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CATHODE-RAY TUBE BEAM-POSITIONING DEVICE

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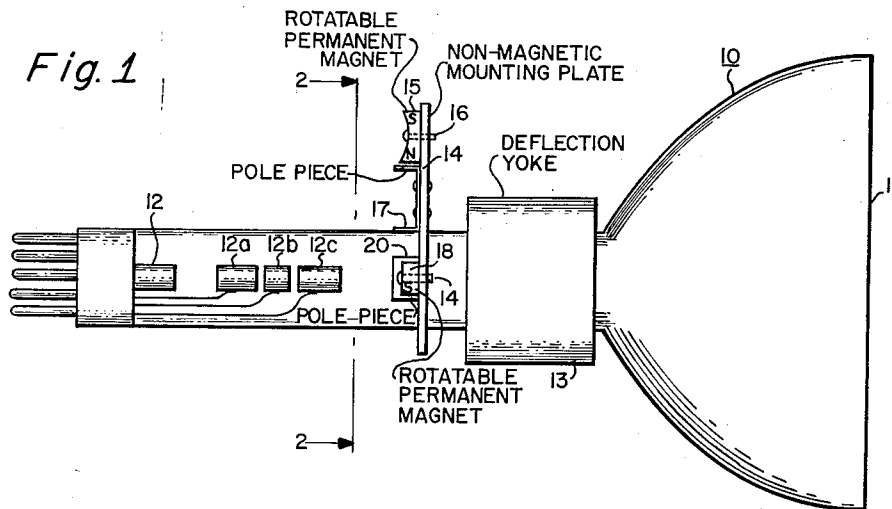
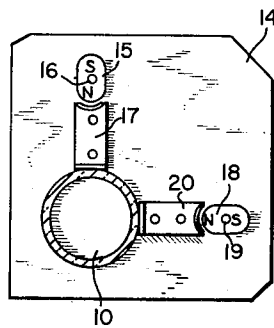


Fig. 2



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CATHODE-RAY TUBE BEAM-POSITIONING
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4 Claims. (Cl. 313-76)

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This invention relates generally to electron-beam positioning or centering devices, and more particularly to a positioning device for a cathode-ray tube which enables the electron beam developed within such a tube, when in its undeflected position, to impinge on any desired point of the target or screen electrode of the tube.

A cathode-ray tube for use as a reproducing device in a television receiver, or for other related purposes, includes a source of electrons located in the neck portion of the tube and a screen or target electrode situated in the conical portion thereof opposite the electron source. Suitable electrodes are included in the tube for focusing the electrons emitted from the source into an electron beam and for directing the beam to the screen electrode. An electro-static or electro-magnetic arrangement is also included within the tube or supported on its neck portion for deflecting the electron beam to scan it over an area of the screen electrode. Moreover, an electro-static or magnetic assembly is usually provided for focusing the electron beam to enable images to be reproduced on the screen with clarity and distinctness.

It has been found desirable to provide some means for positioning the electrons beam in order that images may be reproduced correctly centered on the screen area despite slight misalignments of the component elements of the tube. One known beam-positioning arrangement comprises means for adjusting the angular position of the focusing device of a magnetically focused tube relative to the longitudinal axis of the tube. However, such structure is usually awkward and commercially infeasible and, obviously, is not applicable when electro-static focusing is utilized.

Another beam-positioning system for an electro-magnetically deflected type of tube consists of suitable circuits for passing a controllable unidirectional current through the line- and field-deflection windings of the yoke. The amount of current passing through the respective windings is adjusted by a control until the electron beam is accurately centered on the screen. This arrangement has been found to be satisfactory in operation, but it imposes an additional current drain on the system.

It is a general object of the present invention to provide an improved structure for positioning the electron beam of a cathode-ray tube.

Another object of the invention is to provide an improved beam-positioning device of the magnetic type which is simple to construct and is conveniently adjustable to perform its centering function.

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Yet another object of the invention is to provide an improved and inexpensive beam-positioning device which is especially useful for electrostatically focused cathode-ray tubes.

The beam-positioning device of this invention, for use in conjunction with a cathode-ray tube having a target or screen electrode mounted at one extremity and means at its other extremity for generating and directing an electron beam along a given path to the target, comprises a supporting structure mounted in a plane transverse to the electron path, and at least one bar magnet exhibiting north and south magnetic poles at its respective extremities and mounted on the supporting structure for rotation about an axis laterally displaced from the path. A pole piece is mounted on the supporting structure between the magnet and the electron path to establish a beam-centering field within the tube traversing the path of the electron beam and having an intensity and sense determined by the angular orientation of the magnet.

The features of this invention which are believed to be new are set forth with particularity in the appended claims. The invention itself, however, together with further objects and advantages thereof may best be understood by reference to the following description when taken in conjunction with the accompanying drawing, in which:

Figure 1 shows one embodiment of the invention associated with a cathode-ray tube, and,

Figure 2 shows a view taken along the lines 2-2 of Figure 1.

As shown in the drawing, a cathode-ray tube 10 has a target or screen electrode 11 affixed to the end of its enlarged or conical portion, this target usually taking the form of an electron-responsive fluorescent screen. The tube also includes means 12, such as a conventional electron gun, located at the end of its neck section remote from target 11 for generating an electron beam and for directing the beam along a given path to the target, and an electro-static lens arrangement 12a, 12b, 12c (for example) for focusing the beam on the screen. A deflection yoke 13 of any well-known construction is mounted on the neck of tube 10 adjacent the conical section to deflect the electron beam and scan it in a preselected two-dimensional pattern over an area of target 11.

The beam-positioning device of this invention for accurately locating the scanning pattern within the confines of screen 11 comprises a supporting structure or plate 14 of non-magnetic material which is mounted on the neck section of

tube 10 adjacent deflection yoke 13 as shown. Structure 14 may be rigidly held on the neck section by providing a friction fit therebetween or by means of any well-known mounting brackets. Plate 14 has a permanent bar magnet 15 exhibiting north and south poles at its respective extremities rotatably secured thereto by means of a pin 16 about an axis laterally displaced from the electron path within the tube. The magnet is held in frictional engagement with the plate by the pin so that upon rotation thereof to a desired angular position it is firmly held in such position. A pole piece 17 is secured to mounting plate 14 between magnet 15 and the neck section of tube 10 to direct the field from the magnet across the axis of the tube. In this manner a first beam-centering field is developed within the tube, traversing the path of the electron beam. Rotation of magnet 15 does not affect the direction of the above-mentioned beam-centering field since its direction is fixed by pole piece 17. However, the intensity and sense of the field are determined by the angular orientation of the magnet. For when the north pole of the magnet is adjacent the pole piece, rotation of the magnet through 180° can increase the field from zero to maximum intensity in one sense and back to zero. Whereas, when the south pole is adjacent the pole piece rotation of the magnet varies the field intensity but in the opposite sense.

Plate 14 has a further magnet 18 secured thereto by means of a pin 19 for rotation about an axis laterally displaced from the electron path in tube 10 and angularly displaced from the axis of magnet 15 by substantially 90°. Magnet 18 may also be a bar magnet magnetized in a longitudinal direction so that one end is a north pole and the other a south pole, as shown. Magnet 18, like magnet 15, is frictionally held against plate 14 by its associated pin so that it may be set in any desired position. A pole piece 20 is secured to the mounting plate between magnet 18 and the neck section of tube 10 to direct the magnetic field from this magnet across the axis of the tube. The latter arrangement develops a second beam-centering field within the tube, traversing the path of the electron beam at substantially right angles to the first-described beam-centering field. The intensity and sense of the second beam-centering field may be adjusted by rotation of magnet 18 about its axis.

The beam-positioning device develops, therefore, two magnetic fields extending across the path of the electron beam and mutually disposed at right angles. The intensity and sense of each of these fields can be adjusted simply by rotating magnets 15 and 18 until a desired resultant field is obtained of proper sense and magnitude to position accurately the electron beam on target 11.

The invention provides, therefore, an extremely simple device for positioning an electron beam within a cathode-ray tube. The device may be constructed in an economical manner and is composed of relatively few and inexpensive components. Moreover, the device provides an extremely convenient means for positioning an electron beam, this being accomplished by the mere manipulation of the two bar magnets which are mounted to be readily accessible when the tube is mounted in place in a television receiver, or like apparatus. The device has been constructed and has been found to operate with a high degree of satisfaction in performing its centering function.

While a particular embodiment of the invention has been shown and described, modifications

may be made and it is intended in the appended claims to cover all such modifications as fall within the true spirit and scope of the invention.

I claim:

1. A beam-positioning device for a cathode-ray tube, having a target electrode and means for generating and directing an electron beam along a given path to said target, comprising: a supporting structure mounted in a plane transverse to said path; at least one bar magnet mounted on said structure for rotation about an axis laterally displaced from said path and exhibiting north and south magnetic poles at its respective extremities; and a pole piece mounted on said supporting structure between said bar magnet and said path in an asymmetrical position relative to said path for establishing a beam-centering field within said tube traversing said path with an intensity and sense determined by the angular orientation of said magnet.

2. A beam-positioning device for a cathode-ray tube, having a target electrode and means for generating and directing an electron beam along a given path to said target, comprising: a first bar magnet mounted for rotation about an axis laterally displaced from said path and exhibiting north and south magnetic poles at its respective extremities; a first pole piece disposed between said first bar magnet and said path in an asymmetrical position relative to said path for establishing a first beam-centering field within said tube traversing said path with an intensity and sense determined by the angular orientation of said first magnet; a second bar magnet mounted for rotation about an axis laterally displaced from said path and angularly displaced from said first-mentioned axis, said second bar magnet exhibiting north and south magnetic poles at its respective extremities; and a second pole piece disposed between said second bar magnet and said path in an asymmetrical position relative to said path for establishing a second beam-centering field within said tube traversing said path at a selected angle to said first beam-centering field and having an intensity and sense determined by the angular orientation of said second magnet.

3. A beam-positioning device for a cathode-ray tube, having a target electrode and means for generating and directing an electron beam along a given path to said target, comprising: a supporting structure mounted in a plane transverse to said path; a first bar magnet mounted on said structure for rotation about an axis laterally displaced from said path and exhibiting north and south magnetic poles at its respective extremities; a first pole piece mounted on said supporting structure between said first bar magnet and said path in an asymmetrical position relative to said path for establishing a first beam-centering field within said tube traversing said path with an intensity and sense determined by the angular orientation of said first magnet; a second bar magnet mounted on said structure for rotation about an axis laterally displaced from said path and angularly displaced from said first-mentioned axis, said second bar magnet exhibiting north and south magnetic poles at its respective extremities; and a second pole piece mounted on said supporting structure between said second bar magnet and said path in an asymmetrical position relative to said path for establishing a second beam-centering field within said tube traversing said path at a selected angle to said first beam-centering field and hav-

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ing an intensity and sense determined by the angular orientation of said second magnet.

4. A beam-positioning device for a cathode-ray tube, having a target electrode and means for generating and directing an electron beam along a given path to said target, comprising: a supporting structure mounted in a plane tranverse to said path; a first bar magnet mounted on said structure for rotation about an axis laterally displaced from said path and exhibiting north and south magnetic poles at its respective extremities; a first pole piece mounted on said supporting structure between said first bar magnet and said path for establishing a first beam-centering field within said tube traversing said path with an intensity and sense determined by the angular orientation of said first magnet; a second bar magnet mounted on said structure for rotation about an axis laterally displaced from said path and angularly displaced from said first-mentioned axis by an amount substantially equal to 90°, said second bar magnet exhibiting north and south magnetic poles at its respective extremities; and a second pole piece mounted on

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said supporting structure between said second bar magnet and said path for establishing a second beam-centering field within said tube traversing said path at right angles to said first beam-centering field and having an intensity and sense determined by the angular orientation of said second magnet.

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