

The present invention refers to a magnetic deflector for cathode ray tubes of reduced neck length.

In the field of professional visualization especially, particularly in avionics, the space requirement of a cathode ray tube and its deflector can pose problems which are not easy to solve. To reduce this space requirement, the deflection angle being constant, it had been thought of shortening the neck length ; however, such a solution has been rejected until now since the length of the space available for the deflector is then reduced, which causes either a significant decrease of the sensitivity of the deflector if the length has been reduced, or perturbations of the function of the electron gun which is dipped into the magnetic fields produced by a normal length deflector, these perturbations being due to these fields and modifying particularly the beam concentration lens.

The subject of the present invention is a deflecting device which can be used on a cathode ray tube of reduced neck length which practically does not cause any functional disturbance of the electron gun and which offers a nearly optimal sensitivity.

The deflector according to the present invention comprises a magnetic circuit, the rear part of which is closed and wraps the rear leading-out wires of the windings of the deflector, these leading-out wires being fold down in the prolongation of the central parts of these windings, the windings of these deflectors being saddle-type windings.

The present invention shall be better understood by reading the detailed description of an embodiment taken

as a non-restrictive example which is illustrated on the annexed drawings.

Fig. 1 is a schematic longitudinal section through a cathode ray tube according to the prior art with its classic deflector ;

Fig. 2 is a schematic longitudinal section through a cathode ray tube with reduced neck which is provided with a deflector according to the invention ;

Fig. 3 is a curve representing the amplitude of the horizontal deflection magnetic field along the longitudinal axis of the cathode ray tube of fig. 1 and fig. 2 in the range of action of the deflector according to the invention.

The known cathode ray tube, represented on figure 1 is a "long neck"-type cathode ray tube, the neck 2 having such a length that the magnetic field produced by the deflector 3 is nearly equal to zero at the level of the electron gun 4 of this tube, the deflector being positioned as far as possible from the electron gun and supported by the conical part 5 of the tube. The deflector 3 comprises, as usual, a first horizontal deflection winding 6 and a second vertical deflection winding 7, both windings being saddle windings.

The tube 8, represented on figure 2, is a "short neck"-type tube. Its neck 9 is distinctly shorter than the neck 2 of the tube 1 so that, if the deflector 3 of the prior art would be used, the electron gun 10 of this short neck tube would be in an area where the amplitude A of the magnetic field produced by the deflector is not insignificant. Thus, the operation of the

electron gun would be disturbed, as described above.

To reduce the amplitude of the magnetic field of the deflector at the level of the electron gun 10 to a trivial value, a deflector according to the invention is used, such as the deflector 11 represented on figure 2.

The deflector 11 comprises a magnetic circuit 12, the front part of which (on the side of the conical part 13 of the tube) is flare-shaped in the same way as the front part of the magnetic circuit. The rear part of the magnetic circuit 12 is closed, i.e. instead of constituting a cylindrical sleeve, the end 12A of this rear part extends radially inward (towards the longitudinal axis of the tube) and nearly comes into contact with the neck so as to constitute a "bottom" which is perpendicular to the axis of the tube and provided with an axial hole, the diameter of which is approximately equal to the outside diameter of the neck 9 of the cathode ray tube.

The deflector comprises an horizontal deflection winding 14 and a vertical deflection winding, both windings being concentrically arranged around the neck 9, the winding 14 for example inside the winding 15 with the magnetic circuit 12 surrounding them.

The winding 14, which moulds most exactly the shape of the tube (neck and beginning of the conical part 13) comprises a central part 16 and end leading-out wires 17 (at the front part) and 18 (at the rear part). Instead of being radially fold down outward, the leading-out wire 18 is approximately in the prolongation of the central part 16. In the same way, the winding 15 comprises a central part 19 and end leading-out wires 17 (at the front part) and 21 (at the rear part), the

leading-out wire 21 being approximately in the prolongation of the central part 19 above the leading-out wire 18. At the front and in their central part, the windings 14 and 15 have basically the same saddle form as the windings 6 and 7. Therefore, the magnetic circuit 12, which should mould the outer contour of the winding 15, comprises a slight recess 22, just in front of the end wall 12A, to receive the leading-out wires 18 and 21 which are thicker than the central parts 16 and 19. Thus, the magnetic circuit 12 "wraps" the leading-out wires 18 and 21.

In case of using a short neck tube such as the tube 8, the beam concentration lens 23 is very near to the deflector. If we used a deflector such as the classic deflector 3 of fig. 1, the amplitude of its magnetic field (full line curve of fig. 3) at the level of the lens 23 (area 24 of fig. 3) would still be high enough to deflect the electronic beam produced by the gun and thus to offset it relatively to the lens 23 causing special aberrations due to this lens at the focussed spot. In fact, the electronic beam of the gun 10 has reached, at the level of this lens 23, its maximum diameter and has a low potential in comparison with its final potential at the lead of the gun; thus, this beam is very sensitive to the magnetic fields.

When using a deflector according to the invention, the magnetic circuit of which is made of a ferromagnetic material, for example of mumetal or ferrite, with high permeability (higher than 1) and a low time constant (approximately a few microseconds) in the setting of the field, a very strong attenuation of the magnetic field of the deflector is reached behind the deflector, as shown by the discontinued curve in fig. 3. At the level

of the beam concentration lens, the magnetic field becomes insignificant (area 24 in fig. 3), the winding 17 being, for its front part, identical to the classic winding 6. The left part of the discontinued curve merges with the full line one. Similar curves would be obtained for the vertical deflection.

Claims

1. A magnetic deflector for a cathode ray tube of reduced neck length, the deflecting windings (14, 15) of this deflector being saddle windings, characterized in that it comprises a magnetic circuit (12), closed at its rear part (12A) which wraps the rear lead-out wires (18, 21) of the windings (14, 15) of the deflector which are folded down in the prolongation of the central parts (16, 19) of these windings.
2. Deflector according to claim 1, characterized in that the end (12A) of the rear part of the magnetic circuit extends radially inward and nearly comes into contact with the neck (9).
3. Deflector according to claim 1 or 2, characterized in that the rear lead-out wires (18, 21) lie upon another.
4. Deflector according to one of the preceding claims, characterized in that the magnetic circuit moulds the contour of the outer winding and that it includes in its rear part a recess (22) receiving the rear lead-out wires (18, 21) of the windings (14, 15).
5. Deflector according to one of the preceding claims, characterized in that the magnetic circuit (12) is made of a ferromagnetic material with high permeability, such as mumetal or ferrite.

