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MATRIX FOR A CHARACTER DISPLAY TUBE

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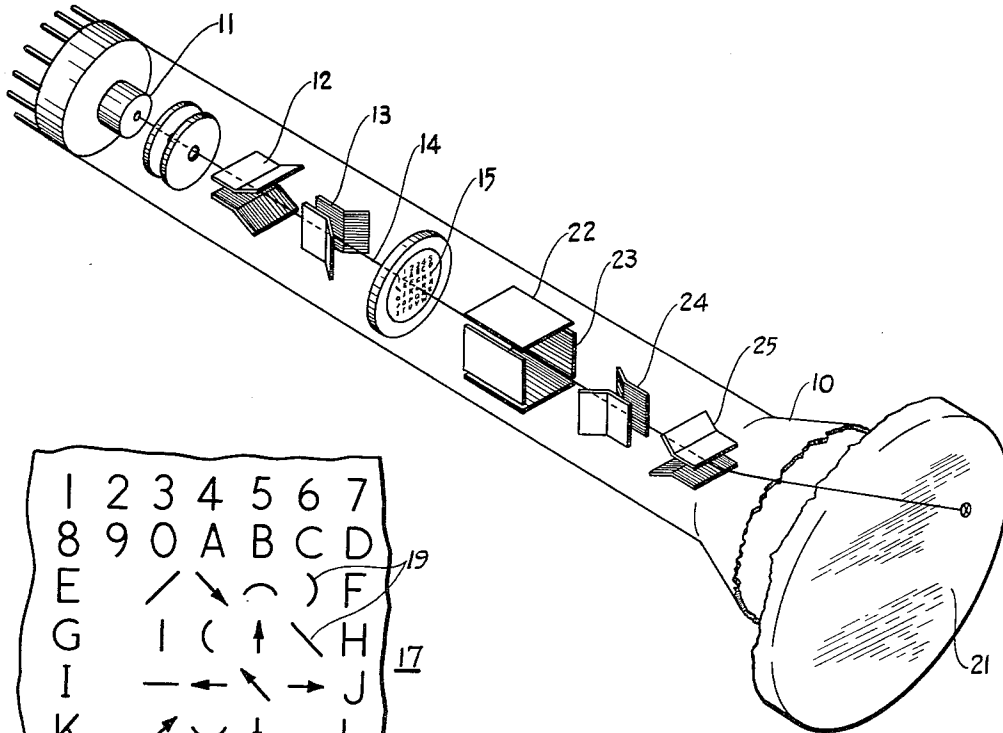


FIG. 1

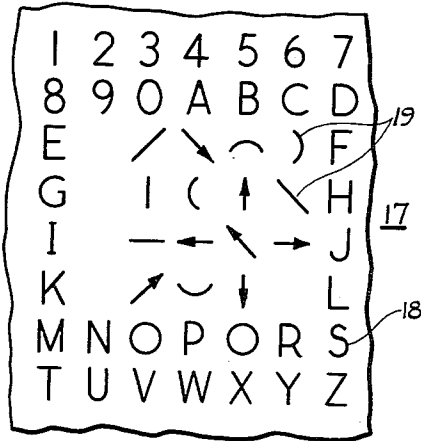


FIG. 2

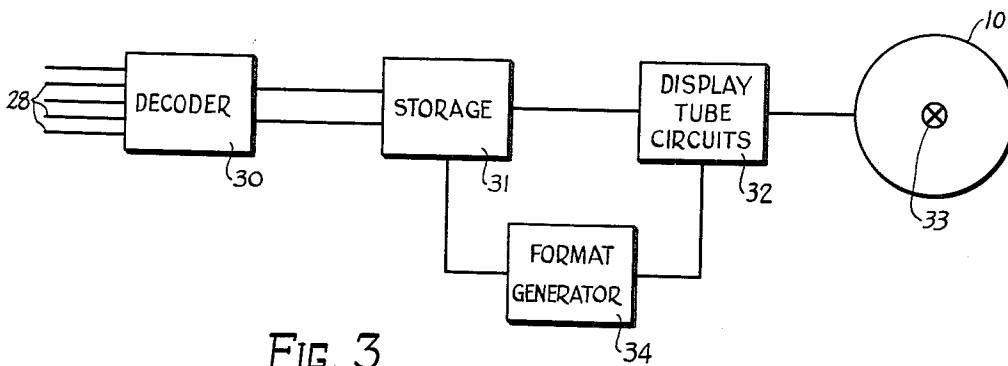


FIG. 3

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MATRIX FOR A CHARACTER DISPLAY TUBE
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Continuation of application Ser. No. 580,633, Apr. 25, 1956. This application Aug. 31, 1960, Ser. No. 53,307
4 Claims. (Cl. 313—86)

This invention relates generally to cathode ray display tubes and more particularly to a matrix for use therewith.

This application is a continuation of an application by the same applicant, Thomas H. Tatham, Jr., for a Matrix for a Character Display Tube, Serial No. 580,633, filed April 25, 1956, now abandoned.

The cathode ray display tube, such as is disclosed in U.S. Patent No. 2,735,956, utilizes therein a matrix having character shaped cross-sections formed therethrough. The matrix is positioned in the path of the electron beam and selectively shapes the beam cross section into one or more cross-sectional shapes corresponding to the shaped cross-section of the matrix illuminated.

In the prior art it has been customary to shape the characters in the matrix in accordance with the complete desired shape. Illumination of the character shaped cross-section produces a corresponding cross-sectional shape of the electron beam. The cross-sectional shape of the beam is impinged upon a screen or target of the tube and produces the desired character thereon. In prior art, therefore, it was necessary to have a particular character cross-section on or in the matrix for each desired character to be displayed. The physical size of the matrix and the etching processes utilized in making it limited the matrix character array.

The present invention overcomes these disadvantages to a considerable degree. The invention includes a matrix wherein part or all of the openings or character cross sections defined therein are predetermined segments of total characters or symbols desired to be displayed on the tube. The serial presentation in time of these segments at the same point on the screen results in building desired characters or symbols. This may be accomplished by time sharing the display tube circuitry. The building is not discernible to the human eye in viewing the target or screen.

An object of the present invention is to provide a display tube having a matrix which tube is capable of displaying a number of characters exceeding the number of openings in the matrix.

It is another object of this invention to provide a matrix capable of building complete characters or symbols from segments of characters or symbols by the time sharing display circuitry.

It is another object of this invention to provide a matrix for a display tube which matrix presents predetermined segments of characters to permit alternate display of the segments rapidly enough to create a composite impression thereby forming desired characters.

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:

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FIGURE 1 is a view in perspective of a cathode ray display tube embodying the invention;

FIGURE 2 is an enlarged view of a representative format of a matrix;

FIGURE 3 is a block diagram schematic of a typical circuitry for operating the display tube of FIGURE 1.

Referring more particularly to FIGURE 1, a display tube 10 includes beam generating and projecting means 11. Selection plates 12, 13, vertical and horizontal deflection plates, respectively, effect positioning of beam 14, whereby the desired selection of one or more openings in a matrix or thin unitary member 15 is made. Although FIGURE 1 demonstrates a tube capable of illuminating only one opening at a time, it should be understood that the illumination of more than one opening at a time, such as shown in Serial No. 414,551, now U.S. Patent No. 2,761,988, assigned to the common assignee hereof, is also included in the invention and is capable of utilizing such a matrix. Also any other type of matrix utilizing assembly likewise is included herein.

Matrix 15, shown in greater detail in FIGURE 2, has a format 17 defining a plurality of openings therethrough. These openings may be of a character cross-sectional shape or character 18 or a predetermined segment 19. A plurality of segments 19 may be so designed as to shape and size, depending upon the characters and symbols selected for final display upon a target or screen, as to be adapted for use as building blocks to construct characters and symbols. Such segments 19 may also be made even in an opaque matrix of bridgeless construction. The final character to be presented on the screen may be constructed by the alternate presentation of a plurality of such segments 19 at the same point upon the screen.

Matrix 15 may further utilize advantageously the format 17 wherein the segments 19 are positioned substantially at the center portion thereof and surrounded by completed character cross-sectional shapes or characters 18. Such a format arrangement tends to reduce to a minimum, the pincushioning and barrelling distortion effects resulting from the electron optics of the display tube. The illuminated segment 19 will lie close to the electron optical axis of the tube and its display will result in a minimal amount of redirection to axis.

The shaped electron beam 14 leaving matrix 15 is then redirected in known manner, such as by coplanar deflection plates 22, 23 into position intermediate positioning deflection plates 24, 25, which deflect the beam for presentation at desired positions on screen 21.

FIGURE 3 shows a representative circuitry in block diagram form for character building by use of segments. Circuitry of the various blocks is well known. Input signals 28 are presented to a decoder 30. The decoder, which may utilize well known coincidence circuitry, provides an output for each particular combination of input signals 28.

The output of decoder 30 is fed to a storage device 31 of known construction, such as those used with computers or in accordance with U.S. 2,721,990. The storage device 31 selectively presents to the display tube circuitry 32 the necessary signals to select the desired beam cross sections on the tube 10, such as the symbol 33, for example. The display tube circuitry 32 employs well known deflection voltage amplifier circuits.

A format generator 34 may be used to furnish in-

cremental positioning movements or spacing to the circuitry 32 to position the displayed symbols or characters 33 in desired spaced relation to one another. Such format generator may employ well known staircase generators to provide necessary space pulses. It is also contemplated that random presentation of desired spacing or positioning movements could be provided, if desired, by storing predetermined voltages and supplying them at predetermined intervals.

The various circuitry shown in FIGURE 3 in a block diagram form, is shown in circuit detail, in the copending application of Joseph T. McNaney, Serial No. 340,245, now U.S. Patent 2,850,723, and assigned to the common assignee hereof. That case circuit-wise teaches a manner of constructing decoder 30, storage device 31, format generator 34, and display tube circuits 32.

Format generator 34 accepts from the storage device 31 a stored predetermined serially presented code group presented in the serial manner in which a character is to be built up from segments 19. In Serial No. 340,245, selector control units responsive to such code groups for selecting such segments 19 are taught in full circuit detail. It is well within the capability of one skilled in the art to serially select a code such as disclosed in detail in the application of Joseph T. McNaney et al., Serial No. 491,116, now U.S. Patent 2,840,637, also assigned to the common assignee hereof, wherein an exemplary six-digit code utilization is taught. Proper selection of such code groups to serially present segments 19 thereby building composite symbol 33, are effected by utilizing, for example, the code groups corresponding to the position in the matrix of six of the segments 19, storing these code groups serially in the order in which they are to be presented in the storage device 31. Upon proper address to decoder 30, the decoder presents to storage device 31, which, in turn, presents the code groups to the format generator 34 for actuations of circuits 32 to select those portions of the format 17 and present them in succession at the same general screen location as symbol 33. In other words, as the appropriate signals are received from the input 28, the decoder 30 will formulate the appropriate address to the storage device 31, which, in turn, will present a plurality of code groups in serial order to the format generator 34. Generator 34 will then effect serial presentation of such deflection voltages to the tube 10 through circuits 32 thereby forming character 33 upon the screen 21 of the tube 10.

As the function of format generator 34 is very similar to certain of the display tube circuits 32 in the ordinary presentation of characters, format generator 34 may, for exemplary purposes, utilize the selection control circuits as disclosed in detail, in Serial No. 340,245, which circuits are similarly used as part of the display tube circuits 32. It has been determined from experimentation that the building up of a character such as symbol 33 can readily be effected at a time much less than the $\frac{1}{20}$ of a second necessary to have good viewing retentivity of the phosphors utilized on screen 21. Such cycling or presentation of 20 times per second is more than adequate to present to the human eye an optical illusion that the character shown is being simultaneously composed and presented for viewing. In fact, utilizing circuitry of Serial No. 340,245, characters 18 or 19 can be displayed upon screen 21 at the rate of one for every 75 microseconds. Therefore, a composite symbol such as 33 could more than adequately be built and presented within the period of $\frac{1}{20}$ of a second necessary to give adequate character retention upon known phosphors.

As shown in FIGURE 2, an embodiment of matrix 15 may use format 17, wherein characters of the complete cross-sectional shape 18 are disposed about the inner grouped predetermined segments 19. In this way, it is possible to display the most used or most difficult to build character shapes 18 in a completed manner and

reduce the amount of required time sharing or programming necessary to effect desired displays.

In operation, the input 28 is decoded by decoder 30 into signals which are stored in storage device 31. Storage device 31 then transmits to display tube circuitry 32 the necessary signals to cause display tube 10 to project upon its screen the desired symbol 33. Storage device 31 may also trigger the format generator 34 which in turn supplies the tube circuitry 32 with predetermined position spacing of successive characters or symbols 33.

Tube 10 receives its signals and selects by means of selection plates 12, 13 at least one of the segments 19 or shapes 18 for illumination by the beam 14. The shaped beam 14 is then focused and converged as desired by plates 22, 23 and positioned at the desired position on the screen 21 by positioning plates 24, 25. In building of symbols such as symbol 33, the symbol is composed of two half circle segments 19 and the opposing slanted line segments 19. As the display tube is responsive to the speed of electrons, also due to the persistence of the target materials such as phosphors and due to the retentivity of the human eye, the building of the symbol is not discernible to the human eye.

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.

What is claimed is:

1. A matrix for a character display tube, said matrix comprising a thin unitary member having a plurality of apertures therein, at least one of which individually defines a segment of a character or symbol which is adapted to cooperate with first and second other segments forming apertures to respectively build when displayed on the screen of the display tube at least two different unitary characters or symbols.

2. In combination, a cathode ray display tube including an evacuated envelope; an electron gun mounted within and at one end of said envelope; a screen positioned within said envelope at the opposite end thereof; a character shaping matrix mounted within said envelope, said matrix comprising a member having a plurality of apertures at least two of which individually form predetermined segments of a given character or symbol, said two predetermined segments when placed in proper cooperating relationship forming said entire given character or symbol; means for causing the beam radiated toward said screen by said electron gun to sequentially scan said two segments of said matrix; and deflection means for imaging said two segments upon said screen in said proper cooperating relationship whereby said segments compositely form said given character or symbol upon said screen.

3. In combination, a cathode ray display tube including an evacuated envelope; an electron gun mounted within and at one end of said envelope; a screen positioned within said envelope at the opposite end thereof; a character shaping matrix mounted within said envelope, said matrix comprising a member having first, second and third apertures therein, said apertures individually defining first, second and third segments of characters or symbols, respectively, said first segment individually defining predetermined segments of first and second different characters or symbols, said first and second segments defining when placed upon said screen in proper cooperating relationship at least a portion of said first character, said first and third segments defining when placed upon said screen in proper cooperating relationship at least a portion of said second character, and display means for sequentially selecting said first and second segments in response to the application of a first code group thereto, said display means being responsive to a second code group for sequentially selecting said first and third segments; said display means including means for

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selectively placing said segments upon said screen in said proper cooperating relationships whereby said segments compositely form said first or second character or symbol in accordance with the code group applied thereto.

4. In combination, a cathode ray display tube for displaying character information including an evacuated envelope, an electron gun, a character shaping matrix and a display screen mounted within said envelope in the order named, said matrix having at least a region thereof restricted to openings defining a plurality of individual segments, said segments each forming portions only of complete characters, and circuit means for se-

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quentially directing said beam through a selectable group of more than one of said segments to compositely form for each of said group of segments selected a display which appears on said display screen as a single character.

References Cited in the file of this patent

UNITED STATES PATENTS

2,728,872	Smith -----	Dec. 27, 1955
2,735,956	McNaney -----	Feb. 21, 1956
2,803,769	McNaney -----	Aug. 20, 1957