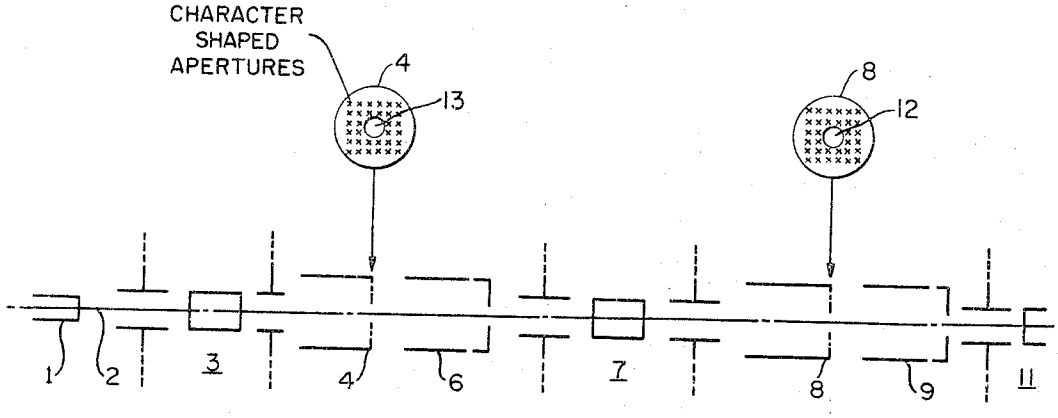
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CATHODE-RAY TUBE WITH BEAM-SHAPING BARRIERS, EACH HAVING A PLURALITY OF SHAPING APERTURES AND A NON-SHAPING APERTURE

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CATHODE-RAY TUBE WITH BEAM-SHAPING BARRIERS, EACH HAVING A PLURALITY OF SHAPING APERTURES AND A NON-SHAPING APERTURE

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The present invention relates to shaped-beam cathode-ray tube circuitry and more particularly to shaped-beam cathode-ray tube circuitry which sharply increases the number of available characters which may be generated therein.

A shaped-beam cathode-ray tube is a tube which causes characters to be generated on the face of a luminescent screen or to be otherwise manifested upon a nonluminescent target screen. An electron beam generated therein is shaped or extruded by causing the beam to pass through a character matrix or beam shaping barrier having a plurality of character-shaped apertures formed therein. The beam is selectively directed at various positions upon the beam shaping barrier thereby to selectively form the various characters. Reference may be made to J. T. McNaney Patent 2,824,250, assigned to the same assignee as the present invention, for an overall description of such a system. Various methods have been developed to increase the number of available characters which may be produced by such a shaped-beam cathode-ray tube. Patent No. 3,111,598 of T. H. Tatham, Jr., assigned to the same assignee as the present invention, discloses a beam shaping matrix having a plurality of apertures having shapes corresponding to portions of various symbols or characters which are to be displayed. By using a time division technique and by taking advantage of the persistence of various luminescent screens, Tatham is able to build up numerous characters by means of these partial segments. Another solution is disclosed in patent application Ser. No. 383,385, of John H. Brown, filed July 17, 1964, and assigned to the same assignee as the present invention. In this application, mechanical means are provided for sequentially positioning various character matrices or beam shaping barriers in the path of the electron beam so as to provide for more characters than may be formed by means of one of the matrices. Tatham's arrangement requires time division multiplex control circuitry; whereas, the method disclosed in the aforesaid patent application utilizes moving parts.

Accordingly, it is the principal object of the present invention to provide shaped-beam cathode-ray tube circuitry which generates a larger number of shaped characters than could be generated by the use of a single beam shaping matrix.

Other objects and advantages of the invention will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of the invention, reference may be had to the sole figure which discloses a preferred embodiment of the present invention.

In accordance with the present invention, first and second beam shaping barriers each having a plurality of character-shaped apertures and a central noncharacter-shaped aperture formed therein are positioned at different points along the longitudinal axis of the tube. The character-shaped apertures formed within the second beam shaping barrier differ from the character-shaped apertures formed within the first beam shaping barrier. If it is desired to shape an electron beam generated by a gun positioned at one extremity of the tube pursuant to a

character-shaped aperture formed within the first beam shaping barrier, the beam is directed through such an aperture in the first beam shaping barrier. This beam is thereafter directed through the central noncharacter-shaped aperture formed within the second beam shaping barrier and is then directed to a particular area on the target screen. On the other hand, if it is desired to shape the beam pursuant to a character-shaped aperture formed within the second beam shaping barrier, the beam generated by the gun is passed through the centrally positioned noncharacter-shaped aperture formed within the first beam shaping barrier and then is directed at a character-shaped aperture formed within the second beam shaping barrier. The beam is subsequently positioned upon a desired area on the target screen. The beam passes through both noncharacter-shaped apertures when operating in the spot writing mode.

As shown in the sole figure, electron gun **1** is positioned upon longitudinal axis **2** of the shaped-beam tube. Conventional beam positioning means **3** directs the beam to various positions upon the first beam shaping barrier **4**. Electrostatic lens system **6** thereafter references the extruded beam back upon longitudinal axis **2**. Conventional beam positioning means **7** may be thereafter utilized to cause the beam to be directed at various positions upon the second beam shaping aperture **8**. Electrostatic lens system **9** thereafter references the beam upon longitudinal axis **2**. Conventional screen positioning circuitry **11** is provided for further positioning the beam with regard to the target screen (not shown). Electrostatic lens referencing circuitry **6** and **9**, screen positioning circuitry **11**, and other peripheral equipment is more fully disclosed in the aforesaid McNaney Patent 2,824,250. The details of these circuits form no part of the present invention and accordingly have been omitted to clarify the present invention. The *x*'s shown upon the tandemly positioned character matrices or beam shaping barriers **4** and **8** represent character-shaped apertures. The character-shaped apertures. The character-shaped apertures formed within beam shaping barrier **8** will differ from the character-shaped apertures formed within barrier **4** so as to provide for the generation of a greater number of characters than could be generated by a shaped-beam tube having a single character forming matrix therein.

Let it be assumed that it is desired to generate a character manifested by a character-shaped aperture formed within matrix **4**. The appropriate X and Y deflection voltages are applied to the plates of deflection means **3** so as to direct the beam at the desired character-shaped aperture. Electrostatic lens system **6** thereafter references the extruded beam along longitudinal axis **2** of the array. The voltages applied to the plates of deflection system **7** at this time will not alter the course of the centrally positioned beam and the beam will thereafter pass through the centrally positioned noncharacter-shaped aperture **12** formed within matrix **8** and will be deflected by screen positioning circuit **11** to any desirable position upon the target screen. In the alternative, if it is desired to shape the beam in accordance with the shape of a character-shaped aperture formed within matrix **8**, the beam is not deflected by deflection system **3** and passes through centrally positioned aperture **13** of matrix **4**. The beam thereafter is directed along longitudinal axis **2** until it is deflected by deflection system **7** which directs the beam at a particular character-shaped aperture formed within matrix **8**. The extruded beam is thereafter rereferenced by electrostatic lens system **9** and is directed to a particular desired position on the target screen by screen positioning circuitry **11**. If it is desired to utilize the present invention for spot writing purposes, the beam is directed through both centrally positioned apertures **12** and **13** of the matrices.

If the time division technique mentioned hereinabove in connection with the Tatham patent should be utilized, the beam would be sequentially extruded by character-shaped apertures in both barriers thereby to even further increase the available number of characters or symbols which may be generated.

While there has been shown and described a specific embodiment of the invention, other modifications will readily occur to those skilled in the art. It is not, therefore, desired that this invention be limited to the specific arrangement shown and described, and it is intended in the appended claims to cover all modifications within the spirit and scope of the invention.

What is claimed is:

1. In a shaped-beam cathode-ray tube, an electron gun for generating and projecting an electron beam along a beam path, first and second beam shaping barriers positioned in tandem along said beam path each having a plurality of character-shaped apertures formed therein for shaping the electron beam generated by said electron gun and a non-character-shaping aperture and selection means for effecting interception of said electron beam by a character-shaped aperture in only one of said first and second beam shaping barriers.

2. In a shaped-beam cathode-ray tube, an electron gun, first and second tandemly positioned beam shaping barriers each having a plurality of character-shaped apertures and a non-character-shaped aperture formed therein, the character-shaped apertures formed within said second beam shaping barrier being different than the character-shaped apertures formed within said first beam shaping aperture, first selection means positioned between said electron gun and said first beam shaping barrier for selectively directing an electron beam generated by said electron gun at a character-shaped aperture or at said noncharacter-shaped aperture, and second selection means positioned between said first beam shaping barrier and said second beam shaping barrier for directing the beam emanating from said first beam shaping barrier selectively at a character-shaped aperture formed within said second beam shaping barrier or at said noncharacter-shaped aperture.

3. In a shaped-beam cathode-ray tube, an electron gun, first and second tandemly positioned beam shaping barriers each having a plurality of character-shaped apertures and a centrally positioned noncharacter-shaped aperture formed therein, the character-shaped apertures formed within said second beam shaping barrier being different than the character-shaped apertures formed within said first beam shaping aperture, first selection means positioned between said electron gun and said first beam shaping barrier for selectively directing an electron beam generated by said electron gun at a character-shaped aperture or at said noncharacter-shaped aperture, and second selection means positioned between said first beam shaping barrier and said second beam shaping barrier for directing the beam emanating from said first beam shaping barrier selectively at a character-shaped aperture formed within said second beam shaping barrier or at said noncharacter-shaped aperture.

4. In a shaped-beam cathode-ray tube, an electron gun, first and second tandemly positioned beam shaping barriers each having a plurality of character-shaped apertures and a noncharacter-shaped aperture formed therein, first selection means positioned between said electron gun and said first beam shaping barrier for selectively directing an electron beam generated by said electron gun at a character-shaped aperture or at said noncharacter-shaped aperture, and second selection means positioned between said first beam shaping barrier and said second beam shaping barrier for directing the beam emanating from said first beam shaping barrier selectively at a character-shaped aperture formed within said second beam shaping barrier or at said noncharacter-shaped aperture.

5. In a shaped-beam cathode-ray tube, an electron gun, first and second tandemly positioned beam shaping barriers each having a plurality of character-shaped apertures and a centrally positioned noncharacter-shaped aperture formed therein, first selection means positioned between said electron gun and said first beam shaping barrier for selectively directing an electron beam generated by said electron gun at a character-shaped aperture or at said noncharacter-shaped aperture, and second selection means positioned between said first beam shaping barrier and said second beam shaping barrier for directing the beam emanating from said first beam shaping barrier selectively at a character-shaped aperture formed within said second beam shaping barrier or at said noncharacter-shaped aperture.

6. The combination defined in claim 1 wherein the character-shaped apertures in said first barrier are different than the character-shaped apertures in said second barrier.

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