

The present invention relates to a device for correcting the NORTH-SOUTH geometrical distortions of an aspheric cathode ray tube.

To correct the NORTH-SOUTH geometrical distortions of a cathode ray tube, generally the field sweep signal has to be influenced. The distortion can be decomposed into a parabolic distortion, called cushion distortion, and a so-called "gullwing" distortion. Each of these distortions is corrected by an appropriate signal which modulates the field signal so that two different modulators, which are expensive and complex, are needed. Moreover, it has been stated that, in case of aspheric cathode ray tubes ("planar" tubes such as those defined in the French patent FR-A-2 541 820 of RCA), the geometrical distortions are more important than with the classical spheric tubes and that the gullwing distortion on the edges of the screen is not homothetic to that at the $1/4$ or at the $3/4$ of the height of the screen so that it is difficult to correct it with the known means.

The object of the present invention is a device for correcting the NORTH-SOUTH distortions of a cathode ray tube which is less complex and less expensive than the known means and which enables to correct the distortions of aspheric tubes of the "planar" type in a satisfactory way.

The device according to the invention (see claim 1) comprises a single field signal modulator which cooperates with at least four NORTH-SOUTH correcting magnets arranged on the deflector or in the vicinity thereof, each of these magnets being oriented at about 30° in relation to the NORTH-SOUTH direction of the tube. Preferably, the used magnets are magnets with a magnetic

induction comprised between 4 and $12 \cdot 10^{-4}$ T (4 and 12 Gs) approximately.

The present invention will be better understood by reading the detailed description of an embodiment taken as a non restrictive example and illustrated on the annexed drawings.

Fig. 1 is a view of the screen of a cathode ray tube of the prior art, the deflector of which does not receive any NORTH-SOUTH correcting signal and to which a crossed bar pattern is sent.

Fig. 2 and 3 are diagrams of forms of modulating waves used in the modulators of field signals of the prior art.

Fig. 4 is a view of the screen of a cathode ray tube, the deflector of which is not associated to any correcting modulation to which a crossed bar pattern is sent and which comprises correcting magnets according to the invention.

Fig. 5 is a diagram of the form of the modulating wave of the field signal according to the invention.

Figs. 6 and 7 are simplified views, respectively of the rear part and of the side of a deflector equipped with correcting magnets according to the invention.

The figures 2 and 3 represent diagrams of forms of modulating waves of the field signal which is sent to a deflector of the prior art. Such a deflector 1 (see figs. 6 and 7) is equipped with two "NORTH-SOUTH" geometry correcting magnets 2A, 3A (i.e. mainly acting on the

horizontal lines of the screen of the tube on which this deflector is fixed), these magnets 2A, 3A being arranged along a vertical axis V (we suppose, of course, that the receiver or monitor which comprises the tube with its deflector is arranged on a horizontal plane and that the horizontal and vertical axes of the screen of the tube are respectively parallel and perpendicular to this plane). On figure 6, these magnets have been represented in dotted lines because they are not used by the correcting device of the invention.

In case such a deflector of the prior art is mounted on a cathode ray tube of an aspheric screen of the "planar" type and if we send a crossed bar pattern as video signal to this tube, we obtain a picture like that represented on figure 1. In the examples of the figures 1 to 4, the concerned pattern is made up of equidistant horizontal and vertical lines, five for each direction, the extreme lines being formed almost on the edges of the screen and the median lines constituting the axes of the screen.

In the case of figure 1, we suppose that the EAST-WEST geometry correction (relating to the vertical lines), performed in the classical way, is satisfactory. On the other hand, we state that the horizontal lines, except the median line, show a "gullwing" distortion. The amplitude of the latter is greater at the quarter and at the three quarters of the height of the screen than on the edges of the screen but the distortion which affects the intermediate lines (at the $1/4$ and $3/4$ of the height) is not homothetic to that which affects the extreme lines. The difference in amplitude of these two non homothetic distortions can easily be compensated for by the appropriate form of the signal modulating the

field deflection signal but the lack of homothety can only be compensated for by using two modulators. One of these modulators, assigned to the correction of the "cushion" distortion component, is controlled by a signal such as that of figure 2 and the other, assigned to the correction of the "gullwing" distortion component is controlled by a signal such as that represented on figure 3.

To avoid the use of two NORTH-SOUTH geometry correcting modulators, the present invention consists in modifying the number and place of the NORTH-SOUTH correcting magnets by reinforcing the "gullwing" distortion component of the extreme lines (without practically modifying the "gullwing" distortion component of the intermediate lines) so that the distortion of the external lines is approximately homothetic to that of the intermediate lines. Besides, to reduce the importance of the "gullwing" distortion of the intermediate lines and of the adjacent lines (not represented), magnets 2, 3 similar to the magnets 2A, 3A are placed on the deflector 1 along the horizontal axis (EAST-WEST) H.

Then, we obtain a pattern on the screen of the tube such as that represented on figure 4. We state that the intermediate lines are hardly different from what they were on figure 1, whereas the extreme lines are strongly modified : the "gullwing" distortion component is predominant and the distortion of these extreme lines is practically homothetic to that of the intermediate lines.

A single geometry correcting modulator is then sufficient to obtain approximately rectilinear lines. An example of the diagram of the control signal of this

modulator has been represented on figure 5. This signal is similar to that of figure 2 but is more rectilinear than the latter.

According to an embodiment example according to the invention, which is represented on the figures 6 and 7, the arrangement of the NORTH-SOUTH geometry correcting magnets is as follows. The centers of the magnets are approximately coplanar and the plane determined by them has a nominal position P located at the level of the anterior front face of the deflector 1 (its front face nearest to the screen of the cathode ray tube). The extreme positions P1 and P2 of this plane are located on each side of the position P at a distance d of approximately 20 mm. This plane is always perpendicular to the axis A of the deflector.

Considering the arrangement of the correcting circuits in the plane P (figure 6), we see that the magnets 2 and 3 are arranged on the horizontal axis and that they are diametrical. On the other hand, the magnets 2A and 3A are done away with and are replaced by the magnets 4, 5, 6 and 7. The magnets 2 to 7 are fixed on the periphery of the deflector 1. The magnets 4 and 7 on the one hand and the magnets 5 and 6 on the other hand are diametrical. The diameters D1, D2, on which the respective centers of the magnets 4 to 7 are located, are at an angle α to the vertical V. According to the invention, this angle α is of $30^\circ \pm 10^\circ$. The magnets 2 to 7 are magnets which are usually used for the geometry correction of deflectors, of 4 to 12×10^{-4} T approximately and preferably of 6 to 8×10^{-4} T, these values being measured at approximately 12 mm from the center of the magnet.

In case the centers of the magnets 2 to 7 are located in another plane than the plane P of figure 7 (magnets 2_1 , 4_1 , 6_1 represented for the plane P_1 and 2_2 , 4_2 , 6_2 for the plane P_2), they are fixed to the deflector 1 by appropriate lugs, for example plastic lugs.

C L A I M S

1. Device for correcting the NORTH-SOUTH geometrical distortions of an aspheric cathode ray tube, characterized in that it comprises a single field signal modulator which cooperates with at least four correcting magnets (4 to 7) being with their centers approximately coplanar, arranged in a plane (P) on the deflector (1) or in a plane (P₁ or P₂) in the vicinity thereof, each of these magnets being oriented at approximately 30° of the NORTH-SOUTH direction (V) of the tube.
2. Device according to the claim 1, characterized in that it comprises moreover two magnets (2, 3) arranged on the deflector (1) or in the vicinity thereof (2₁, 2₂), along an EAST-WEST axis (H) of the tube.
3. Device according to one of the claims 1 or 2, characterized in that the plane (P) in which magnets (4-7) are located is at the level of the anterior front face of the deflector (1).
4. Device according to one of the claims 1 or 2, characterized in that the plane (P₁) in which magnets are located is at a distance (d) of approximately 20 mm at the most from the level of the anterior front face of the deflector (1).
5. Device according to any of the preceding claims, characterized in that the magnets have a magnetic induction comprised between 4 and 12x10⁻⁴ T (4 and 12 G) approximately, these values being measured at approximately 12 mm of the center of the magnet.

