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3,071,706

PLURAL BEAM CATHODE RAY TUBE

Filed Nov. 21, 1956

2 Sheets-Sheet 1

FIG. 1

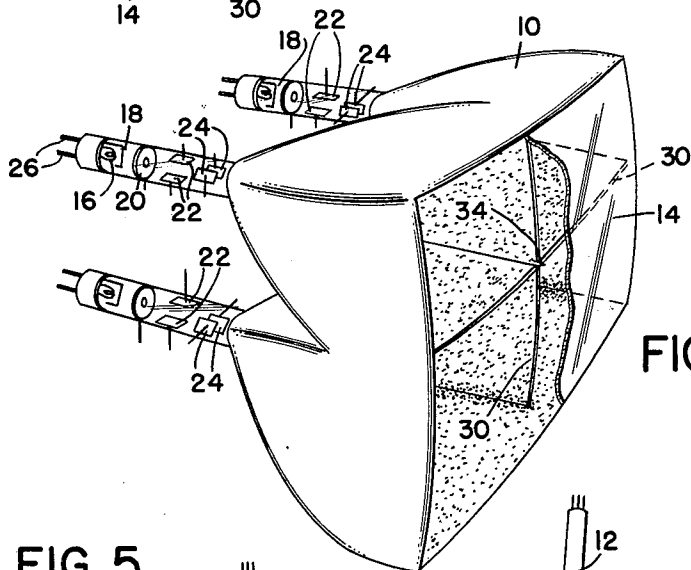
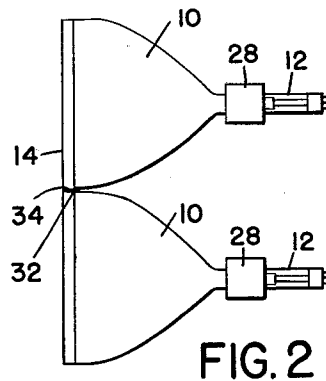
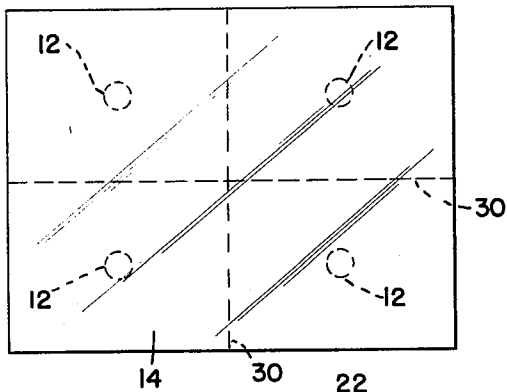


FIG. 5

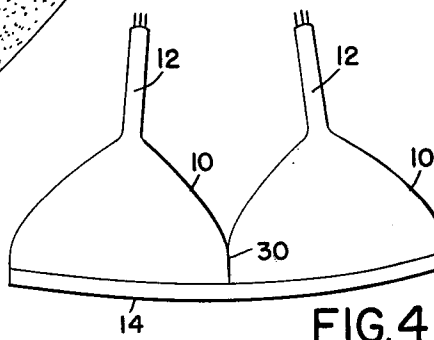
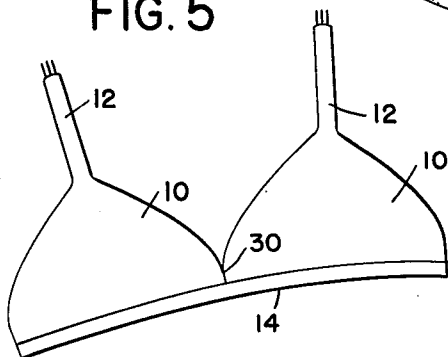


FIG. 4

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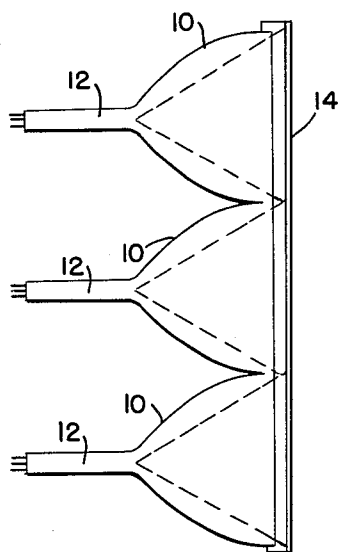


FIG. 6

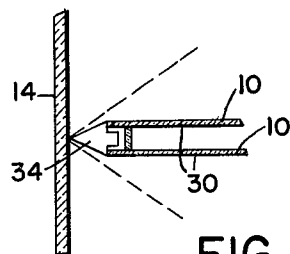


FIG. 8

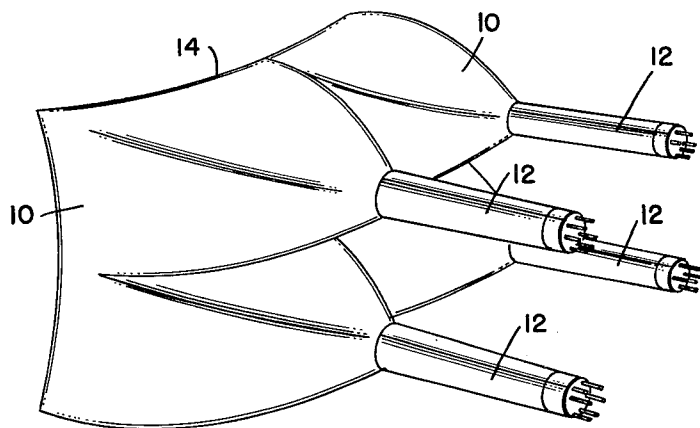


FIG. 7

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PLURAL BEAM CATHODE RAY TUBE

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3 Claims. (Cl. 313-70)

This invention is concerned with apparatus and methods relating to cathode ray techniques and is particularly directed to the production of displays covering areas in excess of those heretofore produced electronically.

There are definite limitations on the size of a display that can be produced with a single cathode, involving voltages, brightness of the image, deflection angles, distortion and physical size. Whereas efforts have been made to overcome these limitations through the use of optical projections as will be exemplified by the disclosure of the patent to Goldsmith, No. 2,219,149, dated October 22, 1940, various optical problems have been encountered which adversely affect the quality of the final image.

There is a growing demand for large displays of high quality in conjunction with educational television, advertising and audience presentation of all kinds.

Accordingly, it is among the objects of the present invention to provide cathode tubes and methods of operating them whereby relatively large images are produced electronically for direct viewing, free of distortion and of generally high quality.

The cathode ray tube contemplated comprises an envelope having a continuous luminescent screen, a plurality of electron-stream-emitting cathodes supported within the envelope, and horizontal and vertical deflecting means independently controlling the electron stream of each of the cathodes for directing each such electron stream over a fractional portion of the screen not exceeding half its area. Whereas the invention is applicable to tubes involving only two cathodes, it is particularly suitable where three or more cathodes are employed. The cathodes may be arranged in a plurality of vertically spaced rows or in a plurality of horizontally spaced columns or both and the envelope preferably contains one or more partitions separating the cathodes from one another and extending to points in spaced relationship to the screen so that registry of the independent images can be secured in order that the composite display will appear to be continuous. Such partition means will provide one or more supports extending to the screen itself and engaging it over a relatively small area for purposes of physical support.

The screen itself may be of various configurations including externally convex and externally concave, and the curvature may exist in one or two dimensions.

The arrangement of the cathodes is preferably symmetrical with respect to at least one plane or axis and in many applications with respect to two planes or axes perpendicularly disposed.

The invention also contemplates a method of producing an image comprising bombarding a single luminescent screen with a plurality of electron streams, separately controlling each of the streams in two dimensions to produce a fraction of an image complementing fractions similarly produced by each of the other streams, and maintaining each fractional image contiguous to each fractional image adjacent thereto.

A more complete understanding of the invention will follow from a description of the accompanying drawings wherein:

FIG. 1 is a front elevation depicting a cathode ray tube comprising four guns;

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FIG. 2 is a side elevation of the cathode tube depicted in FIG. 1;

FIG. 3 is a perspective view of a tube of the type depicted in FIG. 1 but having a screen which is convex in two dimensions;

FIG. 4 is a plan view of the tube shown in FIG. 3;

FIG. 5 is a similar plan view depicting a modified tube having a concave screen;

FIG. 6 is an elevation depicting a cathode tube having in excess of two guns in at least one dimension;

FIG. 7 is a perspective view from the rear of a cathode tube having a screen which is externally concave in two dimensions; and

FIG. 8 is a fragmentary view, partially in section, depicting a detail.

The cathode tube depicted by the drawings in each case comprises a plurality of bodies 10, each having a neck 12 and common to these bodies, a continuous luminescent screen 14. Each neck will contain conventional electrodes such as a cathode 16, a control electrode 18, an anode 20, vertical deflecting elements 22 and horizontal deflecting elements 24, provided with termini 26 in accordance with established practice. As depicted in FIG. 3, the deflecting electrodes have been portrayed as of the capacitance type whereas in FIG. 2 a magnetic winding 28 has been indicated.

The partitions 30 separating the guns from one another extend forwardly towards the screen 14 but are terminated by edges 32 disposed in spaced relationship to the screen so that the areas scanned by the several guns can be made to register with a minimum degree of discontinuity, the paths of the electron streams having been indicated by broken lines in FIGS. 6 and 8. Where the area of the screen is appreciable however, a suitable number of projections 34 will be provided by the partition or partitions to physically support the screen against collapse, as best depicted in FIG. 8. The supporting element 34 may be formed of glass or any other suitable material and may be fused to the glass walls constituting the partition 30 for engagement with the rear surface of the screen 14. The area of engagement between the supporting projection 34 and the screen may approach a point or line contact to preserve as far as possible the impression of continuity of the image presented by the several electron streams produced by the cathodes.

As compared with the externally flat screen of FIG. 2 and the externally concave screen of FIG. 4, the screen of FIG. 5 is externally concave. As shown in FIG. 7, the screen 14 is concave in two dimensions at right angles to one another.

In each case, the construction and materials contemplated for the tubes will follow conventional practice, but for example, it can be assumed that the necks and bodies will be composed of glass or metal, the screens being composed of glass coated on their inner surfaces with luminescent material which will be excited by the electron streams to produce a picture or other display.

In accordance with the present invention, each gun will produce on its portion of the screen a fragmentary or fractional image maintained in registration with adjacent images to produce a composite image covering the entire screen. It is of great importance that each cathode be provided with deflecting electrodes which will control the electron stream in two dimensions and independently of the deflecting electrodes of the other guns. The importance of this arrangement will be emphasized by reference to the patents to Kwartin, No. 2,055,174, dated September 22, 1936, and Schlesinger, No. 2,083,203, dated June 3, 1937, wherein the use of common deflecting electrodes for at least one dimension would prevent registration of the character necessary to produce displays of

large areas of the order contemplated by the present invention.

It is also advantageous to provide the partitions 30 with the customary coatings internally thereof so as to render the electron streams emanating from the respective guns independent of the deflecting electrodes of adjacent guns.

In constructing tubes of the type contemplated herein, the bodies 10, necks 12, and gun assemblies may be formed in accordance with procedures employed in producing conventional television receiving tubes, the bodies being then suitably secured together, following which the common screen 14 will be fused or otherwise secured to the bodies in fluid-tight relationship, whereupon the envelope so formed can be evacuated in a conventional manner.

Whereas only a few forms contemplated by the present invention have been illustrated and described, there is no intention that the examples be construed as limiting beyond the scope of the appended claims.

I claim:

1. A cathode ray tube comprising an envelope having a continuous luminescent screen substantially rectangular in elevation, at least four electron-stream-emitting cathodes supported within said envelopes, and horizontal and vertical deflecting means independently controlling the electron stream of each of said cathodes for directing each said electron stream over a fractional portion of said screen contiguous to at least two similar portions produced by the streams of cathodes adjacent thereto, said cathodes being arranged in a grid pattern of parallel rows each containing at least two cathodes, and parallel columns

perpendicular to said rows and each containing at least two cathodes, and partition means separating said cathodes and extending entirely across said envelope to points closely adjacent said screen.

2. A cathode ray tube as set forth in claim 1 wherein said partition means includes a plurality of perpendicular partitions.

3. A cathode ray tube comprising an envelope having side walls supporting a continuous luminescent screen, a plurality of electron-stream-emitting cathodes supported within said envelope, horizontal and vertical deflecting means independently controlling the electron stream of each of said cathodes for directing each said electron stream over a fractional portion of said screen contiguous to at least two similar portions produced by the streams of cathodes adjacent thereto, partition means separating said cathodes to points in spaced relationship to said screen, and a support carried by said partition means engaging a relatively small area of said screen in spaced relationship to said side walls.

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