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CATHODE-RAY TUBE FOR DISPLAYING COLOR PICTURES

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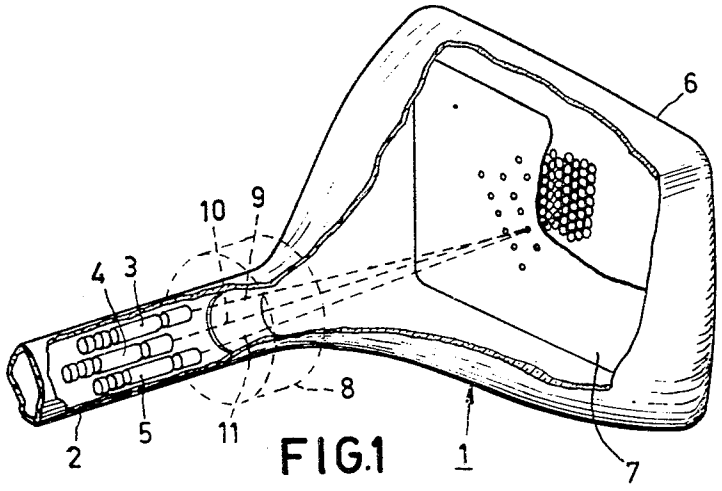

FIG.1

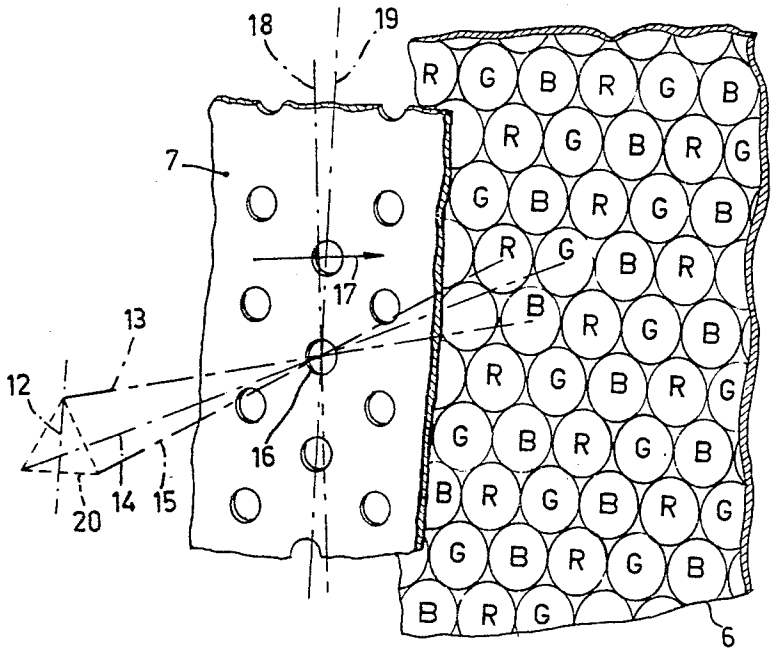

FIG.2

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CATHODE-RAY TUBE FOR DISPLAYING COLOR PICTURES

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U.S. Cl. 313—92 1 Claim

ABSTRACT OF THE DISCLOSURE

A cathode-ray tube for producing color images employing a color selection electrode having a plurality of apertures arranged systematically in rows through each of which an electron beam passes and strikes a phosphor causing it to luminesce. In order to prevent moire patterns forming the minimum angle between a direction at right angles to the scanning lines on the phosphor screen and the rows of sequential apertures is chosen to lie between 5° and 10°.

The invention relates to a cathode-ray tube for displaying color pictures which is provided with at least one electron gun which produces a number of electron beams which scan in lines a color selection electrode provided with systematically arranged apertures and which strike parts of the display screen. In such a cathode-ray tube, each electron beam causes a given luminescent material present on the display screen of the tube to luminesce and the color selection electrode (generally referred to as the mask) prevents these electrons from reaching one of the other luminescent materials.

Due to an optical interference between the line structure of the image and the hole structure of the mask, disturbing moire patterns may occur during operation of the tube. The apertures also lie systematically arranged in rows in given directions. In the usual arrangement in which the apertures are provided in the shadow mask in the hexagonal pattern, the occurrence of moire patterns is considerable if the minimum angle between the direction at right angles to the scanning lines on the screen and the rows of sequential apertures in the shadow mask is approximately 30°, whereas the moire patterns are eliminated if the said angle is approximately 0°. It has further been found that for a cathode-ray tube which is intended for use in a given transmission system and in which the number of scanning lines per image and hence a given line distance occurs, moire patterns can be eliminated only if a given ratio is chosen between the relative distance of the mask apertures and the line distance. For a cathode-ray tube which is intended for use in various transmission systems and in which a different number of scanning lines per image and hence different line distances occur, it has been proposed also to choose a given relative distance of the mask apertures, which choice is of course comparatively limited. The difficulty remains that the moire patterns are eliminated only for the nominal line distance. If deviations occur due to the non-linearity of the frame time base, or to an overscan which is larger or smaller than the assumed overscan, moire patterns may as yet be observed. Furthermore, the choice of the relative distance of the mask apertures is limited, since different line distances must be taken into account. In the manufacture of the mask, the relative distance of the mask apertures must be adapted to any variation of the image height, which in a given transmission system results in a variation of the line distance.

The invention is based on the discovery that these disadvantages do not occur at all or substantially not at all if an angle relation different from 0° is chosen. The occurrence of moire patterns then no longer depends upon the chosen ratio between the relative distance of the mask apertures and the line distance.

According to the invention, the minimum angle between the direction at right angles to the scanning lines on the display screen and the rows of sequential apertures in the color selection electrode lies between 5° and 10°. Thus, the occurrence of moire patterns is substantially completely avoided independently of the ratio between the relative distance of the apertures in the shadow mask and the line distance on the screen. This results in a wider choice of the relative distance of the mask apertures, while the tube can be used without any limitation for different numbers of scanning lines per image. Moreover, errors in linearity and amplitude of the frame time base do not influence the occurrence of moire patterns.

If in a cathode-ray tube three electron beams are produced which are relatively positioned so that in the gun their axes form, on a plane at right angles to the axis of the tube, the corners of an equilateral triangle, in a known cathode-ray tube one side of this triangle extends at right angles to rows of sequential apertures in the shadow mask, while the scanning lines on the screen are substantially parallel to this side of the triangle. It is important that this relation between the relative positions of the electron beams and the row of sequential apertures in the shadow mask should be maintained. Since, according to the invention, the minimum angle between the direction at right angles to the scanning lines on the screen and the rows of sequential apertures in the shadow mask lies between 5° and 10°, this should also apply to the minimum angle between the direction of the scanning lines on the screen and the side of the triangle formed in the gun by the electron beams. This may be achieved in that during mounting of the cathode-ray tube, the gun is rotated about its axis, or the guns are rotated about their common axis through that angle. An analogous solution applies to the case in which a number of electron beams different from three is produced, or in which the electron beams are differently arranged with respect to each other.

The invention will now be described more fully with reference to a drawing in which FIGURE 1 is a partly developed view of a shadow-mask color tube, and FIG. 2 shows, not to scale, the geometric relation between the electron beams, the shadow mask, and the phosphor screen.

The neck **2** of a shadow-mask tube **1** accommodates three electron guns **3**, **4** and **5**. The display screen is disposed on the inner side of the window **6**. The screen has blue, green and red phosphor dots. The shadow mask **7**, in which the apertures are provided in a hexagonal pattern, is arranged at a short distance from the window **6**. These apertures are not shown to scale. Reference numeral **8** denotes diagrammatically the deflection system which deflects the beams **9**, **10** and **11** emitted by the electron guns in two orthogonal directions.

FIG. 2 shows part of the window **6** and the blue, green and red phosphor dots applied thereto, which are denoted by B, G and R respectively. Part of the shadow mask **7** is also shown. Reference numeral **12** denotes the center in the deflection plane of the three electron beams. The axes of the beams are shown: reference numeral **13** denotes the axis of the beam striking the blue phosphor dots, reference numeral **14** denotes the axis of the beam striking the green phosphor dots, and reference numeral **15** denotes the axis of the beam striking the red phosphor dots. In the situation shown, the beams pass through the aperture **16** in the shadow mask. The direction of the scanning lines described by the beams on the shadow

mask **7** is designated by the arrow **17**. The line **18** is at right angles thereto and the line **19** interconnects two sequential apertures. The lines **18** and **19** are at an angle to each other of 7°. The line **20** which interconnects the points of intersection of the axes **14** and **15** with the deflection plane crosses the line **19** at right angles.

What is claimed is:

1. A cathode-ray tube for displaying color pictures comprising at least one electron gun for generating a plurality of electron beams each of which intersect a plane of deflection with the points of intersection of two beams being joined by a line having a given direction, a color selection electrode having a plurality of apertures systematically arranged in rows which are scanned in lines by the electron beams parallel to said given direction, a display screen having portions which luminesce in different colors when struck by an incident electron beam

passing through an aperture in the color selection electrode, a line in a direction at right angles to the scanning lines on the display screen and a line joining a row of sequential apertures in the color selection electrode forming an angle lying betwen 5° and 10°.

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