

PATENT SPECIFICATION

(11) 1 242 999

NO DRAWINGS

1 242 999

- (21) Application No. 26566/70 (22) Filed 2 June 1970
 (31) Convention Application No. 6 908 600 (32) Filed 5 June 1969 in
 (33) Netherlands (NL)
 (45) Complete Specification published 18 Aug. 1971
 (51) International Classification H01j 9/22
 (52) Index at acceptance
 H1D 4A4 4A7 4F2B 4F2E 4F2Y 4G6 4GY 4H1 4HY
 4K4 4K7



(54) IMPROVEMENTS RELATING TO LUMINESCENT SCREENS

- (71) We, PHILIPS ELECTRONIC AND ASSOCIATED INDUSTRIES LIMITED, of Abacus House, 33 Gutter Lane, London, E.C.2., a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- 10 THIS INVENTION relates to a method of manufacturing a luminescent screen of a cathode-ray tube for displaying coloured pictures, the screen comprising in discrete areas substances which upon excitation by
- 15 electrons luminesce in different colours, said areas being separated by areas of a light-absorbing substance.
- A screen built up in this manner has the advantage that with the same contrast, the
- 20 tinting of the window glass can be omitted or at least can be less than is the case when no such light-absorbing substance is used. As a result of this the observed brightness of the picture becomes larger.
- 25 A method of manufacturing such a screen is described in the United States patent specification 3,146, 368. The light absorbing substance is provided by means of a photosensitive lacquer. The layer of the photo-
- 30 sensitive lacquer is exposed at the places where afterwards the luminescent areas will be present and a lacquer with such properties is used that the exposed parts of the layer are soluble in a solvent in which the
- 35 non-exposed parts are not soluble. If the light-absorbing substance is present in the solution of the photosensitive lacquer, it is consequently present already in the layer during the exposure; this may give rise
- 40 to difficulties, because the light-absorbing substance also has an absorbing action during the exposure so that very long exposure times are necessary. If the light-absorbing substance is provided after the exposure of
- 45 the photosensitive lacquer, it is often difficult to obtain a sufficiently dense layer of the light absorbing substance. Moreover, a number of such lacquers have the drawback of being difficult to develop because the exposed parts do not dissolve as such but only swell, after which the gel-like substance has to be removed mechanically, for example, by rubbing.
- United Kingdom patent specification 1,180,195 describes a method in which the light-absorbing substance is provided without the use of a photosensitive binder. In this case the support is covered with a layer of photosensitive lacquer which becomes insoluble after exposure. The layer is exposed at the places where afterwards the luminescent surfaces will be present and the unexposed parts are then dissolved. A dispersion of colloidal graphite in water is provided on the support which is partly covered with exposed photosensitive lacquer, and after drying, the graphite adheres both to the uncovered support and to the photosensitive lacquer present. The areas of the photosensitive layer with the graphite particles adhered thereto are then removed by means of a substance which chemically attacks the hardened lacquer. The difficulty of this method is that a large number of operations is necessary.
- 75 The present invention provides a method of manufacturing a luminescent screen of a cathode-ray tube for displaying coloured pictures, the screen comprising discrete areas of luminescent substances which luminesce in different colours upon excitation by electrons, the method including the steps of providing a conductive layer on a support, providing a photoconductive layer on the conductive layer, charging the photoconductive layer by means of a corona discharge, exposing areas of the photoconductive layer which correspond to the positions of the discrete areas of the luminescent substances on the screen to

[Price 25p]

light so that these areas lose their charge, and depositing particles of a light-absorbing substance on the still-charged areas of the photoconductive layer so that in the resultant luminescent screen each said discrete area is bounded by particles of the light-absorbing substance.

There are several possible methods available for providing the luminescent substances. If this is also carried out electrophotographically, the photoconductive layer is charged again and the parts where the areas of the luminescent substance should be present are exposed so that the charge on said parts flows away. Charged particles of the luminescent substances are provided on said parts, the polarity of the charged particles being dependent upon the polarity of the charge of the photoconductive layer. In this case it is also possible first to provide the luminescent substances and then to provide the light-absorbing substances.

If the luminescent substances are not provided electrophotographically, the conductive layer and the photoconductive layer are removed by firing and the layer of light-absorbing substance is adhered to the support by means of an adhesive. The various luminescent substances are then provided in the desired areas successively in the conventional manner by means of a photosensitive lacquer on the support which is now provided with a given pattern of a light-absorbing substance.

The invention also relates to a cathode-ray tube comprising a luminescent screen manufactured in this manner.

The invention will now be described in greater detail with reference to the following Example.

EXAMPLE.

On the inside of the face plate of a shadow mask tube a conductive layer is provided consisting of polyvinyl alcohol with the addition of a substance to improve the conductivity, for example, choline chloride. After drying, an organic photoconductive layer is provided on said layer, for example, polyvinyl carbazole. The photoconductive layer is charged negatively relative to the underlying conductive layer by means of a corona discharge. The shadow mask is secured in the window and the photoconductive layer is exposed three times by means of three different positions of the light source, so that the areas of the photoconductive layer which correspond to the areas where the luminescent substances should be present afterwards, become conductive and lose their charge. After removing the shadow mask, a liquid in which positively charged particles of a light-absorbing substance, for example, MnO_2 , are present is provided

on the photoconductive layer. The particles adhere to the unexposed areas of the photoconductive layer which are still charged negatively relative to the underlying conductive layer. The liquid is decanted and the screen is dried. The photoconductive layer is then charged positively relative to the underlying conductive layer by means of a corona discharge. The shadow mask is secured in the window and the photoconductive layer is exposed at the areas where the green luminescent substance should be present. After removing the shadow mask a liquid in which positively charged particles of a green luminescent substance are present is provided on the photoconductive layer. These particles adhere at the exposed areas where the positive charge has flowed away. The liquid is decanted and the screen is dried. In the same manner the blue and the red luminescent substances are provided.

WHAT WE CLAIM IS:—

1. A method of manufacturing a luminescent screen of a cathode-ray tube for displaying coloured pictures, the screen comprising discrete areas of luminescent substances which luminesce in different colours upon excitation by electrons, the method including the steps of providing a conductive layer on a support, providing a photoconductive layer on the conductive layer, charging the photoconductive layer by means of a corona discharge, exposing areas of the photoconductive layer which correspond to the positions of the discrete areas of the luminescent substances on the screen to light so that these areas lose their charge, and depositing particles of a light-absorbing substance on the still-charged areas of the photoconductive layer so that in the resultant luminescent screen each said discrete area is bounded by particles of the light-absorbing substance.

2. A method of manufacturing a luminescent screen substantially as herein described with reference to the Example.

3. A luminescent screen manufactured by a method as claimed in Claim 1 or Claim 2.

4. A cathode-ray tube comprising a luminescent screen as claimed in Claim 3.

C. A. CLARK,

Chartered Patent Agent,

Century House,
Shaftesbury Avenue,
London, W.C.2.

Agent for the Applicants.



light so that these areas lose their charge, and depositing particles of a light-absorbing substance on the still-charged areas of the photoconductive layer so that in the resultant luminescent screen each said discrete area is bounded by particles of the light-absorbing substance.

There are several possible methods available for providing the luminescent substances. If this is also carried out electrophotographically, the photoconductive layer is charged again and the parts where the areas of the luminescent substance should be present are exposed so that the charge on said parts flows away. Charged particles of the luminescent substances are provided on said parts, the polarity of the charged particles being dependent upon the polarity of the charge of the photoconductive layer. In this case it is also possible first to provide the luminescent substances and then to provide the light-absorbing substances.

If the luminescent substances are not provided electrophotographically, the conductive layer and the photoconductive layer are removed by firing and the layer of light-absorbing substance is adhered to the support by means of an adhesive. The various luminescent substances are then provided in the desired areas successively in the conventional manner by means of a photosensitive lacquer on the support which is now provided with a given pattern of a light-absorbing substance.

The invention also relates to a cathode-ray tube comprising a luminescent screen manufactured in this manner.

The invention will now be described in greater detail with reference to the following Example.

EXAMPLE.

On the inside of the face plate of a shadow mask tube a conductive layer is provided consisting of polyvinyl alcohol with the addition of a substance to improve the conductivity, for example, choline chloride. After drying, an organic photoconductive layer is provided on said layer, for example, polyvinyl carbazole. The photoconductive layer is charged negatively relative to the underlying conductive layer by means of a corona discharge. The shadow mask is secured in the window and the photoconductive layer is exposed three times by means of three different positions of the light source, so that the areas of the photoconductive layer which correspond to the areas where the luminescent substances should be present afterwards, become conductive and lose their charge. After removing the shadow mask, a liquid in which positively charged particles of a light-absorbing substance, for example, MnO_2 , are present is provided

on the photoconductive layer. The particles adhere to the unexposed areas of the photoconductive layer which are still charged negatively relative to the underlying conductive layer. The liquid is decanted and the screen is dried. The photoconductive layer is then charged positively relative to the underlying conductive layer by means of a corona discharge. The shadow mask is secured in the window and the photoconductive layer is exposed at the areas where the green luminescent substance should be present. After removing the shadow mask a liquid in which positively charged particles of a green luminescent substance are present is provided on the photoconductive layer. These particles adhere at the exposed areas where the positive charge has flowed away. The liquid is decanted and the screen is dried. In the same manner the blue and the red luminescent substances are provided.

WHAT WE CLAIM IS:—

1. A method of manufacturing a luminescent screen of a cathode-ray tube for displaying coloured pictures, the screen comprising discrete areas of luminescent substances which luminesce in different colours upon excitation by electrons, the method including the steps of providing a conductive layer on a support, providing a photoconductive layer on the conductive layer, charging the photoconductive layer by means of a corona discharge, exposing areas of the photoconductive layer which correspond to the positions of the discrete areas of the luminescent substances on the screen to light so that these areas lose their charge, and depositing particles of a light-absorbing substance on the still-charged areas of the photoconductive layer so that in the resultant luminescent screen each said discrete area is bounded by particles of the light-absorbing substance.
2. A method of manufacturing a luminescent screen substantially as herein described with reference to the Example.
3. A luminescent screen manufactured by a method as claimed in Claim 1 or Claim 2.
4. A cathode-ray tube comprising a luminescent screen as claimed in Claim 3.

C. A. CLARK,

Chartered Patent Agent,

Century House,
Shaftesbury Avenue,
London, W.C.2.

Agent for the Applicants.