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SYSTEM FOR TRANSFERRING DATA FROM A STORAGE MEDIUM TO A RECORD MEDIUM
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3.299,434 SYSTEM FOR TRANSFERRING DATA FROM A STORAGE MEDIUM TO A RECORD MEDIUM
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This invention relates to a system for transferring data from a storage medium to a record medium wherein the order and rate at which the data is taken from the storage medium is a function of the angular position of a light directing means of the recorder and the speed of rotation imparted thereto.

The invention is an improvement in the recorder portion of the photographic recording apparatus having cathode ray readout of a character mask which I disclosed in my U.S. Patent No. 3,188,663. In the present system I provide a storage medium on which the placement of message codes is directly related to the design characteristics of the character deflection means of the recorder, and in which I synchronize the movements of the storage medium and the deflection means. Furthermore, the cathode ray readout disclosed in the above patent functions as a slave to recordings of the storage medium and, in doing so, relates a series of message character codes and their positions on the storage medium to a predetermined series of character positions on the surface of the character deflection means.

It is therefore the principal object of my invention to provide a system improvement for utilizing the inherently high speed characteristics of the above cathode ray readout in conjunction with a mechanically rotating light reflector by tailoring the placement of message codes on a tape to agree with only certain beam reflection angles of the reflector, by mechanically linking the tape drive means and the rotating reflector for effecting operating alinement and synchronization thereof, and also allowing the cathode ray readout to merely function as a link between a code sensing means and the reflecting surfaces of the light reflector.

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

FIGURE 1 is a diagrammatic presentation of an exemplary system embodying the present invention; and
FIGURE 2 is a detail regarding the placement of message codes on a tape.

With reference to FIGURE 1, the invention shows a cathode ray tube 10 having a faceplate 11 on which there is a fluorescent screen 12. Cathode ray tube 10 contains the usual beam producing means, electron beam deflecting means, and such electron lenses as may be necessary, and has associated synchronizing, blanking and deflection circuits.

In the usual cathode ray tube, the faceplate is a single pane of glass. As light from a spot on the fluorescent screen 12 on the inner surface of such a pane traverses the thickness of the glass, it spreads out and produces a larger and much diffused area of light on the outer viewing surface. Therefore, the light from two closely adjacent spots on the inner surface overlap on the viewing surface to the extent that one cannot be distinguished from the other. This overlapping produces a blurring, which is intolerable for high quality displays. To prevent this effect, a cathode ray tube may have a faceplate that comprises an array of light guides, or optical fibers 13. These optical fibers are well known in the art and can be drawn down to extremely small cross sections; even as small as a few microns.

The cathode ray tube 10 is therefore preferably one wherein the faceplate 11 comprises an array of optical fibers which provides an inner surface on which the fluorescent screen 12 is disposed. In the cathode ray tube art, electron beam deflection systems capable of precisely positioning the electron beam on the screen 12 are well known, and by means of a deflection yoke 17 the electron beam 14 may be positioned to excite any number of different areas of the screen 12 and quite rapidly. Circuitry 29 are also provided to perform the necessary tube functions including the blanking and unblanking of the electron beam 14, the deflection therefrom, and a decoder for converting input message codes to control voltages necessary in the operation of the tube 10.

External to the tube 10 and directly in front of the faceplate 11 is positioned a sheet 16 of opaque material having transparent areas whose shapes correspond to characters, such as letters, numerals, symbols, etc. Each of these characters, or transparent areas of the sheet 16, are spaced adjacent the ends of a group of optical fibers where the internal ends are adjacent the screen 12. This sheet 16 will therefore be referred to as a light beam shaping matrix.

It will be seen from the illustration in FIGURE 1 that the light from a given area of the screen 12 is conducted through a group of optical fibers and is emitted therefrom in such a manner that the light traverses an individual transparent area of the light beam shaping matrix 16. The light beam that emerges from the matrix 16 therefore has a cross section that corresponds to the shape of the opening in the mask 16 through which it has passed. It is thus apparent that sequential positioning of the electron beam provides an output of light whose cross section periodically changes to correspond to various desired characters.

In order to project the shaped light beam onto a record medium, I utilize optical means intermediate the matrix 16 and the record medium for projecting the shaped light beams parallel to a common axis and from which the beams are reflected to predetermined positions on the record medium. This optical means includes a lens 18 in front of each transparent area of the matrix 16. Instead of using an array of individually supported lenses 18 I prefer to use a “lenticular” structure that, once designed, can be readily molded in plastic, glass, or other materials having suitable light refracting characteristics. Each lens of the lenticular structure 19 will be so designed that the shaped beam of light which enters any lens 18 will be refracted and thereby directed to a common point 20 of the optical means, which is on a common axis thereof. It is apparent therefore that selected positions of the electron beam 14 will image any desired character in the matrix 16 at a given point on the axis.

Another plurality of optical fibers 22 are positioned on the common axis so that their input ends form a plane perpendicular to the axis through point 20. Any shaped light beam that reaches the plane at point 20 enters the array of optical fibers 22, and traverses the array parallel to the axis, and emerges therefrom collimated and parallel to the axis. The emergent light now consists of an axial beam of light whose cross section corresponds to the character selected by the position of the electron beam 14.

In order to convert a character display from the fiber array 22 to a recording, I image the emergent light beams onto a movable light receptive means 23, through a lens system 24, after being reflected from the common axis 25 by means of a light directing means 26. The light directing means may be in the form of a light sensitive record medium 27, such as photographic paper or film, and is movable in the direction of the arrow 27. The light directing means 26 is illustrated as being a polygon mirror having six light reflecting sur-
faces, for example, and one surface 28 is shown as being in position to intercept a light beam parallel to the common axis 25 and reflect it along a secondary axis 30.

An electric motor 31, which is supplied with power from a common source of electrical current, is geared through conventional gearing 32 to the polygon mirror 26, which is rotated in the direction of the arrow 33. A roller 53 is shown in the direction of the arrow 27 which is linked through a Geneva gear 34 to the shaft of the polygon mirror 26. The Geneva gear 34, whose operation is described on pages 74-77 of the book entitled, "Ingenious Mechanisms for Designers and Inventors," by Franklin D. Jones, contains the combination of rotary motion from the polygon mirror into intermittent rotary motion, causing the medium 23 to be advanced very precisely in predetermined steps.

Input message codes, from which the control voltages for operating the tube 10 are obtained, appear on a tape 35 which is moved in the direction of the arrow 37. The tape, as illustrated, may be one which has codes recorded thereon in the form of perforations, which are sensed by a set of photocells in the path of light being admitted through the perforations. I show, therefore, a source of light 38 being directed through the tape as perforations therein move. Another example of an aperture plate 40, and then onto a set of photocells 60. There will be one cell 60 for each code bit of a parallel message code appearing on the tape 35. An electrical output from the photocells 60 is then coupled to the circuitry 29 for decoding and conversion to control voltages.

A set of sprocket wheels 41, which engage a series of perforations in the tape 35, are linked through conventional means 42 to the polygon mirror. This linkage provides movement of the tape in the direction of the arrow 37 in synchronism with the rotary motion of the polygon mirror 26, independent of the tube, or light generating means, which merely serve as a slave to recordations appearing on the tape 35.

Referring now with particularity to the polygon mirror, and also to the tape storage medium, I have described the mirror 26 as having six light reflecting surfaces, although it may have fewer than six or more than six. But as illustrated, there are six surfaces and one surface 28 is shown as being in position to intercept light beams along the axis 25, and a succeeding surface 45 will be next in line to intercept the light beams as the mirror continues its rotation in the direction of arrow 33. In order to utilize such a system, information will be directed to said record medium, and (2) a plurality of non-directing positions, during which said reflector will not direct light beam information to said record medium;

(g) said message codes comprise a series of codes recorded on said tape in individual groups, each of said groups spaced a predetermined distance from adjacent groups and space between said groups being substantially greater than spacing between the codes of said groups;

(h) said rotation of each light directing position, relative to said path, corresponds to the movement of a predetermined one of said groups relative to said means for sensing message codes recorded on said tape;

(i) said rotation of each of said non-directing positions, relative to said path, corresponds to the movement of one of said spaces between said groups relative to said means for sensing message codes recorded on said tape; and

(j) said directing of the light beam information by said light reflector from said path to said record medium being dissociated from said tape and the means for sensing message codes recorded on said tape.

2. In a system for transferring data from a storage medium to a record medium (a) a tape having message codes recorded thereon;
(b) a tape drive mechanism for moving said tape in
5 relation to a means for sensing the message codes on said tape;  
(c) a rotatable light reflecting means;  
(d) a light generator, intermediate said means for sensing message codes and said reflecting means, with means for converting said codes to corresponding light beam formations and directing said light beams toward said reflecting means;  
(e) a motor; and  
(f) mechanical coupling means interconnecting said drive mechanism and said reflecting means with said motor for controlling, through direct mechanical linkage, the moving of said tape in relation to the rotation of said reflecting means;  
(g) said rotation of the reflecting means includes rotation thereof through (1) a plurality of light directing positions, during which said light beam formations will be directed to said record medium, and (2) a plurality of non-directing positions, during which said reflecting means will not direct light beams to said record medium;  
(h) said message codes comprise a series of codes recorded on said tape in individual groups, each of said groups spaced a predetermined distance from adjacent groups and space between said groups being substantially greater than spacing between the codes of said groups;  
(i) said rotation of each light directing position, relative to said common axis, corresponds to the moving of a predetermined one of said groups relative to said means for sensing codes on said tape;  
(j) said rotation of each of said non-directing positions, relative to said beam formations, correspond to the moving of one of said spaces between said groups relative to said means for sensing codes on said tape;  
and  
(k) said directing of the light beam formations by said reflecting means to said record medium being dissociated from said tape and the means for sensing codes on said tape.

3. In a system for transferring data from a storage medium to a record medium  
(a) a light generator with means for generating and positioning character shaped light beams selectively along a common axis in response to the application of control voltages thereto;  
(b) light receptive means;  
(c) light directing means, with motivating means for changing the angular position of said directing means in relation to said common axis, for directing said light beams from said axis to said receptive means;  
(d) a storage medium containing a recordation of coded data;  
(e) coded data detection means for controlling the application of said voltages to the generator corresponding to said recordation of coded data;  
(f) a drive mechanism for effecting movement of said medium in relation to said data detection means; and  
(g) said drive mechanism and said motivating means being interconnected directly through mechanical coupling means to provide mechanical synchronization of the movements of said storage medium and said light directing means;  
(h) said movement of the directing means includes rotation thereof through (1) a plurality of light directing positions, during which said beams will be directed to said receptive means, and (2) a plurality of non-directing positions, during which said directing means will not direct light beams to said receptive means;  
(i) said coded data comprise a series of codes recorded on said storage medium in individual groups, each of said groups spaced a predetermined distance from adjacent groups and space between said groups being substantially greater than spacing between the codes of said groups;  
(j) said rotation of each light directing position, relative to said common axis, corresponds to the movement of a predetermined one of said groups relative to said detection means;  
(k) said rotation of each of said non-directing positions, relative to said common axis, corresponds to the movement of one of said spaces between said groups relative to said detection means; and  
(l) said directing of the light beams by said directing means from said common axis to said receptive means being dissociated from said storage medium and data detection means.

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