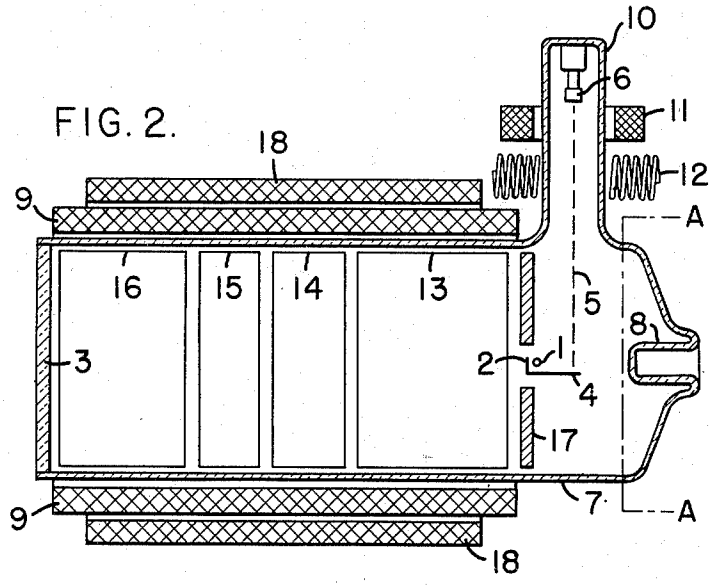
Aug. 29, 1950 K. A. R. SAMSON 2,520,512

ELECTRON DISCHARGE DEVICE

Filed June 18, 1946

FIG. 2.



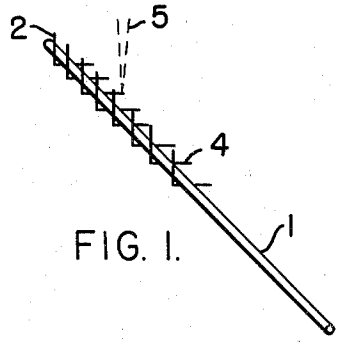


FIG. 1.

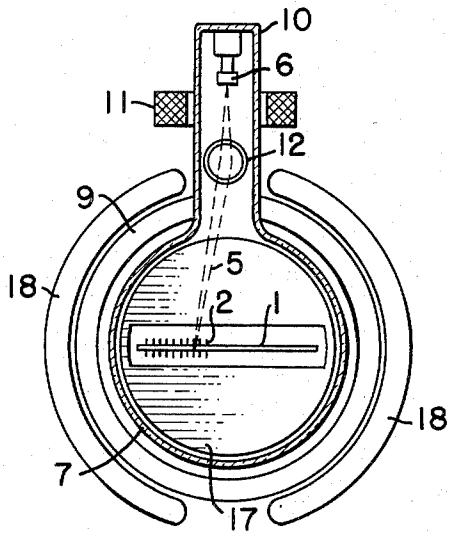


FIG. 3.

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ELECTRON DISCHARGE DEVICE

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2 Claims. (Cl. 250—150)

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The present invention is concerned with improvements in or relating to electron discharge devices and is more particularly concerned with such devices, employing a beam of cathode rays, of the kind used in television and like systems for the translation of trains of electrical impulses into an optical image.

The invention furthermore specifically relates to an electron discharge device for use in the reconstitution of a television or like picture, of the type wherein a charge image is formed spatially corresponding to the illumination of an optical image or a portion of said optical image and an electron stream is modulated by being passed through said charge image.

The object of the invention is to provide an electron discharge device for use in a television or like system which utilizes the so-called "storage principle" for the reconstitution of at least a portion of an optical image and which is of simplified and advantageous construction as compared with other electron discharge devices heretofore proposed for achieving image reconstitution by using storage.

According to the invention there is provided an electron discharge device for use in the reconstitution of a television or like picture, of the type referred to comprising an array of substantially mutually insulated elements formed so as to produce a modulated electron stream or beam corresponding to a single line of the optical image.

Again according to the invention there is provided an electron discharge device of the type referred to comprising an electron source for providing an electron stream or beam which is substantially unidimensional (i. e. of extended length and elementary width) and means for modulating said stream in correspondence with a succession of lines of the optical image to be reconstituted.

Further according to the invention there is provided an electron discharge device of the type referred to comprising a unidimensional storage electrode for producing an electron stream in the form of a succession of electronic images corresponding to successive lines of an optical image and means for scanning so that the successive electronic line images provide a two-dimensional optical image.

The invention will be hereinafter more particularly described with reference to the accompanying drawing comprising Figs. 1 to 3 which illustrate, purely by way of example, one method of carrying the invention into effect.

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Fig. 1 shows an enlarged perspective view of a portion of a linear cathode and the control elements associated therewith;

Fig. 2 shows a diagrammatic view of an electron discharge device incorporating the linear cathode and control elements of Fig. 1; and

Fig. 3 shows a section on the line A—A of Fig. 2.

The same elements in these three figures are given the same reference numerals.

The electron discharge device in accordance with the invention incorporates a linear cathode 1 formed of tungsten wire which is directly heated electrically or formed of a small diameter tube coated externally with an electron-emissive oxide and indirectly heated. The cathode upon being heated produces and projects towards screen 3 a beam of electrons having a plurality of unit areas which shows up on the screen as a line. Associated with the linear cathode 1 is a plurality of control elements or electrodes 2 arranged in a line close to the cathode and positioned between the latter and fluorescent screen 3. These control elements are insulated from each other and from all other electrodes so that they can hold an electric charge, and are each provided with an extension 4 which extends at right angles to the electrode portions 2 and into the path of a narrow scanning electron beam 5 generated by a cathode assembly 6. The number of control elements 2 must be at least equal to the number of unit areas in one line of a picture.

The line storage array comprising cathode 1 and elements 2 is centrally positioned with respect to screen 3 and arranged across a diameter of a cylindrical tube 7 and supported in a manner not shown from a pinch 8 sealed into one end of the tube 7. The fluorescent screen 3 is deposited on a flat end plate sealed onto the end of the tube 7 opposite the pinch 8. A longitudinal focusing field is produced along practically the whole length of the tube 7 by means of a coil 9 which forms an axial magnetic field. The electron gun 6 is arranged in a side arm 10 and the narrow electron beam 5 produced thereby, after modulation in accordance with applied electrical signals, is focused and scanned by coils 11 and 12 so as to traverse the projecting ends 4 of the control elements 2. One or more accelerating electrodes 13, 14, 15 and 16 are provided (connecting leads not shown) and in addition there is provided a shield 17 to improve the field conditions in the neighborhood of the cathode 1. This shield 17 is

maintained at a suitable potential by means of a connection (not shown) through the pinch 8.

In operation, the scanning beam 5, being modulated by the signals to be reproduced on the fluorescent screen, sets up potentials on the control elements 2 varying in accordance with the modulating signals. Varying amounts of electron currents are, therefore, allowed to pass from the corresponding points of the cathode 1 to the screen 3 where they form, after being focused by coil 9, a line of the image having a plurality of unit areas corresponding to the number of unit areas of the image which vary in brightness according to the impressed signals. The beam or line of electrons projected on the screen is of very small width or thickness but of substantially the same length as the horizontal dimensions of the screen. The vertical movement of the individual lines to build up the complete two-dimensional picture is effected by deflecting coils 18 which may surround or be contained in tube 7. Alternatively, this vertical movement can be effected by mechanical means, for example, by a suitable optical system including a mirror drum arrangement. A mirror drum arrangement of the kind which may be employed is disclosed in British Patent No. 484,003.

The time interval during which the elements 2 will retain their potentials depends on their time constant and the rate at which they are discharged by electrons reaching them from the cathode. In the ideal case they should retain their charges just for the length of time taken for the beam 5 to scan one line. Even, however, if this ideal cannot be achieved, a considerable gain can still be obtained as compared with the usual way of reconstituting a picture with the normal cathode ray tube. If, for instance, the charge effect lasts only for the duration of one hundred picture elements, one hundred times more light will be obtained on the screen 3 with the same current density in the electron beam as in the usual method of scanning the fluorescent screen with a cathode ray beam.

What I claim is:

1. In a cathode ray tube for television receivers, a fluorescent screen, a first cathode assembly for producing a modulated beam of electrons, a second cathode substantially perpendicular to the path of electrons emitted by the first cathode, a plurality of mutually insulated control electrodes in the path of said modulated beam and in close association with said second cathode, accelerating electrodes between the screen and the control electrodes, focusing and scanning means for sweeping the beam across the control electrodes, whereby the electron stream emitted by the second cathode is modulated and produces line images having a plurality of unit areas on the screen, and means for moving across the screen the individual line images perpendicular to the longitudinal axis thereof.

2. In a cathode ray tube for television receivers, a fluorescent screen, a first cathode assembly for producing a modulated beam of electrons, a second cathode substantially perpendicular to the path of electrons emitted by the first cathode, a plurality of mutually insulated control electrodes in the path of said modulated beam and in close association with said second cathode, accelerating electrodes between the screen and the control electrodes, a shield between the accelerating electrodes and the modulated beam of electrons so as to prevent distortion of the latter, focusing and scanning means for sweeping the beam across the control electrodes, whereby the electron stream emitted by the second cathode is modulated and produces line images having a plurality of unit areas on the screen, and means for moving across the screen the individual line images perpendicular to the longitudinal axis thereof.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,301,388	Farnsworth	Nov. 10, 1942
2,355,212	Farnsworth	Aug. 8, 1944