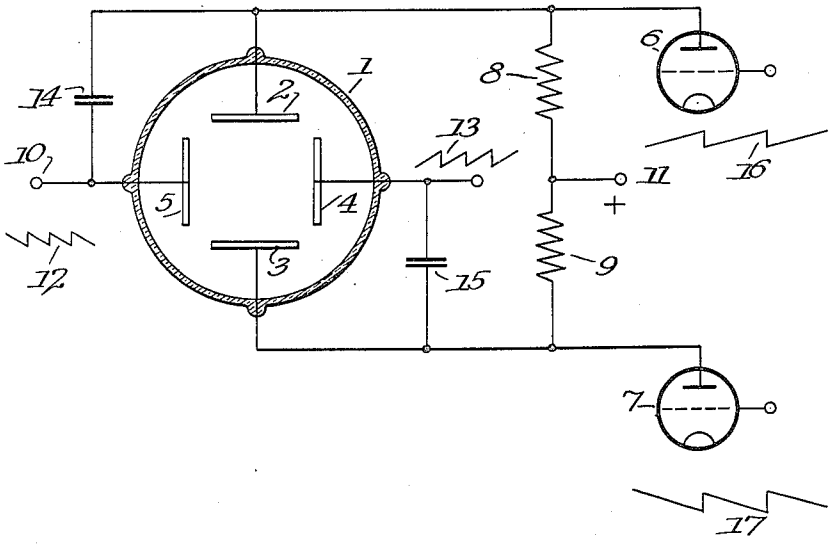
April 2, 1940. U. KNICK 2,195,863

SCANNING DEVICE

Filed Feb. 8, 1938

Fig. 1.



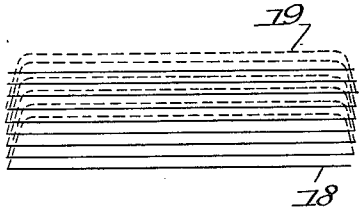


Fig. 2.

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Patented Apr. 2, 1940 2,195,863

UNITED STATES PATENT OFFICE

2,195,863

SCANNING DEVICE

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Application February 8, 1938, Serial No. 189,443
In Germany February 9, 1937

4 Claims. (Cl. 178—7.7)

This invention relates to a method and means for scanning television picture signal generating tubes and particularly relates to scanning such tubes having a screen adapted to store electrical charges.

The difficulty exists, in tubes utilizing a charge storage effect, that the retrace of the scanning electron beam partially destroys the charge image accumulated on the storage screen under the influence of light because the retracing electron beam travels over a number of elemental areas of the screen which are to be scanned during the following scansion. In order to avoid this, the scanning beam can be suppressed during the horizontal and also during the vertical retrace period by means of an auxiliary voltage applied to the control electrode of the electron gun producing the scanning beam. This intermittent operation, however, produces strong signal voltages which, in turn, produce a bright or dark edge of the image at the receiver and impair the quality of the transmitted television image.

According to the invention, the scanning beam is guided over a previously scanned portion of the storage screen during the retrace period. The beam can then no longer destroy the charge distribution on the storage screen during the retrace and defects in the received image are eliminated which would be caused by a periodical suppression of the scanning beam. In a preferred embodiment of the invention, the horizontal or line retrace is set back by one or preferably several, for instance 5, lines. In order to accomplish this, a square top voltage or current impulse is applied to the vertical or frame scanning system during the horizontal or line retrace period and thereby superimposed upon the usual frame deflection. It is, for instance, possible to produce square top current impulses in this device which are superimposed upon sawtooth shaped current waves in electromagnetic deflecting devices. It may, however, be preferred to effect this superposition by means of a separate deflecting system which is effective in the direction of the vertical or frame deflection and to which the aforesaid square top current impulses are applied. When electrostatic deflection is used, the voltages for the vertical or frame deflection as well as the square top voltage impulses taken from the horizontal or line-scanning generator are applied to the vertical or frame-deflecting plates.

Another possibility is to connect the deflecting plates of the vertical scanning system with the two deflecting plates of the horizontal deflecting system by means of condensers. A certain current then flows through these condensers which superimposes square top voltage impulses on the vertical deflecting plates during the line-retrace period.

In order to suppress interference caused by the vertical retrace, the method of suppressing the scanning beam is preferably used because the signal voltages thereby produced are considerably less annoying. Of course, it is also possible to make the vertical retrace occur outside of the scanned area of the storage screen. However, a considerably higher auxiliary voltage is necessary in this case than for transposing the horizontal retrace.

This invention is applicable to television signal generating tubes having a mosaic of mutually insulated particles as a storage screen, as well as to tubes in which electrical charges are stored on the surface of a screen of insulating material.

For the purpose of illustrating my invention, an embodiment thereof is shown in the drawing, wherein

Fig. 1 is a simplified diagrammatic view of a cathode ray tube showing in cross-section the plane of the deflecting plates and showing the manner in which the deflecting plates are connected with conventional oscillators generating sawtooth voltage waves; and

Fig. 2 represents the trace of the cathode ray on the storage screen.

Referring now more particularly to Fig. 1 of the drawing, there is shown schematically a neck portion 1 of a cathode ray tube containing two pairs of deflecting plates 2, 3 and 4, 5. The plates 2 and 3 for vertical deflection are connected with the anodes of two amplifier tubes 6 and 7. The anode circuits are connected at a terminal 11 with the positive terminal of the source of potential by means of resistors 8 and 9.

The deflecting plates 4 and 5 for horizontal or line deflection of the scanning beam are connected with two terminals 10 and 11 of conventional sawtooth oscillators producing sawtooth potential waves of opposite polarity as indicated by the curves 12 and 13. Condensers 14 and 15 are arranged between the plates 4 and 5 for the horizontal deflection and the plates 2 and 3 for the vertical deflection, respectively.

Referring now to the operation of the system, the scanning electron beam is deflected in the horizontal direction by electrostatic fields produced by the potentials of plates 4 and 5. The deflecting frequency is c. p. s. according to pres-

ent television standards. The grids of the amplifier tubes 6 and 7 receive a sawtooth potential of, for instance, 50 strokes per second indicated by the lines 16 and 17. The sawtooth potentials 12 and 13 produce a series of rectangular impulses at the ends of the resistances 8 and 9 by way of the condensers 14 and 15. These impulses are superimposed upon the deflecting voltages in the anode circuits of tubes 6 and 7 so that the electron beam is scanned to describe a pattern as represented in Fig. 2, whereby the solid lines 18 indicate the slow forward movement and the dotted lines 19 the quick return movement of the electron beam.

It is to be understood that the invention is not limited to the exact circuit arrangement shown although the example illustrated has proved satisfactory and therefore many and various modifications may be resorted to without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. The method of scanning a screen or the like in a device of the cathode ray type which comprises causing the ray to scan a line of said screen during a portion of a scanning cycle; and during the remainder of said cycle shifting the ray back along substantially the border of said screen a distance of a few scanning lines; then swinging said ray across said screen to approximately the opposite border thereof; and then moving said ray ahead to the starting position of a new scanning line.

2. The method of scanning a screen or the like in a device of the cathode ray type which comprises causing the ray to scan a line of said screen during a portion of a scanning cycle and during the remainder of said cycle, shifting the ray back along substantially the border of said screen a distance of a few scanning lines, then swinging said ray across said screen to approximately the opposite border thereof and then moving said ray ahead to the starting position of a succeeding scanning line on said screen.

3. The method of scanning a screen or the like in a device of the cathode ray type which comprises scanning a plurality of lines in a predetermined sequence in one direction of movement of a scanning ray across said screen, and during the return movements of said ray, traversing a portion of said screen which has already been scanned during the prevailing frame scanning cycle.

4. In combination a cathode ray device, a pair of deflecting plates therein for horizontal line scanning control, a pair of deflecting plates disposed normal to said first pair for vertical frame scanning control, means for applying a saw tooth voltage wave at frame frequency to said second pair of plates, means for applying to said first pair of plates a saw tooth voltage wave at line scanning frequency, and means for periodically superimposing a square top wave impulse on said frame frequency saw tooth wave at time intervals coinciding with the steep slope portions of said line frequency saw tooth wave and of a value causing a cathode ray to shift back along substantially the border of said screen a distance of a few scanning lines to execute a return trace over a portion of said screen previously scanned during the prevailing vertical deflection cycle.

ULRICH KNICK.