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Van Den Avoort

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[54] **CATHODE-RAY TUBE HAVING INDEXING STRIPS ON THE SCREEN FOR DETERMINING THE POSITION OF THE ELECTRON BEAM**

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[51] **Int. Cl.** **H01j 29/18**

[58] **Field of Search** ..... 313/92 BI; 174/5.4 H, 5.4 F; 315/10

[56] **References Cited**

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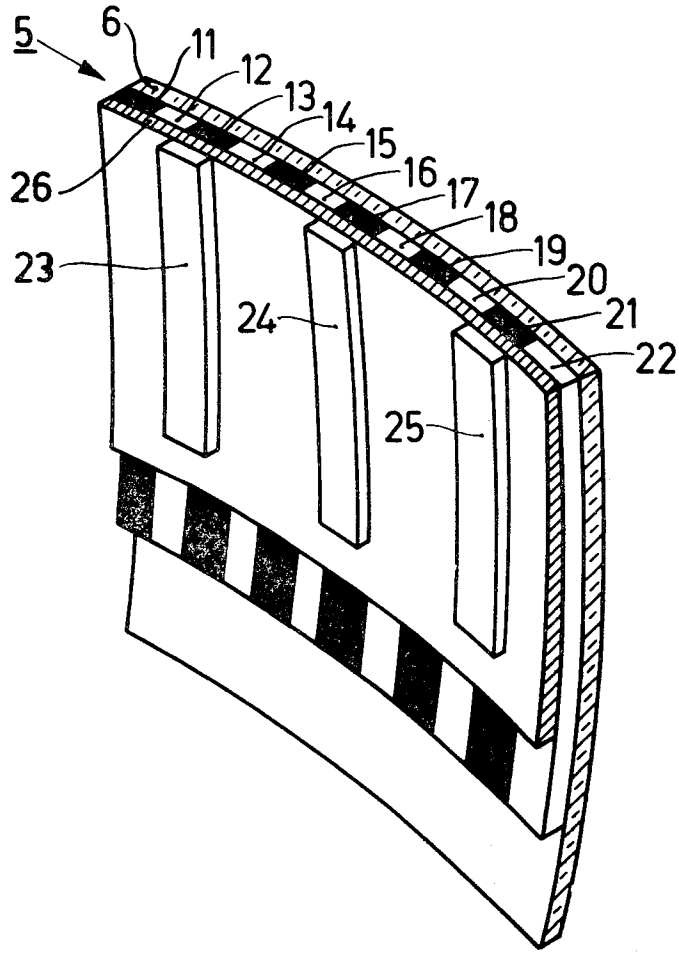
[57] **ABSTRACT**

A cathode-ray tube having indexing strips for determining the position of the electron beam. The width of the indexing strips increases in the direction of the edge of the screen in order to make the amplitude of the indexing signal emitted by the indexing strips and received by a pick-up element independent as readily as possible of the place where the electron beam impinges upon the screen.

3 Claims, 2 Drawing Figures



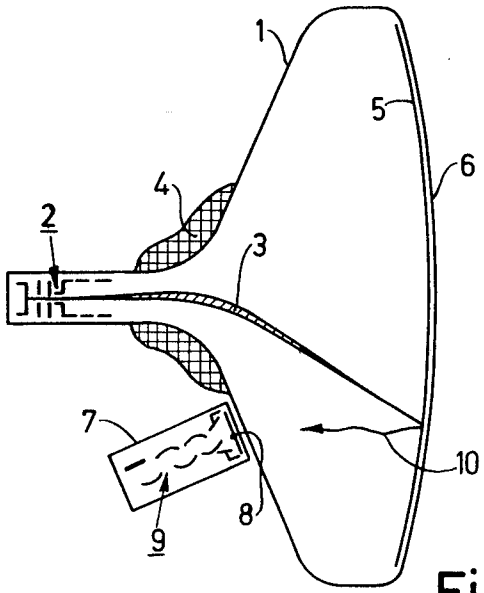


Fig.1

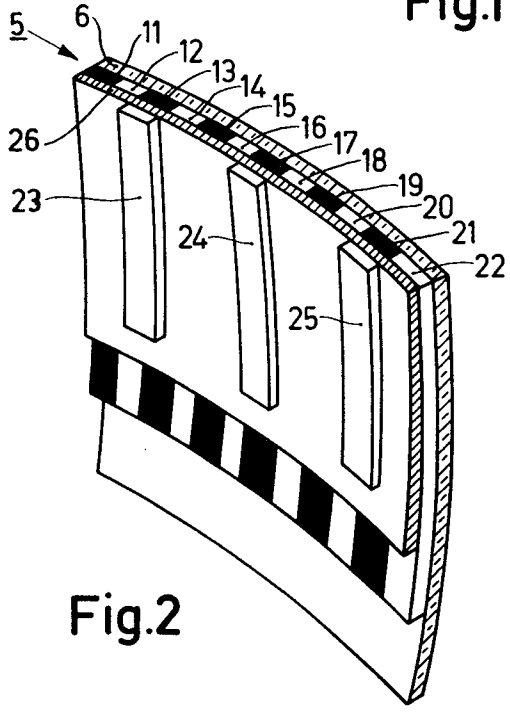


Fig.2

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CATHODE-RAY TUBE HAVING INDEXING STRIPS ON THE SCREEN FOR DETERMINING THE POSITION OF THE ELECTRON BEAM

The invention relates to a cathode-ray tube comprising a fluorescent screen having indexing strips for determining the position of an electron beam by means of radiation emitted by the indexing strips under the influence of the electron beam.

Such a cathode-ray tube is used, for example, for colour television. The screen is then scanned by the electron beam under the influence of deflection means according to a frame of parallel lines. The fluorescent screen comprises a pattern of phosphor strips normal to the scanning lines and separated by inactive strips, the phosphor strips each luminescing under the influence of the electron beam in one of three primary colours. A very thin conductive layer is present on the phosphor strips which passes the electron beam and reflects light of the phosphor strips in the direction of the viewer of the television picture. On this conductive layer located at the inside of the cathode ray tube, a layer with indexing strips is present. Each indexing strip is preferably present opposite to an inactive strip. The indexing strips are provided, for example, after every other inactive strip. The indexing strips comprise a phosphor which preferably luminesces in a part of the spectrum which can easily be separated from the part of the spectrum of the said three primary colours, preferably in the ultraviolet range. The light pulse which is emitted by each indexing strip when the electron beam passes and which forms the so-called indexing signal, is received by a pick-up element in the form of a photomultiplier having a photo cathode succeeded by an electron multiplier. The signal supplied by the pick-up element is handled electronically and used for determining the position of the electron beam. In this manner the current intensity of the electron beam when it passes a given phosphor strip can be controlled with the colour signal of the associated colour and a colour television picture is obtained.

The pick-up element is generally present outside the cathode-ray tube and receives the indexing signal via a light-pervious part of the wall of the cone of the tube. It is obvious that, with a larger maximum deflection angle upon scanning the screen, larger differences will occur in the space angle at which the photo cathode of the pick-up element is seen from various points of the screen. This results in great differences in the quantity of light of the indexing strips received by the pick-up element if, as is usual, said strips have substantially the same width everywhere. This effect occurs in particular with short cathode-ray tubes having large screens and hence large deflection angles and it is just this type of tube that is most desirable for practical reasons.

The drawbacks of the effect are as follows: first of all, the signal-to-noise ratio of the indexing signal originating from the edges of the screen is smaller than the signal-to-noise ratio of the indexing signal originating from the center of the screen. Secondly, the load of the photocathode of the pick-up element increases according as the indexing signal originating from the centre of the screen is larger and this must be chosen to be large to receive still sufficient signal from the edge. Thirdly, the electronic circuit which handles the indexing signal must be capable of handling a large amplitude range without introducing phase shift.

It is the object of the invention to mitigate the above-mentioned drawbacks.

According to the invention, in a cathode-ray tube comprising a fluorescent screen having indexing strips for determining the position of an electron beam by means of radiation emitted by the indexing strips under the influence of the electron beam, the respective widths of the indexing strips gradually increases from an imaginary point on the screen in the direction of the edge of the screen.

By making the indexing strips wider towards the edge of the screen, the indexing signal received by the photo-cathode of the pick-up element has much smaller variations in amplitude as a function of the place on the screen than in the case without application of the invention. The imaginary point should then lie in the proximity of the point of intersection of the axis of the photomultiplier with the fluorescent screen and will generally be situated in the proximity of the centre of the screen. Very small variations of the indexing signal are obtained for practical tubes if the ratio of the maximum and the minimum width of the indexing strip is at least about 1.5.

In a cathode-ray tube according to the invention comprising a screen having phosphor strips luminescing in different colours, the phosphor strips are preferably wider in the proximity of the imaginary point than at the edge of the screen.

This becomes possible in that at the area where the width of the indexing strips is small, the inactive (non-luminescing) strips may also be narrow and more space is available for the phosphor strips. As a result of this a better adaptation of the width of the phosphor strips to the width of the electron beam throughout the screen is possible.

In order that the invention may be readily carried into effect it will now be described in greater detail, by way of example, with reference to the accompanying drawing, in which:

FIG. 1 shows a cathode-ray tube according to the invention which is provided with a pick-up element and

FIG. 2 shows a part of the screen of said tube on an enlarged scale.

The cathode-ray tube shown in FIG. 1 comprises in an envelope 1 an electron gun 2 for producing an electron beam 3 which is deflected under the influence of deflection coils 4 over the fluorescent screen 5 on the window 6 of the tube. Secured to the tube is a pick-up element 7 having a photo-cathode 8 and an electron multiplier 9. The point of intersection of the axis of the pick-up element 7 with the screen 5 lies in the proximity of the centre of the screen 5. By the indexing strips which will be described in greater detail with reference to FIG. 2, light is emitted which is denoted symbolically by the arrow 10 and which impinges upon the photo cathode 8. The stream of photo electrons emitted by the photo cathode 8 is amplified in the electron multiplier 9 and constitutes an amplified indexing signal for controlling the electron beam 3. The control is effected in otherwise known manner and is not further indicated.

FIG. 2 shows a part of the screen 5 on the window 6. The window 6 is of glass and the screen comprises the phosphor strips 12, 14, 16, 18, 20 and 22 which luminesce in red, blue, green, red, blue and green, respectively, under the influence of an electron beam. Inactive strips 11, 13, 15, 17, 19 and 21 are present be-

tween the phosphor strips. On the layer of phosphor strips and inactive strips a thin layer **26** is present which passes electrons and reflects light of the phosphor strips in the direction of the window **6.** Indexing strips **23, 24** and **25** on the layer **26** emit light to the pick-up element **7** (FIG. **1**) in the direction of the arrow **10** (FIG. **1**) under the influence of the electron beam.

A screen, which is, for example, 52 cm wide, comprises approximately 420 triplets having a rod, a blue and a green phosphor strip separated by inactive strips. Opposite to every other inactive strip is an indexing strip. The width of the central indexing strips in the centre of the screen is approximately 0.1 mm and at the edge of the screen it is approximately 0.15 mm. The width of the indexing strips at the edge of the screen is approximately 0.15 mm in the centre of the strip and approximately 0.2 mm at the ends. The respective widths of the indexing strips regularly increase between the places on the screen from the centre of the screen towards the edge.

I claim:

1. An improved cathode ray tube apparatus comprising:

a. an evacuated envelope having a window portion;

b. a fluorescent screen located within said envelope at said window portion and comprising a plurality of phosphor strips characterized in that various ones of said strips luminesce in different colors in response to electron impingement, said screen further comprising an electron permeable light reflecting layer disposed over the side of said phosphor strips remote from said window, and a number of discrete indexing strips disposed on said light reflecting layer and emitting radiation in response to electron impingement thereon;

c. means for directing a scanning electron beam to said screen; and

d. means for indexing said electron beam on said screen, said means comprising a pick-up element responsive to and arranged to receive radiation emitted from said indexing strips, the axis of said pick-up element intersecting said screen at an imaginary point,

wherein the improvement comprises:

said indexing strips having individual widths increasing with increasing distance from said imaginary point in the direction toward the edge of said screen, the axes of said phosphor strips and said indexing strips being transverse to the scanning direction of said electron beam.

2. A cathode ray tube apparatus as defined in claim **1,** wherein the ratio of the maximum and minimum individual width values of said indexing strips is at least about 1.5.

3. A cathode ray tube apparatus as defined in claim **1,** wherein ones of said phosphor strips proximate said imaginary point are greater in width than others of said phosphor strips located at the edge of said screen.

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