Dec. 26, 1939. HANNS-HEINZ WOLFF 2,185,138

CATHODE RAY TUBE

Filed July 6, 1934 2 Sheets-Sheet 1

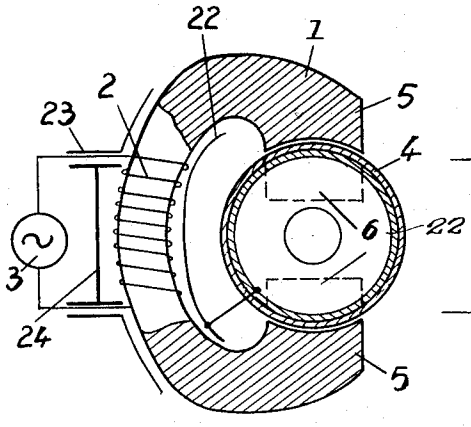


Fig 1

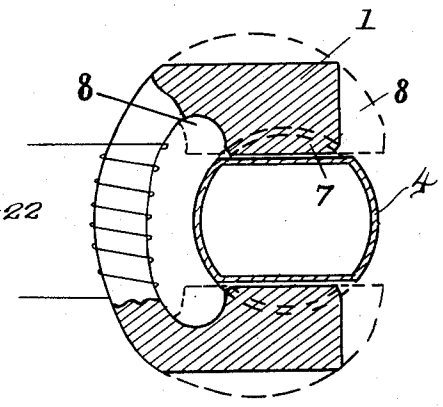


Fig 2.

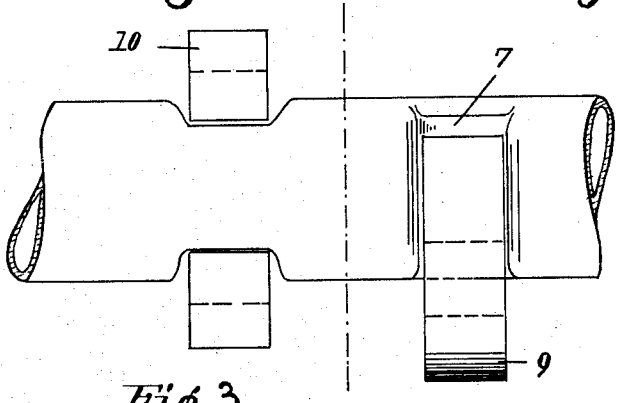


Fig 3.

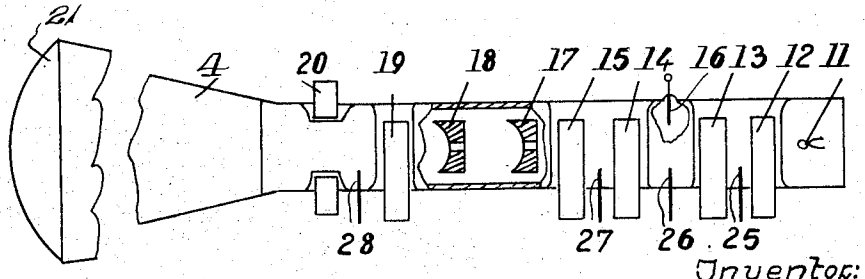


Fig 4.

Inventor:

Hanns Heinz Wolff

Dec. 26, 1939. HANNS-HEINZ WOLFF 2,185,138

CATHODE RAY TUBE

Filed July 6, 1934 2 Sheets-Sheet 2

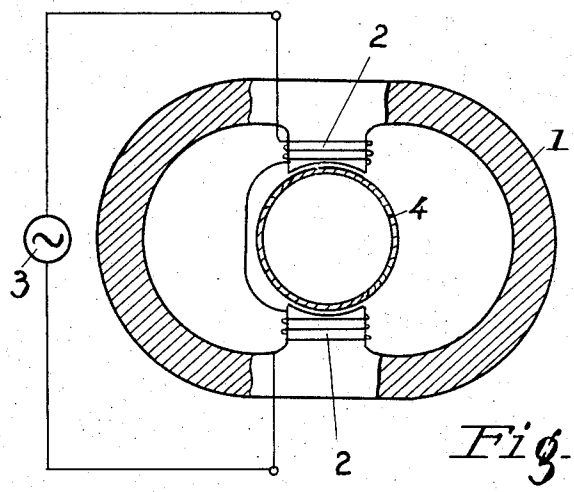


Fig. 5.

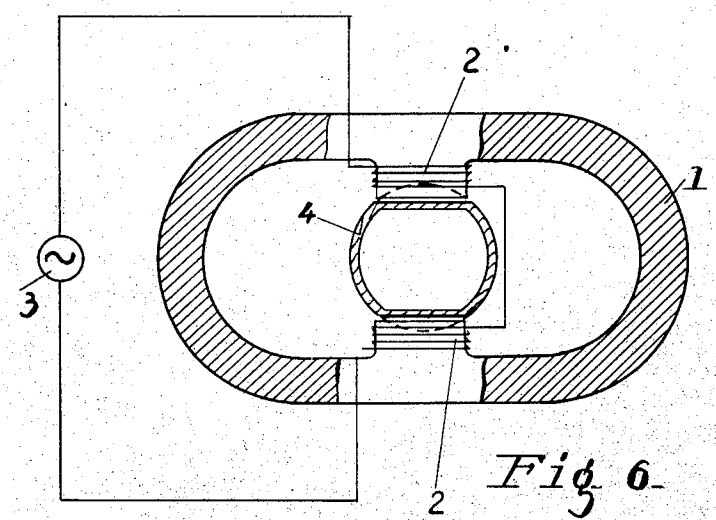


Fig 6.

Inventor:

Patented Dec. 26, 1939 2,185,138

UNITED STATES PATENT OFFICE

2,185,138

CATHODE RAY TUBE

Hanns-Heinz Wolff, Berlin, Germany, assignor, by mesne assignments, to Loewe Radio, Inc., a corporation of New York

Application July 6, 1934, Serial No. 733,997
In Germany July 8, 1933

3 Claims. (Cl. 250—157)

In cathode ray tubes, more particularly in their use for television purposes, there may be used, as well known, electrostatic or magnetic fields for deflecting the cathode ray out of its particular position. The deflection is performed principally at the transmission end for the purpose of scanning the single image points of television images, or at the receiving end for producing the image on the fluorescent screen, the cathode ray being moved in two directions, which are vertical to each other, in chronologically dependent fashion. It is, however, also possible to perform deflection of the cathode ray for other purposes, for example for controlling the light intensity, more particularly in the case of so-called selection control.

From a practical point of view merely electrostatic fields have hitherto been found to be capable of use for deflection of the cathode ray. Up to now it has not been possible in practice to make use of the magnetic deflection, since with increase in the size of the image to be reproduced, and the increase in the number of lines associated therewith, it has been necessary to increase considerably the frequencies. The coils, however, necessary for the magnetic control are unable in their present form to cope with these high frequency requirements.

The deflection of the cathode ray with the assistance of electrostatic fields causes, however, particularly in the case of television arrangements making use of Braun tubes, considerable errors, which make themselves noticeable in the form of distortions within the image to be made visible on the fluorescent screen and in considerable distortions in the form of the image. The concentration and the current intensity of the cathode ray are also affected to an appreciable extent. These errors are due primarily to the mutual effect of the single electrostatic fields which, in addition to the deflection in the two co-ordinates of the image, are also employed for controlling the light intensity of the cathode ray. The mutual effect of these electrostatic fields may, however, only be overcome by particularly complicated means both in the Braun tube itself as well as in the electric circuit arrangement employed for the operation of the tube.

It has already been proposed by the applicant, for the purpose of avoiding the mutual effect of the pairs of deflecting plates, to arrange these a large distance apart, to provide screening means between the pairs of plates, and/or to screen off the leads one against the other.

The proposed measures have been found to be adequate either alone or in combination so long as the image does not exceed to any appreciable extent a certain size (approximately 9–12 cm. or also 10.15 cm.).

It has been found, however, that these measures are not sufficient for the production of television images of large size, and that in the case of large images of this nature the known trapezoidal error is not to be obviated entirely by this measure. It has also additionally been proposed by the applicant to perform the first deflection (image deflection) by the use of deflecting coils, and the second deflection (line deflection) by the use of deflecting plates. The use of deflecting coils for image deflection purposes is possible without difficulties owing to the slow image-change frequency (for example, 25–50 periods). Considerable difficulties occur, however, if the line deflection is also performed with the assistance of magnetic fields. Frequencies are concerned which already fall within the high-frequency range, and amount to 100,000 periods or more.

The methods hitherto proposed for controlling the cathode ray are unsuitable with the use of coils not having a core of high permeability insofar as the dispersion is excessive. It is a condition, however, that an alternating field is produced having a high periodicity, which field is relatively strong, directed with utmost accuracy, and homogeneous over its entire width. The use of cores with high magnetic conductivity is, however, also essential for other reasons, in order to obtain a high self-induction per unit of length of the wire. It is only in this manner that the copper losses in the coil are diminished, causing their damping effect to be smaller. Actually the damping increases in the case of a high-frequency coil having an iron core, viz., one of the usual kind composed of sheets of metal a few tenths of a millimetre in thickness, as in the sheets of the core eddy currents are formed, which have a much greater damping effect than the differences in damping in the values of the copper losses. Since, however, the eddy currents increase with the square of the frequency, cores composed of sheet iron or iron wires are insufficient for contraction of the lines of force in connection with high-frequency deflecting coils in Braun tubes for producing deflection in respect of images of large size.

The eddy current losses occur not only in the single particles of the magnet, but also in the form of capacitative eddy currents, which pass from particle to particle by capacitative cou-

plings. As a result of these capacitative effects there also occur in the insulating agents acting as dielectric losses of a dielectric kind. In addition to these losses the hysteresis losses, which increase with the strength of the fields, also play an important part.

By clearly avoiding all of the sources of loss effective in the case of high frequency it is possible to construct a magnet core, in which the losses are reduced to a minimum.

According now to the invention, there are employed for the cathode ray tube, which is furnished with magnetic control means, for example for deflection or for selection (intensity control) coils, the magnetic flux of which is conducted through substances, which are poor in hysteresis, poor in eddy current losses and are highly permeable (μ actually > 1). Preferably suitable for this purpose are the mass cores employed in the telegraphic art, for example in the case of loading coils. As magnetic means for these coils there is employed in accordance with the invention carbonyl iron powder or an alloy composed of aluminium, iron and nickel. In place of aluminium there may be employed an addition of copper, the alloy being produced from 40% nickel and 60% iron with an addition of copper amounting to 8–10%.

According to the invention, the core of the deflecting coil may also be made up of a material, which may be produced in the manner described in the following:

A strip of paper is first coated with a thin layer of a magnetic composition, consisting of a mixture of an insulating material, which consists of highly insulating material poor in dielectric losses with an addition of magnetic material, preferably carbonyl iron powder or an alloy composed of aluminium, iron and nickel. In place of the aluminium there may be used an addition of copper, whereby the alloy consists of approximately 40% nickel and 54% iron and may contain an addition of copper up to 10%. This material is added to the insulating material, preferably in the form of elongated ellipsoidal particles. This layer of magnet composition is directed in its single parts by the magnetic action of a solenoid coil traversed by direct current during the drying of the insulating liquid. From a suitable number of strips of paper thus treated there is formed a magnet core of suitable shape, which is employed as core for the deflecting magnets of Braun tubes.

Forms of embodiment of magnetic cores, which are excited by a high-frequency alternating field, are illustrated by way of example in the drawings, in which

Figs. 1 and 2 each show a section through a core of this nature, whilst in

Fig. 3 there is illustrated an external arrangement in the case of the Braun tube according to Fig. 2.

In Fig. 4 there is shown by way of example an arrangement for controlling the light intensity, with the assistance of deflecting coils, of the spot of light reproduced on the fluorescent screen.

In detail 1 is the core, which is composed of the material according to the invention, 2 the coil, which is traversed by the alternating current produced by the generator 3. 4 is the Braun tube, and 5 are the pole-shoes, which for the purpose of obtaining a better effect may be continued within the Braun tube by means of the ends 6 produced from the same core material.

In Fig. 2 omitting the special pole-shoes within the tube shown in Fig. 1, there is disclosed a reduced portion 7 in the wall 1 of the Braun tube, the lateral enlargements 8 of the pole-shoes serving to remove possible marginal fields of dispersion outside the zone of deflection of the cathode ray.

In Fig. 3: 9 and 10 are the deflecting systems for line and image deflection, which are made up in accordance with the invention.

In Fig. 4 there is shown by way of example an arrangement for deflection control of the cathode ray by means of magnetic fields. In the same 4 is the Braun tube with the cathode 11, the magnet coils 12, 13, 14, 15 serving for the deflection, and 16 the screening electrode. 17 and 18 are concentration devices, by means of which the cathode ray is concentrated and conducted to the deflecting coils 19 and 20 for line and image deflection, so that on the image screen 21 a rectangular field of image is traversed. The deflection control is already known and described for example in the patent numbered 1,719,756 to Clay (dated July 2, 1929). It forms per se no part of this invention.

For screening the single fields in themselves and against each other there may be provided screening means 22—28, which preferably also possess within the tube a continuation preferably in the form of a diaphragm and may be raised to a suitable potential, which preferably is positive in relation to the anode.

Fig. 5 shows another form of embodiment of the magnet cores employed according to the invention, which embodiment is closed in two parts for the purpose of obtaining a favourable magnetic flux.

The embodiment of the pole-shoes corresponds with the arrangement illustrated in Fig. 1, whilst Fig. 6 shows a form of embodiment having a double yoke, and the pole-shoes for the purpose of producing a homogeneous and powerful field are provided in a contracted portion of the glass body.

It is obvious that in certain cases it is also possible, in place of the laminated assembly of the cores, to produce simple mass cores from the stated materials.

The magnet core according to the invention may also be used for other purposes and in other devices than Braun tubes.

I claim:

1. The combination comprising a Braun tube comprising an evacuated envelope, means in said envelope for producing a cathode ray and an electro-magnet for producing a magnetic field for influencing the cathode ray, said electro-magnet having pole-shoes disposed outside and adjacent to said envelope, and further pole-shoe members disposed inside said envelope forming a magnetic continuation of said first mentioned pole-shoes.

2. The combination comprising a Braun tube comprising an evacuated envelope, means in said envelope for producing a cathode ray, electro magnets for producing magnetic fields for influencing the cathode ray, each of said electro magnets having poleshoes disposed outside and adjacent to said envelope, screening means mounted outside said envelope between every two of said electro magnets for screening them from each other, and screening members disposed inside said envelope forming a combination of said outer screening means.

3. The combination comprising a Braun tube comprising an evacuated envelope, means in said

envelope for producing a cathode ray, electro magnets for producing magnetic fields for influencing the cathode ray, each of said electro magnets having poleshoes disposed outside and adjacent to said envelope, screening means mounted outside said envelope between every two of said electro magnets for screening them from each other, and diaphragm shaped screening members disposed within said envelope and forming a continuation of said outer screening means and adapted to have suitable potentials applied thereto.

HANNS-HEINZ WOLFF.