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O. F. HAMANN

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CHARACTER GENERATING SYSTEM UTILIZING A CATHODE RAY TUBE  
IN WHICH A PORTION OF A PLURALITY OF ELECTRON BEAMS ARE  
SELECTIVELY DEFOCUSSED TO FORM THE CHARACTER

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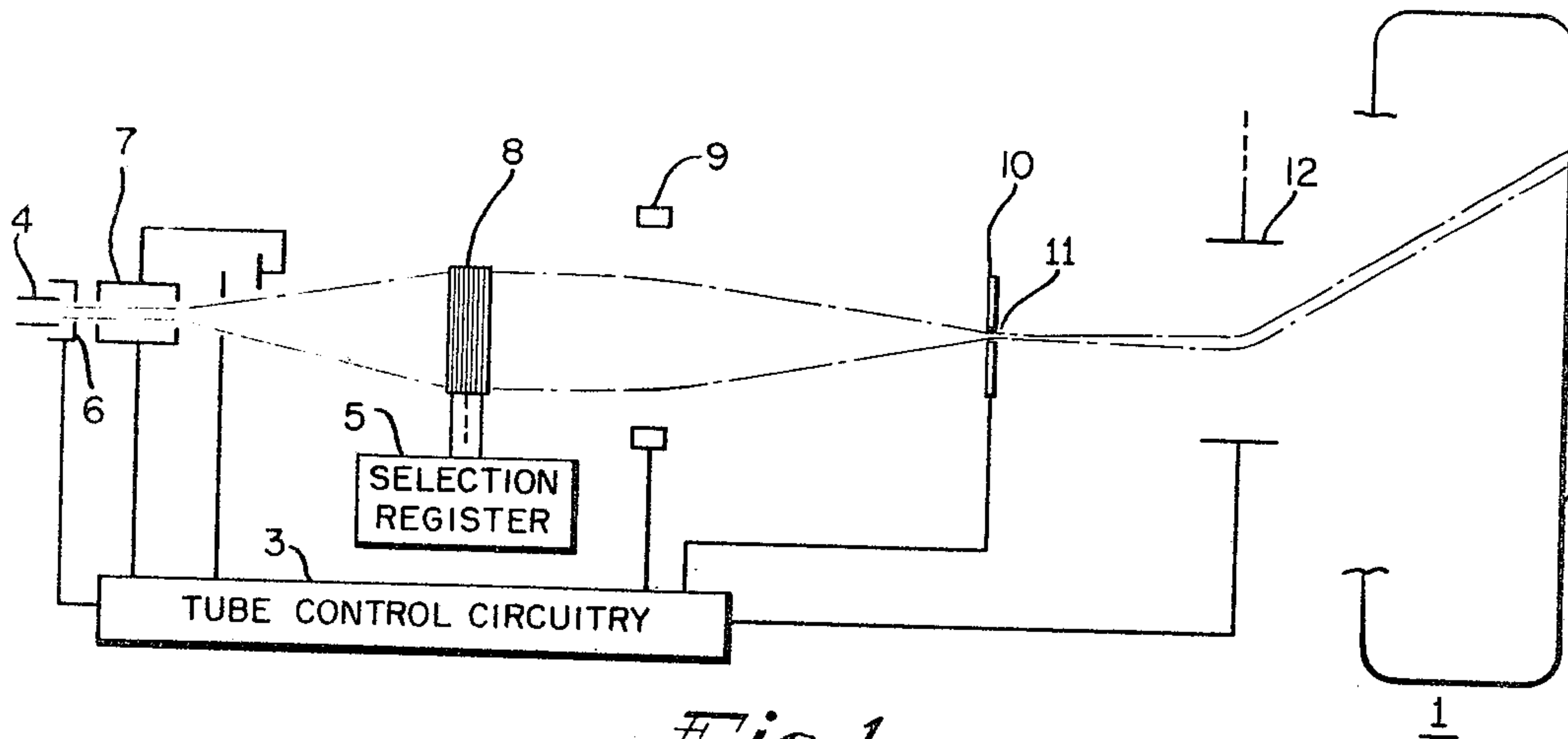


Fig. 1

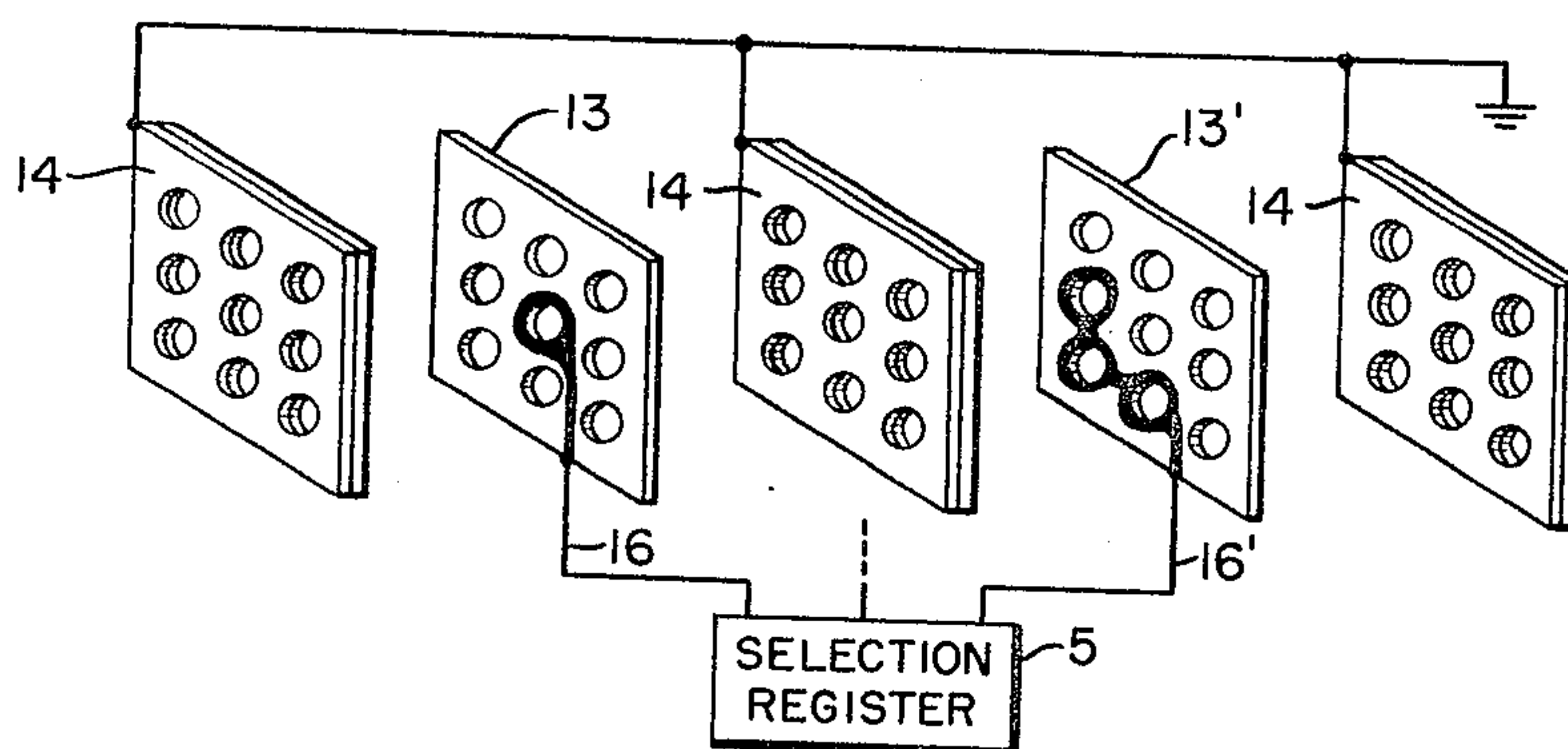


Fig. 2

BINARY SIGNALS APPLIED  
TO CHARACTER FORMER

| 16 | 16' |
|----|-----|
| 0  | 0   |
| 0  | 1   |
| 1  | 0   |

SYMBOL

| A     | B     | C     |
|-------|-------|-------|
| o o o | o o o | o o o |
| o o o | o o o | o o o |
| o o o | o o o | o o o |

Fig. 3

INVENTOR

OMER F. HAMANN

BY

Robert L. Nathans

ATTORNEY



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## CHARACTER GENERATING SYSTEM UTILIZING A CATHODE RAY TUBE IN WHICH A PORTION OF A PLURALITY OF ELECTRON BEAMS ARE SELECTIVELY DEFOCUSSED TO FORM THE CHARACTER

Omer F. Hamann, La Jolla, Calif., assignor, by mesne assignments, to Stromberg-Carlson Corporation, Rochester, N.Y., a corporation of Delaware

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### ABSTRACT OF THE DISCLOSURE

A data display system utilizing a shaped-beam cathode-ray tube including means for generating a plurality of beams, an apertured barrier between the beam generator and a target screen through which said beams are normally focused, and a character former for selectively defocusing certain of said beams with respect to the aperture in said barrier barring their passage therethrough.

The present invention relates to data display systems and, more particularly, to data display systems utilizing shaped-beam cathode-ray tubes.

In shaped-beam cathode-ray tube display systems, such as that system disclosed in United States Patent 2,824,250 to Joseph T. McNaney, an electron beam is selectively directed at one of a plurality of variously shaped apertures in a matrix to shape the beam in accordance with the shape of the selected aperture, which in turn corresponds to the shape of a particular character to be manifested or displayed. The shaped beam is thereafter redirected along the longitudinal axis of the tube by electron lenses before it is subjected to the influence of area selecting lenses which direct the beam to a desired area of the tube face. Such tubes are manufactured by General Dynamics Corporation under the trademark "Charactron." The voltages which are applied to the lenses which direct the beam to a particular aperture in the beam-forming matrix must be closely regulated. In addition, distortion is occasionally introduced because the beam does not remain on the longitudinal axis in the vicinity of the beam-forming matrix and strikes the character forming apertures at an angle. Also, the rate at which data may be handled is somewhat limited by the fact that the beam is sequentially shifted to scattered apertures in the beam-forming matrix.

Accordingly, it is an object of the present invention to provide a new and improved shaped-beam tube which eliminates the aforesaid close voltage regulation.

A further object of the present is to provide an improved shaped-beam tube which does not produce distorted characters, owing to the fact that the beam remains on the longitudinal axis during the beam forming operation.

It is a further object of the present invention to provide a new and improved shaped-beam tube which is faster operating since the beam is not required to be sequentially shifted from one scattered point to another on the beam-forming 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 accompanying drawing, in which:

FIG. 1 discloses a preferred embodiment of the present invention;

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FIG. 2 discloses an exploded view of the character former of FIG. 1; and

FIG. 3 discloses a table which will aid in the understanding of the present invention.

In accordance with the present invention, an electron gun causes a stream of electrons to impinge upon a character former which includes a plurality of similarly shaped apertures, which apertures convert the impinging stream into a plurality of substreams. A barrier having a small aperture is provided between the character former and the display screen. The electrons associated with certain of the substreams are selectively accelerated with respect to the other substreams and diverted so that they are defocused with respect to the aforesaid barrier aperture and therefore cannot pass through the barrier. On the other hand, the remaining substreams pass through the barrier aperture. As a result, "dotted" characters are formed upon the display screen, as shown in FIG. 3.

FIG. 1 discloses an evacuated cathode-ray tube 1 having a display screen 2 affixed to the inside face of the tube. All of the remaining structure disclosed in FIG. 1, except tube control circuitry 3 and character selection register 5, is contained within the cathode-ray tube. Cathode 4 produces an electron stream which passes through control grid 6, accelerating electrode 7, and is directed upon character former 8. Character former 8 forms a bundle of substreams which, under steady state conditions, are focused by focus means 9 at aperture 11 of barrier 10 to pass the aforesaid substreams. In other words, barrier 10 is positioned at the focal point of focusing means 9. Deflection plates 12 thereafter direct the substreams to a desired area on the face of the tube, as is well known to those skilled in the art. The distance between barrier 10 and the display screen is that distance which provides for the imaging of the characters on screen 2.

FIG. 2 discloses an exploded view of character former 8. By employing vacuum deposition techniques and suitable masking, the entire character former can be made extremely thin thereby to eliminate depth of focus problems, for all practical purposes. It is feasible to have one electrode structure, such as 13 and 13', for each character. In the alternative, it is also possible to utilize these electrodes in various combinations to obtain the desired characters. While only two character electrodes, such as 13 and 13', are shown, it should be understood that, in practice, numerous others will be utilized. FIG. 2, therefore, merely discloses two character electrodes which, taken in conjunction with FIG. 3, will illustrate my inventive concept.

Binary code selection register 5, which, in turn, is coupled to a data processing system, is shown connected to character electrodes 13 and 13'. Electrically conductive electrodes 14 are sandwiched in between character electrodes 13 and 13' and are grounded as shown for isolation purposes. The darkened areas on the face of character electrodes 13 and 13' are conductive areas, while the unshaded portions of character electrodes 13 and 13' are insulated. The unshaded backing layers of electrodes 14 are also insulated in order to prevent short circuiting. If leads 16 and 16' are unenergized, nine substreams will be formed by character former 8 to be focused upon aperture 11 of barrier 10 by focusing means 9, and will pass through aperture 11. These substreams will thereafter be imaged upon display screen 2, thereby to produce dotted configuration A, as shown in FIG. 3. By selectively energizing various combinations of leads 16, various combinations of substreams are defocused so that they do not pass through aperture 11 and characters are thusly formed on the face of display screen 2.

Now let it be assumed that it is desired to project the letter F upon display screen 2. A suitable defocusing



potential (binary "one") is applied to lead 16' but not lead 16, owing to the insertion of a code into selection register 5, which code corresponds to the letter F. As a result, the electrons within three substreams are accelerated and diverted relative to the remaining substreams, so as to be defocused relative to aperture 11 and collected by barrier 10. As a result, the letter F will be displayed as shown by FIG. 3.

Now let it be assumed that the aforesaid positive potential is applied to lead 16 but not lead 16'. In this case only the centrally located substream will be defocused, so as to produce the letter O. In like manner, other character electrodes 13 are provided having appropriate conductive patterns produced thereon to form the other desired characters.

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 cathode-ray tube data readout system, a target screen, means for producing a plurality of electron beams, at least some of which are to be directed at said target screen to manifest a particular character, a barrier situated between said last-named means and said target screen, said barrier having an aperture, and focus control means for selectively causing a group of said electron beams to be focused with respect to said aperture to transmit said group of electron beams to said target screen and for selectively causing the remaining ones of said electron beams to be defocused with respect to said aperture to cause interception of the electrons of said remaining ones by said barrier.

2. The combination as set forth in claim 1 wherein said means for producing a plurality of electron beams includes at least one electron gun, an obstruction, and a plurality of orifices running through said obstruction for forming said plurality of electron beams.

3. The combination as set forth in claim 2 wherein said focus control means includes means associated with said orifices for selectively altering the electrostatic field in the immediate vicinity of some of said orifices to selectively change the focus of said beams with respect to said aperture.

4. The combination as set forth in claim 2 wherein said focus control means includes means associated with said orifices for selectively accelerating at least some of

the electrons in the electron beams passing through at least some of said orifices to selectively change the focus of said beams with respect to said aperture.

5. The combination as set forth in claim 1 wherein said focus control means includes means associated with said electron beams for selectively altering the electrostatic field in the immediate vicinity of some of said beams to selectively change the focus of said beams with respect to said aperture.

6. The combination as set forth in claim 1 wherein said focus control means includes means associated with said electron beams for selectively accelerating at least some of the electrons in certain ones of said electron beams to selectively change the focus of said certain ones of said electron beams with respect to said aperture.

7. The combination as set forth in claim 1 wherein said aperture is a pinhole.

8. In a cathode-ray tube data readout system, a target screen, means for producing a plurality of electron beams, at least some of which are to be directed at said target screen to manifest a particular character, a barrier situated between said last-named means and said target screen, and focus control means for selectively causing a group of said electron beams to take a path which traverses said barrier to transmit said group of electron beams to said target screen and for selectively causing the remaining ones of said electron beams to take a path to cause interception thereof by said barrier to prevent their passage to said target screen.

9. In combination, a target screen, means for producing a plurality of beams of charged particles, at least some of which are to be directed at said target screen to manifest a particular character, a barrier situated between said last-named means and said target screen, and focus control means for selectively causing a group of said beams to take a path which traverses said barrier to transmit said group of beams to said target screen and for selectively causing the remaining ones of said beams to take a path to cause interception thereof by said barrier to prevent their passage to said target screen.

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JOHN W. CALDWELL, *Acting primary Examiner.*

T. A. GALLAGHER, R. L. RICHARDSON,  
*Assistant Examiners.*