are circular.

4. A method according to claim **1,** in which said auxiliary film is a photoresist material.

5. A method according to claim **1,** in which said auxiliary film is removed after the second-mentioned covering step and before the re-etching of the electrode plate.

6. A method according to claim **2,** in which said secondary electron emission suppressing material is selected from the group consisting of C, CBr, CBr_2, and CBr_3.

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