

guns are corrected, so that pictures with satisfactory convergence properties are produced on the screen of the display tube. Display tube/deflection yoke combinations of this type are termed self-converging.

5 When the convergence is ensured in this manner, it often appears to be necessary to correct a pin-cushion distortion (east-west raster distortion) occurring on the vertical sides of the display screen.

10 It is the object of the present invention to provide a deflection yoke for a cathode-ray tube with which east-west raster distortions can be reduced to within acceptable limits in a simple manner while maintaining the self-converging properties.

15 The invention provides for a colour display tube of the type disclosed in the opening paragraph a deflection yoke which is characterised in that the winding distribution of the field coil portions is such that the magnetic field when produced thereby is substantially pin-cushion shaped throughout the length of the core, two members of magnetically permeable material being located diametrically opposite to each other radially between the line and
20 field deflection coils adjacent the said second end with each member substantially lying within a sector defined by an associated field coil portion, said members changing the magnetic field when produced by said field deflection coil at said second end from pin-cushion to barrel shape.

25 It has been found that a straight east-west raster can be obtained in principle by laying the wire distribution of the frame deflection coil so that in addition to the overall dipolar field needed for the deflection of the electron beams a sixpole field deflection magnetic field is produced exclusively on the screen
30 side of the deflection yoke. This sixpole field gives rise to a local pin-cushion-shaped modulation of the dipolar field on the screen side which corrects the undesired pin-cushion-like east-west raster distortion inherent to dipolar field deflection magnetic field.

35

of magnetically permeable material placed in the deflection field can be smaller so that the loss of sensitivity thus becomes smaller than in the case without extra blocks. Secondly, since the blocks serve as poleshoes, they make the path of the field deflection magnetic flux through the air smaller, so that the sensitivity increases relative to the case without blocks.

The invention is not restricted to the use of (ferrite) blocks placed on the outside of the core. The blocks may also be formed as two regions which are integrally thickened on the neck side of the core, which, in the case in which the length of the core remains unvaried, has for its advantage that the field deflection point is not further moved towards the smaller end of the core, as is the case when separate ferrite blocks are used which are placed against that end of the core. (In other words, the shape of the dipolar field deflection magnetic field is not varied thereby).

The use of the separate blocks has the advantage that the blocks, when they are supported so that they can be moved in the radial direction, can also provide line symmetry control and/or field balance control. This is of practical use, in particular, in those cases in which it is not possible to perform these controls by means of a movement of the relative position of the core on the display tube, as in systems in which the core has a fixed position on the display tube.

The invention will now be described in greater detail, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic cross-sectional view (taken along the Y-Z plane) of a deflection yoke according to the invention mounted on a colour television display tube with means influencing the field deflection magnetic field,

Figure 2 is a partial cross-sectional view (along the X-Z plane) of the magnetic core of the deflection yoke of Figure 1 which shows a deflection coil half and means to influence the field deflection magnetic field,

The two halves 6 and 7 of the line deflection coil are of the saddle type with two (front and rear) upright ends. However, they may also be of the type having only a front upright end, so that the upright rear end 5 of the cap 3 may be omitted and the use of an undivided annular core 8 becomes possible.

The two halves 9 and 10 of the field deflection coil are wound axially on the annular core 8, i.e. the turns are located in planes which pass through the tubular axis 11 of the core. The distribution of the turns is such that a dipolar magnetic field in combination with a six-pole magnetic field is produced throughout the length of the field deflection coil, the combination resulting in an overall magnetic field of pin-cushion shape. (In the case, for example, of a deflection yoke for a 20 inch 90° display tube this is realized by constructing each field deflection coil half as a multi-layer single-wire axially wound toroidal coil in which each layer consists of 75 turns each coil half occupying an angular amount α of between 70° and 90° (compare Figures 3a and 3b).) As explained above, east-west raster distortion can be considerably corrected, it is true, in this manner, but the quality of the convergence is interfered with. For good convergence (astigmatic level) a field directed sixpole magnetic field of barrel shape is required, this being the required variation of the field deflection magnetic field on the neck side, while with the above-described wire distribution a field directed sixpole magnetic field of pin-cushion shape is generated everywhere, so that at the neck side a pin-cushion variation of the field deflection magnetic field is also produced. In order to make the field directed sixpole field on the neck side sufficiently barrel shaped, the deflection yoke 2 is provided with members 12 and 13 of magnetizable material (for example cut from a sheet of a silicon-iron alloy). The members 12 and 13 are mounted on the outside of the support 3 near the neck side of the field deflection coil halves 6 and 7. A characteristic thickness of these members is 0.5 to 1 mm with a length and width of a few cm.

so as to be movable radially makes it possible to remove or reduce asymmetries in the field deflection coil halves arising during the manufacture or assembly (picture symmetry control). For this purpose the blocks 14 and 15 should
5 be moved in the same direction (Figure 6). Simultaneously, an influence of the line deflection field occurs (Figure 7: line symmetry control).

10

15

20

25

30

35



blocks are provided with supporting means which permit radial movement thereof.

5 5. A display tube as claimed in Claim 1 or 2, in which the core of the deflection yoke at its second end has two regions of greater thickness than the rest of the core, the said regions being situated diametrically opposite to each other in the said first direction.

10 6. A colour television display tube with a deflection yoke mounted thereon substantially as herein described with reference to the accompanying drawings.

7. A deflection yoke for an "in-line" gun colour television display tube, said deflection yoke comprising a substantially frusto-conical core of magnetic material having a first end and a second end of smaller diameter than that of the first end, a line deflection coil consisting of two diametrically oppositely arranged saddle line coil portions located within the said core and which, when energised, provides a first deflecting magnetic field in a first direction, a field deflection coil consisting of two diametrically oppositely arranged field coil portions toroidally wound about said core and which, when energised, provides a second deflecting magnetic field in a second direction transverse to said first direction, characterised in that the winding distribution of the field coil portions is such that the magnetic field when produced thereby is substantially pin-cushion shaped throughout the length of the core, two members of magnetically permeable material being located diametrically opposite to each other radially between the line and field deflection coils adjacent the said second end with each member substantially lying within a sector defined by an associated field coil portion, said members changing the magnetic field when produced by said field deflection coil at said second end from pin-cushion to barrel shape.

8. A deflection yoke as claimed in Claim 7 in which the sector defined by the field coil portion lies between 70° and 90°.

35 9. A deflection yoke as claimed in Claim 7 or 8, in which two blocks of magnetically permeable material placed diametrically