

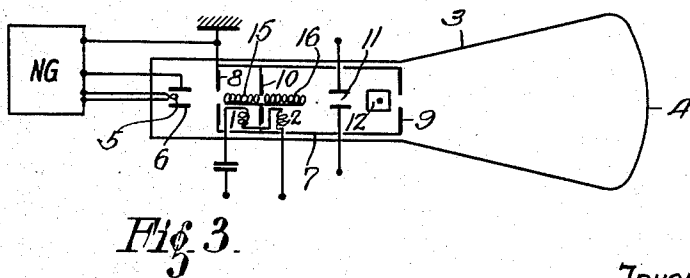
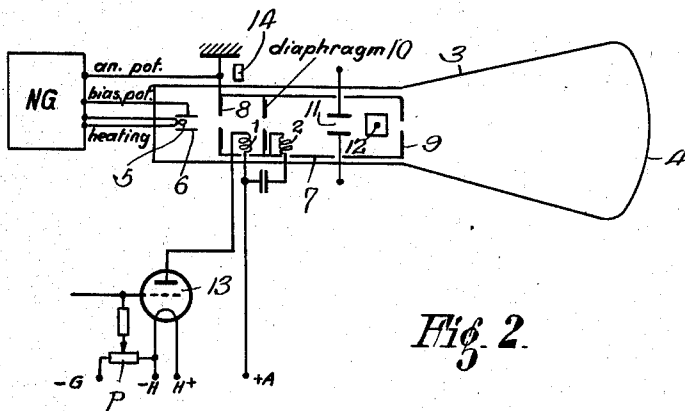
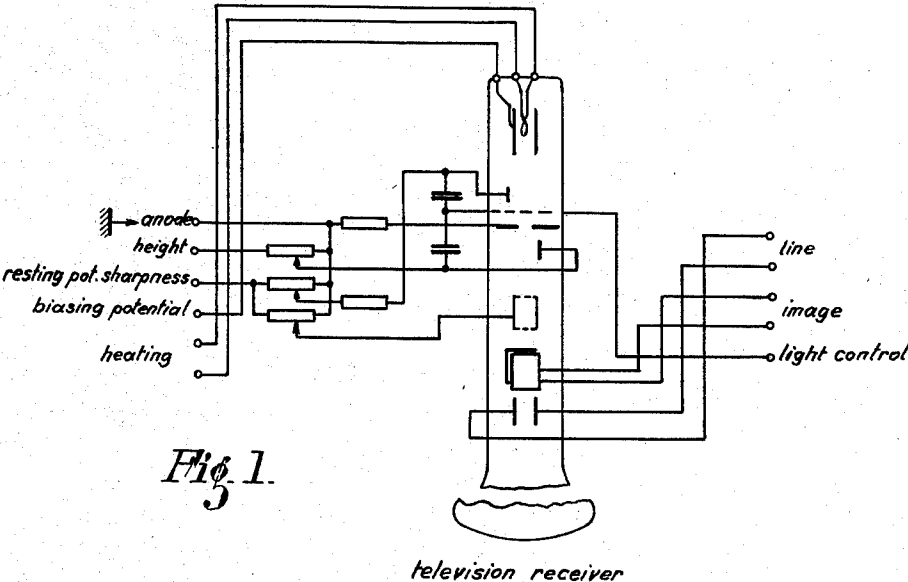
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BRAUN TUBE

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BRAUN TUBE

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This invention relates to Braun tubes, more particularly for television purposes.

In the course of the following explanation and description of the invention, reference will be had to the appended drawing, wherein

Fig. 1 is a diagrammatic view of a known television receiver designed by the inventor.

Figs. 2 and 3 show by way of example television devices according to the invention.

Investigations of the Wehnelt-cylinder light control in Braun tubes resulted on each occasion in different conditions of dependency on frequency when filling different gases into the Braun tube. The tube behaved most favorably in the case of hydrogen, and in an essentially useful manner for purposes of television, the commencement of the abnormal behaviour, which takes place at 40,000 cycles in the case of an argon filling, not taking place until approximately 150,000 cycles. In the case of hydrogen the tube is quite useful up to approximately 500,000 cycles, and should, therefore, be adequate even for very fine analysis of the image. Extreme difficulties would undoubtedly be encountered in advancing to any appreciable extent beyond this, as gases which are lighter than hydrogen do not exist. The single possibility of properly controlling a still finer decomposition with the Wehnelt-cylinder light control consists in passing over, particularly for reception purposes, with simultaneous control of all accelerating potentials, to high vacuum tubes.

With consideration to results which have been obtained, the light intensity control by way of cathode ray deflection appears to be of particular importance. The principal objection to the deflection light intensity control as employed by the applicant heretofore resides in the numerous control manipulations and in the difficulty to perform adjustment. Practical tests were, therefore, carried out with tubes specifically intended for television purposes in order to simplify the deflection light control. On the basis of these investigations the following aspects and simplifications were derived:

Experience has shown that an electrode member fitted in completely insulated fashion in the vicinity of the ray acquires a potential which corresponds with the speed of the ray at the point in question. It is not until the insulation resistance approaches in its value the order of the resistance of the gas-discharge space extending up to said electrode that in accordance with the leakage conditions potentials are enforced of the electrode which differ from the natural

potential referred to, whereby a lateral deflection of the ray then takes place. Fig. 1 shows the circuit system for deflection light intensity control heretofore employed by the applicant at the receiving end. In addition to the alternating potential, which affects the light intensity control proper, three adjustable direct potentials are shown in this figure. The first direct potential, which biases the plate designated 1, serves for the purpose of regulating the resting position of the ray, and of selecting between positive and negative control. Insofar as change over is contemplated to be made from positive to negative control, and as long as adjustment of the working point is desired on the light control curve, regulation of the position of the ray tube is not to be avoided. In contradistinction to the following regulations, this regulation is, from a practical standpoint of considerable importance. In the case of the plate 2 in Fig. 1 only the alternating potential is really necessary to compensate the deflection of the ray. A direct potential is not required for this purpose, particularly if the shutter is so arranged in the tube that the ray is disposed to a certain extent in a straight line.

In the case of the after-concentration cylinder fine regulation is also not absolutely essential either. This cylinder has the desired effect in the case of the arrangement shown in Fig. 1 if it possesses a somewhat higher potential than the plate 2. The after-concentration cylinder accordingly serves the purpose of again eliminating the certainly very small variations in the speed of the electron ray caused by the alternating potential at the plate 2.

The electrostatic deflection at this point possesses the fundamental disadvantage of causing variations in speed in addition to the desired deflections. For this reason it is proposed, in place of electrostatic deflection, to make use of magnetic deflection. In the case of magnetic deflection much clearer experimental conditions may be obtained, which moreover greatly facilitate the entire arrangement. The deflection itself naturally requires to be performed with coils of very small geometric dimensions, which are fitted in the tube in the vicinity of the passage of the ray. The natural wave length of the very thin-wire, vacuum-encased coils may be located at, say, 10^6 cycles. The strengths of field resulting upon a corresponding number of windings and anode currents of 10 milliamperes are sufficient to cause the desired deflections of the ray. An arrangement with magnetic deflection of the

ray, as proposed by the inventor, is illustrated in Fig. 2. The coils 1 and 2 have the same effect as the plates 1 and 2 in Fig. 1.

In Fig. 2, 3 is the envelope of the Braun tube, at the front end whereof the picture receiving screen 4 is preferably provided. 5 is the cathode of the Braun tube which may conveniently be surrounded by a Wehnelt cylinder 6. The anode may be formed as shown by a long metallic tube 7 provided at both its ends with apertured discs 8-9. 10 is the diaphragm for shuttering off a varying percentage of the cathode ray in accordance with the controlling variations which are applied to the magnet coil 1 and effect a varying cathode ray deflection. 11 and 12 are two pairs of deflecting plates for deflecting the cathode ray in two directions perpendicular to each other so that the ray scans the picture area on the screen 4. NG is a voltage supply, for instance, a mains supply apparatus which may be fed from alternating current mains. 13 is the output tube of the amplifier for the light intensity controlling voltages.

As regards the coil 1, the direct anode current is made to flow therethrough together with the alternating anode current of the said output tube. The ray is situated more or less at the edge of the shutter 10 dependent on the adjustment of the working point of the tube 13, i. e., dependent on the position of the potentiometer P in Fig. 2. This adjustment accordingly governs the deflection of the ray in the stationary condition. As regards on the other hand the coil 2, only the alternating anode current is made to flow therethrough for performing the compensation. The arrangement is still more simple if only alternating current is made to flow through both of the two coils, and the resting position of the ray is adjusted from the exterior by means of a small magnet 14. The number of current leads then necessary for the Braun tube are at a minimum. As shown in Fig. 2 the deflecting coils themselves are raised to the potential of the anode. The electrons possess a fully constant speed from the entry into the anode tube up to the exit from the anode tube. In particular the sheathing also of the deflecting plates by the anode has the advantage that the slow electrons returning from the screen do not for the greater part reach the deflecting plates, but are intercepted previously, whereby the conditions in the Braun tube are also more defined.

With the arrangement according to Fig. 2 an undesired electrostatic deflection, in addition to the magnetic deflection of the ray, may still take place by reason of the alternating potentials at the ends of the deflecting coils. In accordance with an additional feature of the invention, this may be avoided if the arrangement is made in accordance with Fig. 3 in which figure like references are given to corresponding members as in Fig. 2.

In this case the two deflecting coils arranged in front of and behind the shutter are also provided with small geometric dimensions; the static coil field, however, is screened off against the ray by means of a grid-like arrangement 15, 16. If this screening effect is performed with the grid-like arrangement as shown, or in other suitably adapted fashion, the magnetic field of the deflecting coils will be affected only to an inappreciable extent in its action on the ray. In an arrangement according to Fig. 3, therefore, a pure control of the intensity of the ray is performed without any action of whatever kind on

the speed, so that the after concentration cylinder may also be dispensed with. By the arrangement according to the invention the following advantages are accordingly obtained:

1. Ideal control of the intensity.
2. Abolition of any regulation of the deflection of the ray after its passing through the shutter.
3. Abolition of the after-concentration cylinder with its adjustment.

I claim:

1. A Braun tube comprising a cathode and an anode mounted in operative relationship thereto for producing a cathode ray, said anode consisting of a metallic tube which is furnished at its both ends with apertured discs, a fluorescent screen, two pairs of deflecting plates for deflecting the cathode ray in two directions vertical to each other for scanning said screen, said deflecting plates being mounted within said anode tube near that end of said tube which is facing said screen, an apertured disc mounted within said anode tube between said deflecting plates and that opening of said tube which is facing said cathode, and two coils, each of said coils comprising a high number of windings, each of said coils being mounted at one side of said apertured disc within said anode tube.

2. A Braun tube comprising a cathode and an anode mounted in operative relationship thereto for producing a cathode ray, a picture receiving screen, two pairs of deflecting plates mounted between said anode and said screen for deflecting the cathode ray in two directions vertical to each other for scanning said screen, an apertured disc mounted between said anode and said deflecting plates, two magnetic coils, each of said coils being mounted at one side of said disc, and two grids, each of said grids being adapted to be supplied with a constant potential, each of said grids being interposed between one of said magnetic coils and the path of the ray for preventing an electrostatic influence of said coils on said ray.

3. A Braun tube comprising a cathode and an anode mounted in operative relationship thereto for producing a cathode ray, a picture receiving screen, two pairs of deflecting plates mounted between said anode and said screen for deflecting the cathode ray in two directions vertical to each other for scanning said screen, an apertured disc mounted between said anode and said deflecting plates, two magnetic coils, each of said coils being mounted at one side of said disc, and two grids, each of said grids being adapted to be supplied with a constant potential, each of said grids being interposed between one of said magnetic coils and the path of the ray for preventing an electrostatic influence of said coils on said ray, and an additional magnet disposed outside the tube for adjusting the direction of the non-deflected ray.

4. A Braun tube comprising an evacuated envelope enclosing a cathode and an anode arranged in operative relationship thereto for producing a cathode ray, said anode consisting of a metallic tube which is furnished at its both ends with apertured discs, a picture receiving screen, two pairs of deflecting plates for deflecting the cathode ray for the purpose of scanning said screen, and means for controlling the intensity of said cathode ray, said deflecting plates and said intensity control means being arranged within said anode tube.

5. A Braun tube comprising a closed envelope, a cathode and an anode mounted inside said envelope and in operative relationship to said cathode for producing a cathode ray, said anode

consisting of a metallic tube which is furnished at its both ends with apertured discs, a fluorescent screen, two pairs of deflecting plates for deflecting the cathode ray in two directions perpendicular to each other for scanning said screen, said deflecting plates being mounted within said anode tube.

6. A Braun tube comprising a closed envelope, a cathode and an anode mounted inside said envelope and in operative relationship to said cathode for producing a cathode ray, said anode consisting of a metallic tube which is furnished at its both ends with apertured discs, a fluorescent screen, two pairs of deflecting plates for deflecting the cathode ray in two directions perpendicular to each other for scanning said screen, said deflecting plates being mounted within said

anode tube more remote from that end of said tube which is facing said cathode than from that end of said tube which is facing said screen.

7. A Braun tube comprising a cathode and a cylinder shaped anode mounted in operative relationship thereto for producing a cathode ray, a fluorescent screen disposed more remote from said cathode than said anode in the path of the cathode ray, apertured discs terminating said anode at both its ends so that the interior of said anode is substantially screened against electrons out of the cathode ray which travel back from said fluorescent screen when the Braun tube is in operation and deflecting plates mounted inside said cylinder-shaped anode.

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