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CATHODE RAY TUBE

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Fig.1

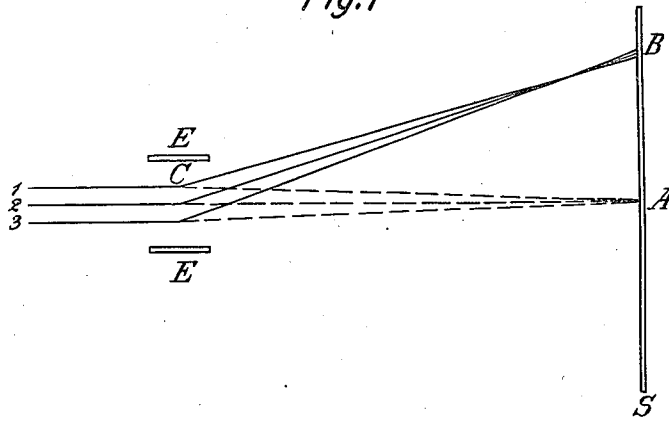
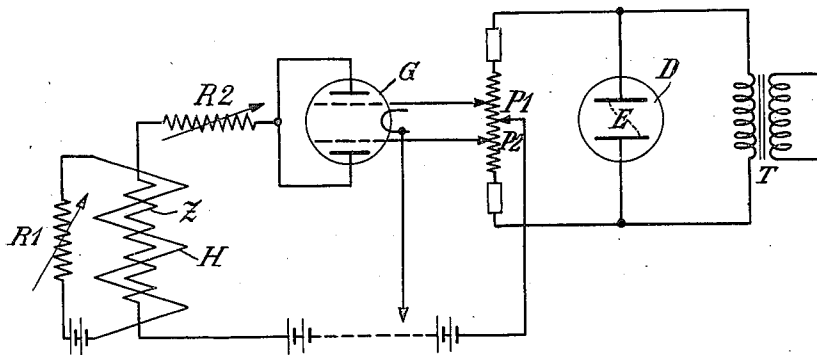


Fig.2



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CATHODE RAY TUBE

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2 Claims. (Cl. 250-27)

Braun tubes or similar cathode ray tubes, especially when employed in television systems, show the drawback that the light-spots, particularly in the case of greater deflections of the beam or bundle of electrons, are distortions of the desired image points. Careful researches have proved this to be mainly attributable to two causes. Let us consider these in the first place and with reference to the Fig. 1 of the accompanying drawing.

Fig. 1 is a diagram illustrating the cooperation of beams of electrons with a screen receiving them. Fig. 2 diagrammatically shows an example of an arrangement adapted for effecting the invention.

If for instance the concentration of a beam of electrons, represented by the lines 1, 2, 3, is ideal and, as shown in dotted lines, adjusted to accord with the axis point A on the screen S, then as shown in full lines the concentration of a deflected beam is no longer ideal even if the deflection itself is so. The extent to which the concentration is different from the ideal condition depends on the shape or form of the fluorescent screen S that for instance is the flask bottom of a Braun tube. Thus in the case of a plane receiving-surface of the screen S the light-spot will be enlarged whenever the beam of electrons is deflected, because the spot B where the beam hits upon the screen is farther away from the centre of deflection C than is the spot A. The distance between the spot of light on the screen and the point of deflection of the beam is in general different, depending upon the size of the angle of deflection. This phenomenon would not occur if the receiving points on the screen were equidistant from the centre C, that is to say, if the receiving surface of the screen were so curved that the distances between the light-spots and the centre C were in each case of the same length, or in other words, if the light-spots were in circular relation to each other. Such requirement however can in most cases not be met, this being due to reasons based in the manufacture of glass articles. Hence these distances are in general different from each other, so that the optical system or in other words the concentration of the beam can only with respect to one image point be adjusted to be of the highest possible efficiency. The other image points will be more or less enlarged, depending upon the angle of deflection, since they are produced either before the point of concentration or thereafter. This phenomenon of course proves to be very intense if plane fluorescence-images, which are

in a vertical or slanting relation to the beam, are concerned, irrespective of whether the mode of viewing the image is in looking through the screen or looking from the other side thereof.

The second cause entailing distortions of the light-spots is due to the fact that at C the beam to be deflected is of a finite, that is to say not of an infinitely small cross-sectional area, the consequence of this being that under the influence of a deflecting field, produced for example by means of plates E in a well known manner, electron rays such as those represented by the lines 1, 2, 3, are each in another field of potential. These rays are thus caused to differ from each other in their speed, and consequently the concentration which in the case of non-deflection, i. e., at A, is ideal, can in the case of deflection not be said to be ideal. The distortion then imparted to the spot of light is not symmetrical but asymmetrical. The spot is caused to change from a circular shape to an elliptical one. This distortion may be decreased in a well known manner by varying the focal distance of the lens system.

According to the invention the said drawbacks are overcome by controlling the concentration of the beam of electrons in dependence on the angle of deflection.

In Fig. 2 the letter D denotes a Braun tube. The deflecting system is shown in a diagrammatic cross-sectional view. The deflection is effected with the aid of the plates E represented also in Fig. 1. The voltage for controlling the deflection is led to the primary of a transformer T. The circuits, tripping devices and the like, necessary for this purpose, are not shown since they are immaterial to the idea of the invention. Connected in parallel with the plates E a potentiometer P1, P2, is arranged from which an auxiliary control voltage is derived in order to concentrate the electron beam in dependence on the deflecting-angle. The concentration system is for the sake of clearness represented on the left in Fig. 2. In the case illustrated, magnetic means of concentration are employed. The winding of the main concentration field is designated H. The intensity of this field is adjusted with the aid of a regulable resistance R1.

In addition to such main concentration an after-concentration is effected by means of a second field whose strength depends upon the angle of deflection and whose winding is denoted by Z. To this additional field the control voltage derived at P1, P2 is conveyed over a rectifier G. The requisite adjustment of the amount of focus correction is effected with the aid of a

regulable resistance R2. The rectifier is of the two-way type in order to ensure that it is utilized to the greatest possible extent and above all to obtain a rectification effect as complete as possible.

The rectifying or detecting action of rectifier G results in changing the focal length in the same sense whether the deflecting potential be positive or negative. This is essential for properly conforming the change of focal length to the shape of the screen. For example, with the simple flat screen arrangement having a normally perpendicular beam as shown in Fig. 1, the focal length must be lengthened when the beam is deflected upward and must again be lengthened in the same degree when the beam is deflected downward from its normal position. The rectifier G serves to give such effect.

For screens of other shapes and/or angular positions the amount of correction and even the sense of the correction (i. e., whether a lengthening or shortening of the focal length) may be required to be different and/or the corrections for positive and negative deflecting may be required to be unequal. In such cases the action of the rectifier G is not so simple as in the above explained arrangement of Fig. 1. But even in such more complex arrangements the two way rectifier G may be adjusted by means of potentiometer P1, P2 and resistor R2 to operate in generally the same way to modify the deflection potentials so as to conform with the change in focus required for the particular shape and position of the screen.

It is a question of convenience if from the deflecting-angle zero onwards the additional field

is made to aid the main field or to act in opposition to it, because the field of main concentration can of course be so adjusted that the sharpest concentration shall be either in the centre of the image or at the edges thereof.

The invention can be effected in connection with electromagnetic concentration and with electrostatic concentration as well. In the latter case symmetrical as well as asymmetrical electrostatic lenses may be employed. Further it may be mentioned that the invention is adapted for use in both directions of deflection.

What is claimed is:

1. A cathode ray tube comprising a source for producing a beam of electrons, means for deflecting said beam through different angles under control of a deflecting voltage, means for concentrating said beam to produce an image at a distance from said source, means including a two way rectifying means connected between said deflecting means and said concentrating means for deriving a control voltage from said deflecting voltage, and means for altering the effect of said concentrating means in step with the deflection of said beam to reduce distortion of said image due to said deflection, including means for supplying said control voltage to said concentrating means.

2. An arrangement in accordance with claim 1 wherein said rectifying means has two control grids and potentiometer means is provided for applying to said grids two different potentials derived from said deflecting voltage.

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