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MAGNETIC DEFLECTING YOKE FOR CATHODE-RAY TUBES

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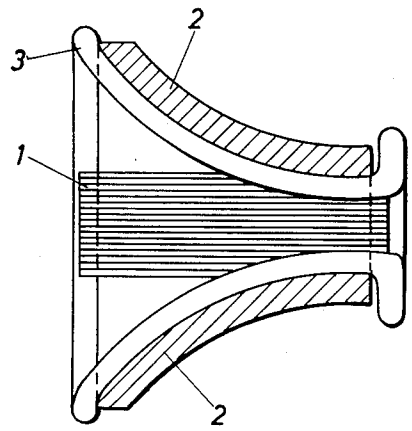


Fig. 1

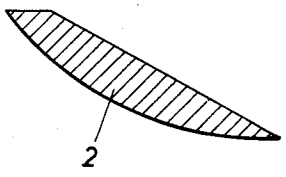


Fig. 2

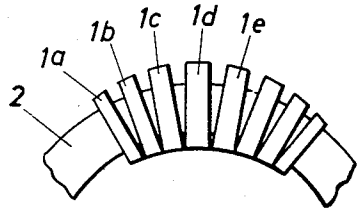


Fig. 3

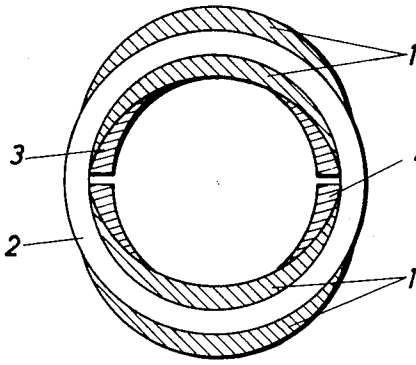


Fig. 4

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MAGNETIC DEFLECTING YOKE FOR CATHODE-RAY TUBES

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3 Claims. (Cl. 313—76)

Object of the present invention is a magnetic deflecting system for cathode-ray tubes.

According to the prior art it is already known to use in deflecting systems saddle-coils having a particular sensitivity to high deflecting frequencies, as well as toroidal coils in which, due to the lacking winding heads, there do not appear any defocusing frontal fields, and which are particularly sensitive to low deflecting frequencies.

In such arrangements, however, the coil pairs or assemblies are arranged on a cylindrically shaped yoke body. This arrangement bears the disadvantage of not permitting the center point of deflection to be brought as near as possible to the screen of the picture tube.

In deflecting system employing saddle-coils for the high deflecting frequencies as well as for the low deflecting frequencies the yoke body has been adapted in special cases to the neck of the tube. These arrangements, however, bear the disadvantage that the sensitivity to the lower deflecting frequency (characterized by the product of the ohmic resistance R and the square of the required coil current i) is an extremely small one.

According to the invention there is now proposed a deflecting system for cathode-ray tubes in which to a ferromagnetic yoke body, embracing both the tube neck and the cone of the envelope, and which yoke body is adapted to the shape of the cone of a tube envelope which is widened out in accordance with a quadratic curve, there are attached toroidal coils serving the slow-deflecting purpose, and in which, at the same time, for effecting a speedy deflection, saddle-coils are built into the yoke body. In this case both kinds of coils may be designed, i.e. with a winding cross-section which is variable along the circumference, e.g. as cosine-coils. Likewise also the toroidal coils may consist of individual coil packs arranged next to each other, the diameter of which may be adapted to the available winding space.

By way of this combination it is rendered possible to use a length of coil and yoke body which is necessary for obtaining an optimum sensitivity in both directions of deflection without risking any neck-shadows. The substantial advantage, however, resides in the fact that a deflecting system constructed in accordance with the invention, and in comparison with a conventional type of system employing saddle-coils for the lower frequency of deflection, has about double the sensitivity to the lower deflecting frequency, in other words, the inventive arrangement only consumes about half as much power.

Accordingly, the deflecting system of the invention bears the advantage over the conventional systems of having a greater sensitivity in both directions of deflection by maintaining the same optimum focus and security against neck-shadows. In addition thereto the system operates with a substantially reduced vertical dissipative power.

In the following the invention will be described in particular with reference to FIGS. 1–4 of the copending drawing, in which:

FIG. 1 shows an inventive deflecting system in a sectional view,

FIG. 2 shows another possible shape of the yoke body,

FIG. 3 shows some subdivided toroidal-coils, and

FIG. 4 is the sectional view of coils with a variable winding distribution.

Referring to FIG. 1 there is shown the toroidal-coil **1** as mounted to a yoke body **2** which, in accordance with the tube neck and the cone-shaped portion of the envelope, is shaped after a curve having a quadratic function. Within this yoke body there are arranged the two saddle-coils **3** and **4**. In FIG. 2 by way of example there is shown another shape of cross-section of the yoke body **2**. FIG. 3 shows how the toroidal-coils are divided into individual winding packs **1***a*, **1***b*, **1***c*, etc., whose diameters may be adapted to the available winding space. FIG. 4 is the sectional view of an arrangement according to the invention comprising a distribution of the windings which is variable along the circumference.

In one exemplified embodiment designed for an external diameter of the neck of the picture tube of 29.7 mm. of the cylindrical portion, and an outer radius (y) of the neck which is widened out in direction to the screen of the picture tube in accordance with the function $y=0.0228x^2+14.63$ (mm.), wherein x extends along the optical axis of the picture tube and $x=0$ indicates approximately the beginning of the widening-out, the following dimensions of the deflecting system were found to be suitable:

Length of the ferrite core is between 28.0–37.5 mm., and the internal diameter of the ferrite core is about 40.0 mm. in the cylindrical portion. In this exemplified embodiment the coils for the lower deflecting frequency consist of 9 layers directly wound upon the core, each layer consisting of 0.4 mm. enamel copper wire.

The innermost layer (which was directly applied to the core) extended approximately over an angular range (sector of dial) of 140°. The angular range of the following layers was gradually reduced from layer to layer, so that for the layers from the inside towards the outside there resulted about the following angular ranges:

First layer	About 140°
Second layer	About 118°
Third layer	About 96°
Fourth layer	About 60°
Fifth layer	About 56°
Sixth layer	About 50°
Seventh layer	About 40°
Eighth layer	About 36°
Ninth layer	About 32°

The winding pattern may be varied at will, especially when employing other thicknesses of wire, in which case the center of gravity of the winding has to be almost maintained towards both sides, if a special vertical cushion-like-distortion correcting network is supposed to be avoided. In this example of an embodiment in which the core had a length of 30 mm., the necessary power (Ri^2) for the lower deflecting frequency of a picture tube with an accelerating voltage of 16 kilovolts amounted to 0.45 watt, whereas the conventional arrangements required 1.03 watts for the same accelerating voltage. In the practical embodiment the coils for the high deflecting frequency were designed in the usual way, viz. with a winding distribution resembling a $\cos^n$-function.

While I have described above the principles of my invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of my invention as set forth in the objects thereof and in the accompanying claims.

What is claimed is:

1. A magnetic deflection system for a cathode ray tube having a hollow frustro-magnetic yoke made of ferro-magnetic material, deflection coils disposed in diametrically

opposed positions around the wall of said yoke in an axial direction each having windings on the inner and outer surfaces thereof, and a second pair of diametrically positioned deflection coils saddle wound on the inner surface of said yoke and displaced 90° around said yoke with respect to said first named deflection coils.

2. A magnetic deflection system as claimed in claim 1, wherein said first and second mentioned deflection coils have a variable winding distribution.

3. A magnetic deflection system as claimed in claim 1, wherein said first mentioned deflection coils consist of separately interconnected coils having different diameters.

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