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CATHODE RAY DISPLAY TUBE WITH IMPROVED CHARACTER SELECTION

Filed July 28, 1955

2 Sheets-Sheet 1

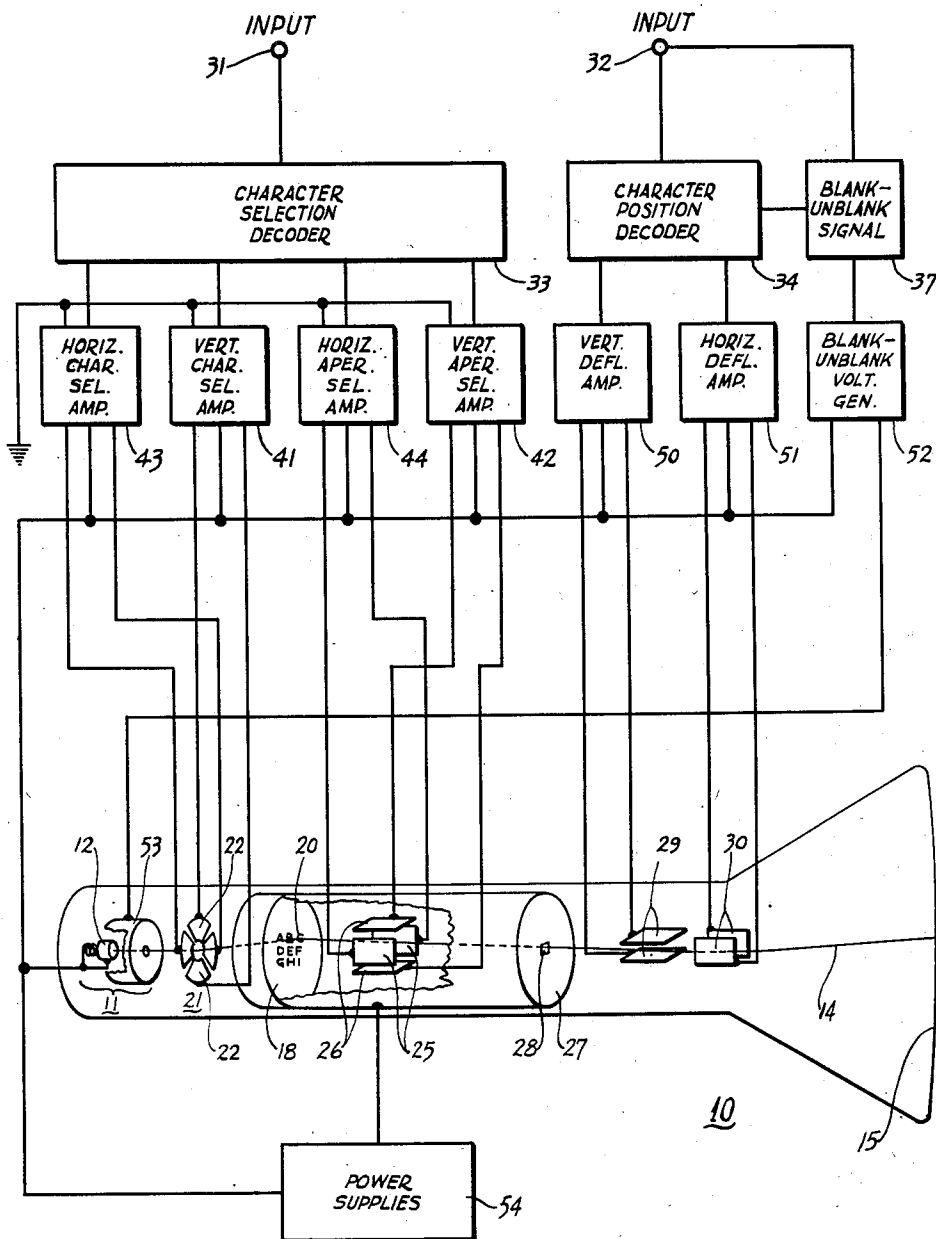


FIG. 1

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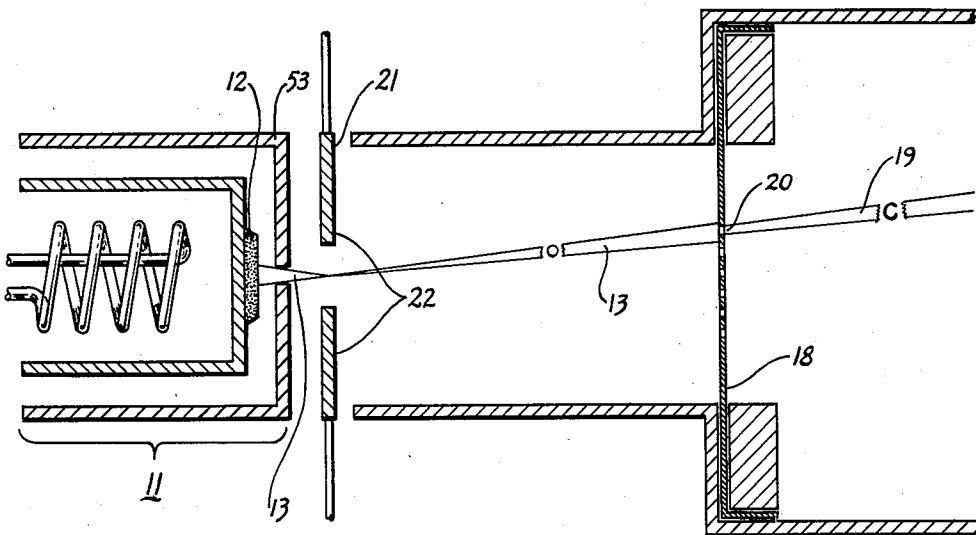


FIG. 2

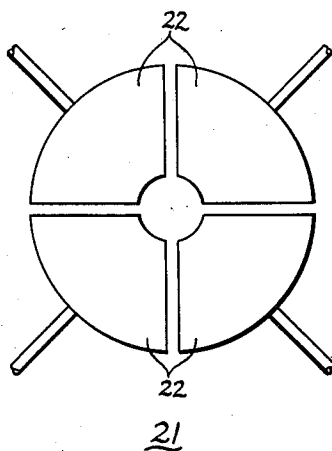


FIG_3

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1

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CATHODE RAY DISPLAY TUBE WITH IMPROVED CHARACTER SELECTION

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7 Claims. (Cl. 313—69)

This invention relates generally to cathode ray display tubes and more particularly the selection of predetermined character for presentation upon a target or screen.

The cathode ray display tube is generally described in the co-pending application of J. T. McNaney Serial No. 297,480, assigned to the common assignee hereof, in which an electron beam is emitted from a beam generating means, such as a cathode, and deflected to select one or more characters defined by a plurality of predetermined shaped openings formed in a beam shaping member. The electron beam, accordingly, is shaped into a cross sectional shaped electron stream whose cross section corresponds to that of the opening illuminated. The electron stream's cross sectional shape is then presented visually upon the screen of the tube as a character. In this art, an electron beam of relatively small cross sectional area is formed and accelerated, along the optical axis of the tube toward the target. The beam is usually accelerated to a predetermined velocity prior to the selection of character from the character shaping means. At the moment of illumination of the character shaped opening, the electron beam has its individual electrons traveling at a considerable predetermined velocity. Therefore, controlling the electron beam at this velocity generally results in considerable difficulties affecting proper selection of the character in the character shaping means. The present invention overcomes these disadvantages.

In the present invention, the electron beam is deflected as it leaves the beam generating means or cathode. The beam adjacent the cathode is traveling at a relatively slow velocity. An electrical field positioned adjacent the cathode about the beam, exerts flux intensities considerably less than utilized in prior art to effect desired beam deflection.

Accordingly, this invention utilizes a selection means positioned adjacent the cathode which preferably comprises a plurality of insulated segments. The selection means, comprising the segments, is generally annular in shape. These segments positioned about the slow moving beam near the cathode, effects deflection of the beam with relatively small field intensities.

In addition to the lesser power requirements needed to effect selection, the overall length of the tube along with the tube optics may be reduced considerably over that shown in the co-pending application Serial No. 297,480. This results in shortening electron beam travel, less cathode usage, and better control of the electron beam.

A modification of the present invention includes an enlargement of the beam cross-section in relation to the cross-section of the shaped opening and utilizes the enlarged beam to illuminate a plurality of character shaped openings in a manner similar to that described in my co-pending application Serial No. 414,551, now Patent No. 2,761,988 assigned to the common assignee hereof. The resultant plurality of electron streams contains a plu-

2

ality of character cross-sections. A desired electron stream is selected from the resultant electron streams by effecting a predetermined positioning of the desired stream through an aperture of an apertured electrode. For purposes of this modification, it is only necessary that a portion of the total beam shaping member be illuminated in the general area of the desired character, all of the electron streams resulting are then deflected to effect selection of the desired stream through the aperture for presentation of its cross-section as a character upon the screen.

In addition to the aforementioned objects and advantages it is also an object of this invention to provide an improved and simplified cathode ray display tube which utilizing the electron beam in a more advantageous and efficient manner.

Another object of this invention is to provide a new and improved selection means for selecting predetermined characters from a shaping means.

Another object of this invention is to provide an improved selection means which also acts as an accelerating electrode.

Another object of this invention is to provide a selection means which may deflect the electron beam immediately adjacent the generating means.

Another object of this invention is to provide an improved selection means for selecting predetermined characters from a shaping means and permitting elimination of the undesirable portions of the beam from presentation.

Objects and advantages other than those set forth above will be apparent from the following description when read in connection with the accompanying drawings in which:

Figure 1 is a view of a cathode ray display tube embodying the invention and showing a simplified means for energizing the cathode ray tube;

Figure 2 is a view of an enlarged cross-section of a portion of the display tube;

Figure 3 is a view in elevation of the preferred selection means.

The cathode ray display tube 10 of Figure 1 is an evacuated container having therewithin beam generating means 11 shown herein as an indirectly heated cathode 12 positioned at one end of the tube. Cathode 12 supplies a beam of electrons 13 directed along a given path 14 toward target 15. Interposed between beam generating means 11 and target 15 is a beam shaping member 18. Member 18 is selectively illuminated by the beam 13 either for deriving a single electron stream 19 or for simultaneously deriving a plurality of shaped electron streams 19 therefrom. The electron beam 13 having substantially uniform circular cross sectional area is shaped by member 18 into the electron stream 19 having a cross sectional shape corresponding to that illuminated in the member 18. This is effected by beam shaping member 18 through a pattern of character-shaped openings 20 formed in member 18. Each of the openings 20 has a cross-section corresponding to a desired character whose overall cross-section is of a size less than the cross sectional area of the electron beam 13. These openings 20 may be aligned in substantially cartesian coordinates alignment, or any other alignment desired.

Positioned intermediate the beam generating means 11 and the beam shaping member 18 is a selection means 21. Selection means 21 may be positioned immediately adjacent generating means 11 to selectively direct the electron beam to illuminate one or a plurality of predetermined character-shaped openings 20. The selection means 21 includes a plurality of segments 22 electrically insulated from each other, but formed into an annular form in any known manner such as embedding in an

insulator (not shown). These segments 22 may be utilized to effect differential deflection of the electron beam therebetween by placing differential voltages on opposing pairs of segments 22. The embodiment in Figure 3, however, utilizes four equally shaped segments 22 positioned about the electron beam 13 to effect selective differential positioning of the electron beam to illuminate a desired portion of the beam shaping member 18. The selection means 21 being positioned adjacent the beam generating means 11 effects deflection of the electron beam 13 at low beam velocity and further aids in acceleration of beam 13. The selection means further effects more efficient cathode beam usage by permitting closer spacing of the shaping member 18 to the cathode 12.

The shaped streams, resulting from the shaping action imparted to the beam by the shaping member 18, enter a deflection means which may be of electromagnetic or electrostatic design as is well known in the art is shown here as electrostatic and having horizontal and vertical deflection plates 25, 26, respectively. In the preferred embodiment, deflection means 25, is utilized to select a predetermined shaped stream 19 to pass through an aperture 28 in an aperture selection electrode 27. Electron stream 19 is subsequently deflected by a positioning means, which may also be of an electromagnetic or electrostatic design but is shown here as electrostatic and having vertical and horizontal deflection plates 29, 30. The position deflection plates 29, 30 effect positioning of the desired character shaped stream 19 passing through aperture 28 to predetermined positions upon the target 15.

The present invention also contemplates the omission of the deflection means 25, 26 and the apertured electrode 27 when the beam 13 illuminates only a single opening 20. The resulting stream 19 may then be positioned on the target by the positioning means 29, 30.

Referring to Figure 1, the various portions of the display tube 10 are shown connected with an illustrated energizing circuitry shown in block form but similar to that shown in my co-pending applications Serial Numbers 297,480 and 414,551. Generally speaking, the inputs 31, 32 may be received from any desired type of coded information to be presented as predetermined characters on the target 15. The inputs 31, 32 are presented to character selection decoder 33 and character position decoder 34 for decoding into vertical and horizontal selection and deflection signals along with the desired spacings intermediate these signals. The spacing signals are presented to a blank-unblank signal generator 37.

The resulting vertical selection signals from the selection decoder 33 are presented to a vertical character selection amplifier or selector 41 and vertical aperture selection amplifier or selector 42. The output voltage of the vertical character selector 41 is presented to opposing segments 22 of the selection means 21. The output voltages of the vertical aperture selector 42 are presented to opposing vertical deflection plates 25.

The horizontal selection signal from the selection decoder 33 is presented to a horizontal character selection amplifier or selector 43 and a horizontal aperture selection amplifier or selector 44. The horizontal character selector 43 supplies the necessary voltages to the remaining pair of opposing segments 22. Horizontal aperture selector 44 presents the necessary voltage signals to the opposing horizontal deflection plates 26. The vertical and horizontal positioned deflection signals from the position decoder 34 are amplified by vertical positioned deflection amplifier 50, 51 to predetermined voltages for application to the respective vertical and horizontal deflection plates 29, 30. Vertical and horizontal deflection plates 29, 30 effect predetermined positioning of the character cross-section upon the target 15.

A conventional blank-unblank signal from generator

37 is amplified to predetermined voltages by voltage generator 52. The resultant voltage from generator 52 is presented to a grid 53 in the generating means 11 to effect blank-unblank of the tube 10, intermediate presentations as is well known in the cathode ray art. The various selectors, voltage amplifiers, voltage generators and predetermined voltages necessary to operate the elements of the tube 10 are supplied from a power supply 54.

It should be apparent from the disclosure herein set forth that the particular novel selection means 21 may be utilized in combination with the aperture selection electrode 27 and its deflection means 25, 26 or without them. However, without them, the cross sectional area of the electron beam limits the size of the characters in the member 18. That is, the electron beam must have a cross sectional area only slightly in excess of the cross sectional area of the character shaped opening 20 to be illuminated to obtain a single shaped stream corresponding in cross section to that of the opening 20. However, with the electrode 27 and deflection means 25, 26 it is possible to utilize the normal beam cross section resulting from the beam generating means 11 to effect illumination of a plurality of openings 20 thereby making more efficient use of the cathode 12. The resulting plurality of streams 19 are deflecting by deflecting means 25, 26 to position the desired stream through the aperture 28 in the aperture selection electrode 27. As aperture 28 is normally positioned along the longitudinal axis of the tube 10 the stream selected will enter the positioning means 29, 30 on axis to be deflected by the horizontal and vertical positioning deflection plates 29, 30 to any desired predetermined position upon the target 15 with minimal distortion.

In this manner, that is by utilizing only the centermost stream 19 from the plurality of openings 20 illuminated, the stream 19 will be of uniform density and maximum intensity. This greatly improves the clarity of the characters and eliminates the undesirable portions of the electron stream 19 from the presentation on the target or screen 15.

The particular embodiment of the invention illustrated and described herein is illustrative only and the invention includes such other modifications and equivalents as may readily appear to those skilled in the art within the scope of the appended claims.

I claim:

1. A cathode ray display tube comprising beam generating means for supplying and directing a beam of electrons along a given path, a target adapted to receive electrons, a beam shaping member positioned across the path of electrons, said member having character shaped openings for deriving predetermined shaped electron streams from said electron beam, selection means intermediate the beam generating means and the beam shaping member for selectively directing the electron beam to illuminate at least one of the shaped openings, said selection means including a plurality of electrically insulated segments encompassing said electron beam, an electrode positioned intermediate said target and said beam shaping member, said electrode having an aperture therein, said aperture being adapted to pass a predetermined electron stream, deflection means for positioning the predetermined electron stream through said aperture, and positioning means for deflecting the electron stream from said aperture to predetermined positions on said target.

2. A cathode ray display tube comprising beam generating means for supplying and directing a beam of electrons along a given path, a target adapted to receive electrons, a beam shaping member positioned across the path of electrons, said member having character shaped openings for simultaneously deriving a plurality of predetermined shaped electron streams from said electron beam, selection means intermediate the beam generating means and the beam shaping member for selectively directing the electron beam to illuminate a predetermined plurality of

5

shaped openings, said selection means including a plurality of electrically insulated segments encompassing said electron beam, an electrode positioned intermediate said target and said beam shaping member, said electrode having an aperture therein, said aperture being adapted to pass a predetermined electron stream, deflection means for positioning the predetermined electron stream through said aperture, and positioning means for deflecting the electron stream from said aperture to predetermined positions on said target.

3. A cathode ray display tube comprising beam generating means for supplying and directing a beam of electrons along a given path, a target adapted to receive electrons, a beam shaping member positioned across the path of electrons, said member having character shaped openings for deriving predetermined shaped electron streams from said electron beam, selection means positioned adjacent the generating means and intermediate the beam generating means and the beam shaping member for selectively directing and accelerating the electron beam to illuminate at least one of the shaped openings, said selection means including a plurality of electrically insulated segments encompassing said electron beam, an electrode positioned intermediate said target and said beam shaping member, said electrode having an aperture therein, said aperture being adapted to pass a predetermined electron stream, deflection means for positioning the predetermined electron stream through said aperture, and positioning means for deflecting the electron stream from said aperture to predetermined positions on said target.

4. A cathode ray display tube comprising beam generating means for supplying and directing a beam of electrons along a given path, a target adapted to receive electrons, a beam shaping member positioned across the path of electrons, said member having character shaped openings for deriving predetermined shaped electron streams from said electron beam, selection means intermediate the beam generating means and the beam shaping member for selectively directing the electron beam to illuminate at least one of the shaped openings, said selection means being annular in form and including a plurality of segments electrically insulated from each other and encompassing said electron beam, an electrode positioned intermediate said target and said beam shaping member, said electrode having an aperture therein, said aperture being adapted to pass a predetermined electron stream, deflection means for positioning the predetermined electron stream through said aperture, and positioning means for deflecting the electron stream from said aperture to predetermined positions on said target.

5. A cathode ray display tube comprising beam generating means for supplying and directing a beam of electrons along a given path, a target adapted to receive electrons, a beam shaping member positioned across the path of electrons, said member having character shaped openings for deriving predetermined shaped electron streams from said electron beam, an annular selection means intermediate the beam generating means and the beam shaping member for selectively directing the electron beam to illuminate at least one of the shaped openings, said selection means including four segments each electrically insulated from the other and encompassing said

6

electron beam, opposing segments being adapted to cause differential positioning of the beam, an electrode positioned intermediate said target and said beam shaping member, said electrode having an aperture therein, said aperture being adapted to pass a predetermined electron stream, deflection means for positioning the predetermined electron stream through said aperture, and positioning means for deflecting the electron stream from said aperture to predetermined positions on said target.

6. A cathode ray display tube comprising beam generating means for supplying and directing a beam of electrons along a given path, a target adapted to receive electrons, a beam shaping member positioned across the path of electrons, said member having character shaped openings aligned in substantially cartesian coordinates for deriving predetermined shaped electron streams from said electron beam, each of said openings having a cross sectional area less than the cross sectional area of the electron beam an annular selection means intermediate the beam generating means and the beam shaping member for selectively directing the electron beam to illuminate at least one of the shaped openings, said selection means including four segments each electrically insulated from the other and encompassing said electron beam, opposing segments being adapted to cause differential positioning of the beam, substantially along the cartesian coordinates of said member an electrode positioned intermediate said target and said beam shaping member, said electrode having an aperture therein, said aperture being adapted to pass a predetermined electron stream, deflection means for positioning the predetermined electron stream through said aperture, and positioning means for deflecting the electron stream from said aperture to predetermined positions on said target.

7. A cathode ray display tube comprising beam generating means for supplying and directing a beam of electrons along a given path, a target adapted to receive electrons, a beam shaping member positioned across the path of electrons, said member having character shaped openings for deriving predetermined shaped electron streams from said electron beam, an annular selection means intermediate the beam generating means and the beam shaping member for selectively directing the electron beam to illuminate a plurality of the shaped openings, said selection means including four segments each electrically insulated from the other and encompassing said electron beam, opposing segments being adapted to cause differential positioning of the beam, an electrode positioned intermediate said target and said beam shaping member, said electrode having an aperture therein, said aperture being adapted to pass a single predetermined electron stream, deflection means for positioning the electron streams to cause a centrally located electron stream to pass through said aperture, and positioning means for deflecting the electron stream from said aperture to predetermined positions on said target.

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