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MULTIGUN CATHODE-RAY TUBE

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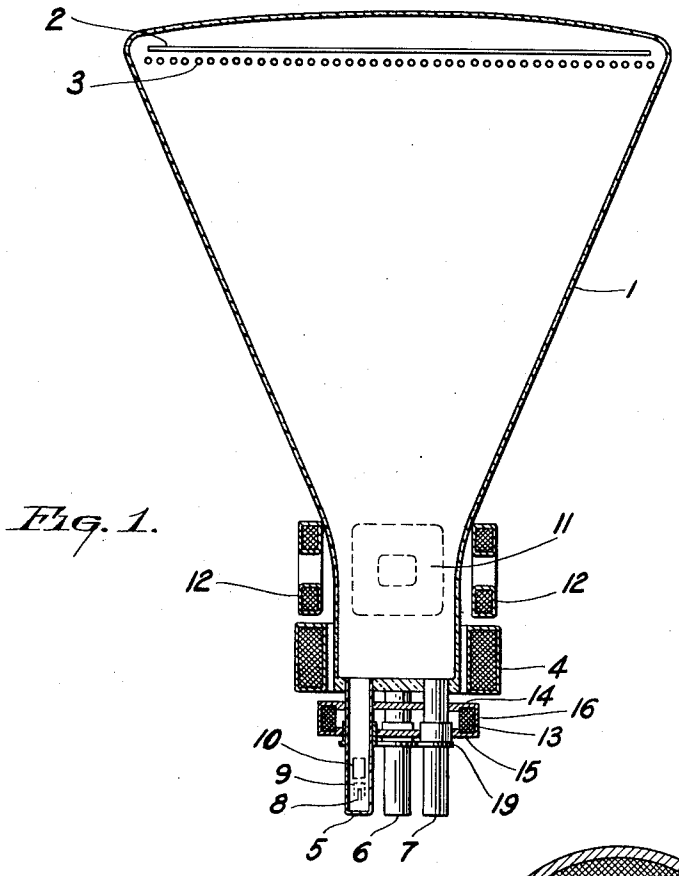

Fig. 1.

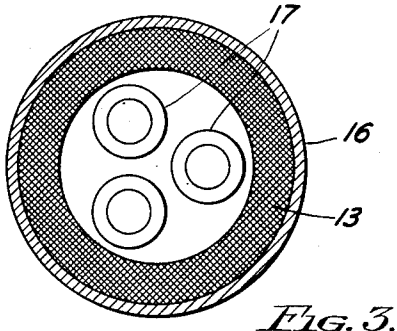

Fig. 3.

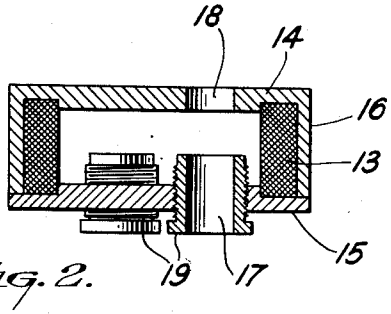

Fig. 2.

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AGENT

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MULTIGUN CATHODE-RAY TUBE

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3 Claims. (Cl. 313—70)

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This invention relates to cathode-ray tubes, more particularly, to multi-gun cathode-ray tubes for color television reception or for the simultaneous recording of two or more values.

One form of color television system commonly employed utilizes three distinct electron guns located in the neck of a cathode-ray tube. The television signal for exciting such a tube is generally broken down into separate channels for the red, green and blue components of the color image, each of the colors energizing one of the electron guns. In order for the color image to accurately correspond to the transmitted image, the picture on the fluorescent screen at one end of the cathode-ray tube is built up by a composite of these three primary color pictures. These systems usually also employ an apertured grid located in front of the luminescent screen in a position to intercept the electron beams in order to direct the beams at particular areas or points of the luminescent screen, the electron beam of each of the electron guns being required to pass through a single aperture of the grid or strike at about the same point on the luminescent screen. That is to say, not only must the beam axes intersect at a single aperture or at the luminescent screen, but also each of the beams must be focussed at that aperture or at the screen.

The main object of the invention is to provide a simple apparatus, externally mounted on a multi-gun cathode-ray tube, for directing and/or foscussing the individual beams of the guns so that they impinge upon a luminescent screen at about the same point without requiring great care in the manufacturing or positioning of the guns themselves.

According to the invention, a cathode-ray tube comprising a luminescent screen supported at one end thereof and including a neck portion located at the opposite end is provided with a plurality of distinct electron guns. Each of the electron guns is housed in a separate cylindrical tube, the tubes being arranged substantially parallel to one another and being connected to the neck portion of the tube. Focussing and directioning of the beams of the electron guns is effected by providing a magnetic device constituted by a pair of plane, substantially parallel plates of magnetic material having apertures therein for mounting said device on the cylindrical tubes housing the electron guns. Hollow slideable pole-members are provided in each of the apertures of one of the plates and surrounding the cylindrical tubes of the electron guns for individual focussing of the guns. A single, common, electrical winding positioned between the plates energizes the magnetic device.

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The arrangement according to the invention has the advantage that the space occupied thereby is materially smaller than that occupied by the previously-known arrangements. Moreover, accurate focussing and directioning of the beams is obtained in a very simple manner thereby eliminating the need for careful manufacturing and positioning of the guns.

The invention will now be described with reference to the accompanying drawing in which:

Fig. 1 shows a cathode-ray tube according to the invention for reproducing color television images;

Fig. 2 is a longitudinal section of a magnetic system of poles according to the invention for simultaneous production of the focussing fields in a multi-gun tube;

Fig. 3 is a cross-sectional view of the device shown in Fig. 2 in a plane at right angles to Fig. 2.

The cathode-ray tube shown in Fig. 1 comprises a wall 1 enclosing a luminescent screen 2 covered with a mosaic of superficial elements consisting of fluorescent materials of the kinds which become luminescent in the desired colors upon being excited by electrons. A grid 3 comprising a large number of small apertures is provided in the vicinity of the screen 2.

Three substantially parallel electron guns each producing a directed electron beam, are provided in the neck of the tube for scanning the screen 2. The beams produced by the guns are directed to a common point on an aperture in the grid 3 and in the case of parallel arrangement of the electron guns, the required convergence of the beams may be produced by the use of a focussing coil 4.

Each of the tubes 5, 6, and 7 contains an electrode gun, only that in tube 5 being shown diagrammatically, comprising a cathode 8, a control electrode 9 and an anode 10. A set of deflection coils 11 for horizontal deflection of the beam and a set of deflection coils 12 for vertical deflection thereof are provided on the tube.

In the construction of the collecting or luminescent screen 2 and the grid 3, use, alternatively, may be made of a grid constituted by parallel wires, the different luminescent substances being provided on the screen in lines having a width corresponding to the spacing between the grid wires. The electron guns may be arranged in a straight line side by side at right angles to the direction of the grid wires. However, in the

embodiment shown in Fig. 1, the guns are arranged in the form of a triangle.

The beams from the three guns are focussed by the magnetic device shown in detail in Figs. 2 and 3 comprising a system of pairs of magnetic poles which are energized by a common electrical winding 13 when the latter is traversed by electric current. In the particular embodiment shown in Figs. 2 and 3, two circular parallel plates 14 and 15 are connected together by an annular upright edge 16 provided along their outer circumferences. Both the plates 14, 15 and the upright edge 16 are constituted by magnetic material. A single energizing winding 13 is arranged between the plates 14, 15 near their outer edges. Each plate 14, 15 contains three apertures 17 and 18, respectively, by means of which the device may be slipped over the tubes 5, 6, 7 comprising the electron guns. Three hollow, adjustable pole members 19, each constituted by magnetic material, are in threaded engagement, respectively, with each of the apertures in the plate 15. These pole members 19, each of which surround an electron gun, may be screwed in and out of the plate 15 to a greater or smaller extent so that the distance between the pole member 19 and the plate 14 varies and, hence, the strength of the magnetic field therebetween for focussing each individual beam.

The energizing of the coil winding 13 will produce magnetic fields between each pole member 19 and the plate 14, the strength and focussing action of these fields being dependent upon the position of the pole members 19 which are individually adjustable for each electron gun. Consequently, with the above-described arrangement, the focal point and direction of the electron beams produced by each of the electron guns are individually adjustable by a magnetic device energized by a single winding with great accuracy.

While I have thus described my invention with specific examples and embodiments thereof, other modifications will be readily apparent to those skilled in the art without departing from the spirit and the scope of the invention as defined in the appended claims.

What I claim is:

1. A multi-gun cathode-ray tube for producing a plurality of directed electron beams which impinge at about the same point on a collecting screen, comprising an envelope supporting the collecting screen at one end thereof and including a cylindrical neck portion located at the opposite end, a plurality of electron guns, a plurality of distinct cylindrical tubes each housing one of said guns, said cylindrical tubes being substantially parallel to one another and being connected to said neck portion of said cathode-ray tube, and a magnetic device for directing said beams, said magnetic device comprising a plurality of pairs of magnetic poles each in proximity of one of said guns, and a single coil winding surrounding all of said pairs of poles for energization thereof.

2. A multi-gun cathode-ray tube as claimed in claim 1 in which said magnetic device comprises a pair of plane parallel magnetic plates for forming said pairs of magnetic poles and having apertures therein for engagement with said cylindrical tubes, said winding being positioned between said plates, and a magnetic member uniting said plates along their outer edges and enclosing said winding.

3. A multi-gun cathode-ray tube as claimed in claim 2 in which a plurality of adjustable sleeves of magnetic material are provided each of which is in engagement with one of said apertures in one of said plates and surrounds one of said guns for individually focussing each gun.

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