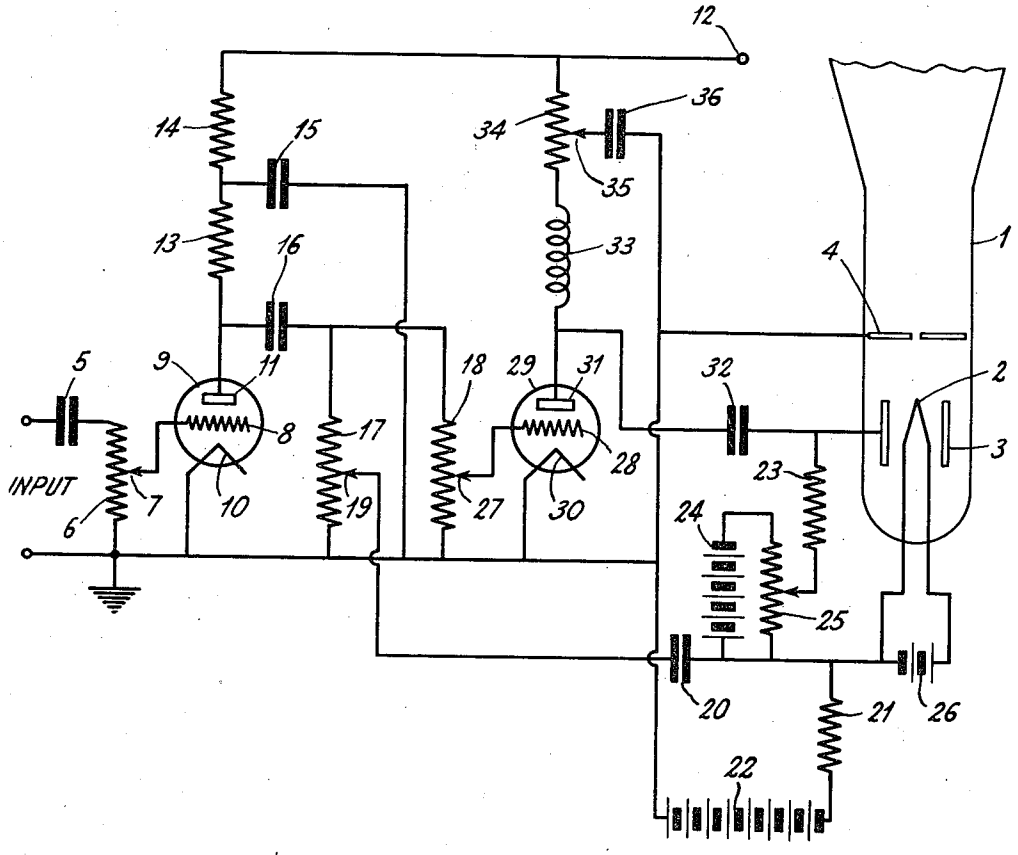
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CATHODE RAY OSCILLOGRAPH

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CATHODE RAY OSCILLOGRAPH

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This invention relates to television and like cathode ray tube oscillograph arrangements and more particularly to television receivers of the cathode ray tube type.

The most generally used and widely known cathode ray tube receivers are those wherein the intensity of the cathode ray beam is modulated in dependence upon received picture signals, for example, by applying potentials corresponding to the said received signals to a Wehnelt cylinder or similar electrode in the picture reproducing tube. Various practical difficulties are met with in apparatus of this kind among them being the important difficulties that the position of the spot caused by the incidence of the cathode ray beam upon the screen of the tube is not completely independent of the signal potentials applied to modulate the cathode ray beam intensity while the size of the said spot is also not completely independent of such potentials. The greater the amplitudes of the picture signals the more serious do these two difficulties become and quite appreciable distortion occurs in many known systems by reason of so-called "spot shift" and alterations in the spot size concomitant with and due to applied potentials which are desired only to control the intensity of the spot. A further difficulty which arises in usual known cathode ray receivers is that there is a more or less pronounced tendency for loss of high frequencies; that is to say, the high frequency picture signals do not produce as much variation in spot intensity as they should do.

The principal object of the present invention is to provide an improved television receiver and like cathode ray tube oscillograph apparatus wherein the above mentioned disadvantages are reduced or eliminated.

According to this invention picture or other signals intended to modulate the intensity of the cathode ray beam in a cathode ray tube reproducer are applied simultaneously and substantially in phase opposition to at least two different electrodes of the tube and the relative amplitudes at which the signals are so applied are so chosen that variation of spot size or "spot shift" due to the application of signal potentials to one of the two said electrodes is counterbalanced or approximately counterbalanced by reason of the application of signal potentials to the other of said two electrodes. In general in carrying out this invention received picture signals are applied simultaneously and in phase opposition to the cathode of a cathode ray tube and to the Wehnelt cylinder or equivalent electrode thereof and the amplitudes at which these potentials are applied are so chosen that the electrostatic relationship between the anode and cathode is substantially constant over a wide range of applied signal voltages. Accordingly in effect the invention provides combined anode and Wehnelt cylinder modulation or in other words it provides for automatically re-adjusting the focus of the spot in such manner as to correct for any change of potential across the "electron gun" due to the application of a signal voltage this being effected by applying a signal voltage in opposite phase to the Wehnelt cylinder so that the voltage relationship between anode cathode and Wehnelt cylinder remains substantially constant.

The invention is illustrated in the accompanying drawing which shows diagrammatically one way of carrying out the said invention.

Referring to the drawing a cathode ray tube 1 of the usual type comprising a cathode 2 a Wehnelt cylinder 3 an apertured anode 4, two mutually perpendicular pairs of deflecting plates and a fluorescent screen at the end of the tube is employed. The tube 1 is shown only in part, the deflecting plates and fluorescent screen (which are as well known per se) being omitted from the drawing. Received picture signals are applied through a condenser 5 across the end of a potentiometer resistance 6 one terminal of which is earthed and an adjustable tapping point 7 upon this potentiometer resistance is connected to the control grid 8 of a first amplifier valve 9. The potentiometer 6, 7, constitutes thus the main or input potentiometer of the whole arrangement. The cathode 10 of the valve 9 is in practice preferably earthed through a biasing resistance shunted by a by-pass condenser but these components are omitted from the drawing, grid bias arrangements being, for the sake of simplicity, not shown. The anode 11 of the valve 9 is connected to a positive terminal 12 of a source of anode potential (not shown) through an anode resistance 13 in series with a decoupling resistance 14 and the junction point of these two resistances is connected to earth through a decoupling condenser 15. The anode 11 is also connected through a condenser 16 to one junction point of two parallel connected potentiometer resistances 17, 18, the junction point at the other ends of those resistances being earthed. A tapping point 19 upon resistance 17 is connected through a condenser 20 to one end of the filament 2 of the cathode ray tube (assuming the tube to have a directly heated cathode) and also to one end of a resistance 21 whose other end is connected to the negative ter-

minal of a source 22 of potential. The tube cathode 2 is also connected through a source of negative bias potential (which may be adjustable if desired) in series with a bias resistance 23 to the Wehnelt cylinder 3 of the cathode ray tube. In the circuit illustrated adjustable bias is obtained by the battery-potentiometer combination 24—25. The positive terminal of the source 22 is connected to the anode 4 of the cathode ray tube and the said source of potential is preferably shunted by a by-pass condenser (not shown). The cathode of the cathode ray tube if of the directly heated type, has the usual cathode heating circuit consisting of a source 26 of potential in series with an adjustable resistance (not shown). An adjustable tapping point 27 upon the resistance 18 is connected to the grid 28 of a second valve 29 which acts as a phase reversing valve the cathode 30 of this valve being earthed preferably through a bias resistance shunted by a by-pass condenser. For the sake of simplicity a directly earthed cathode is shown for the valve 29 as in the case of the valve 9. The anode 31 of valve 29 is connected through a condenser 32 to the Wehnelt cylinder 3 of the cathode ray tube and the anode 4 of the cathode ray tube is earthed. The anode 31 of the phase reversing valve 29 is also connected to one end of an inductance 33 whose other end is connected through a decoupling resistance 34 to the positive terminal 12 of the source of anode potential a tapping point 35 upon the resistance 34 being earthed through a decoupling condenser 36.

It will be appreciated that the two parallel connected potentiometers 17—19 and 18—27 control the potentials applied to the tube cathode 2 and to the Wehnelt cylinder 3 and in operation these two potentiometers are so adjusted that errors in spot size or position due to the application of signals to the cathode of the cathode ray tube are compensated or substantially compensated by reason of the application of picture signals in opposite phase to the Wehnelt cylinder. These two potentiometers may, if desired, be uni-controlled, that is to say, they may be operated by a single shaft which varies them in opposite directions so that a balance arrangement is obtained. After these potentiometers have been adjusted they are left in their adjusted positions and the extent of the cathode ray beam intensity modulation can be adjusted by controlling the input potentiometer 6—7. The inductance 33 which is preferably air cored, produces a "peaking-up" effect as regards the high frequencies and a measure of control of the peaking-up effect is obtainable by adjusting the tapping point 35. Such control can also be obtained by making the inductance 33 variable instead (or as well).

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed we declare that what we claim is:—

1. In a cathode ray apparatus, means for amplifying input signals, a cathode ray tube including anode, cathode and modulating electrodes, means for impressing a portion of said amplified signal upon the cathode of said tube so as to change the potential of the cathode with respect to a reference potential, and means for impressing another portion of said amplified signal upon a modulating electrode of the cathode ray tube in opposite phase to that portion impressed upon the cathode of the tube so as to change its potential with respect to the same reference potential, whereby shifting of the cathode ray beam and variations in cross-section area of the beam due to variation in amplitude of said input signals are substantially neutralized and the electrostatic relationship between the anode, cathode and modulating electrodes is maintained substantially constant.

2. In a cathode ray apparatus, means for amplifying input signals, a cathode ray tube including anode, cathode and modulating electrodes, a reference potential, means for impressing a portion of said amplified signal upon the cathode of said tube so as to change its potential with respect to the reference potential in accordance with variations of the signal, means for impressing another portion of said amplified signal upon a modulating electrode of the cathode ray tube in opposite phase to that portion impressed upon the cathode of the tube so as to change its potential with respect to the reference potential in accordance with variations of the signal, and adjustable means for biasing said modulating electrode with respect to the cathode of the cathode ray tube whereby the electrostatic relationship between the anode, cathode and modulating electrodes is maintained substantially constant.

3. In a cathode ray apparatus, amplifying means, variable means for impressing input signals onto the input of one of said amplifying means, a cathode ray tube including anode, cathode and modulating electrodes, a reference potential, variable means for impressing a portion of the amplified input upon the cathode of the cathode ray tube so as to change its potential in accordance with changes of the input signal with respect to the reference potential, a phase reversing tube, variable means for impressing a portion of the amplified input signal onto a control electrode of the phase reversing tube, and means for impressing a portion of the output of the phase reversing tube onto a modulating electrode of the cathode ray tube whereby the electrostatic relationship between the anode, cathode and modulating electrodes is maintained substantially constant.

4. In a cathode ray apparatus, amplifying means, variable means for impressing input signals onto the input of one of said amplifying means, a cathode ray tube including anode, cathode and modulating electrodes, a reference potential, variable means for impressing a portion of the amplified input upon the cathode of the cathode ray tube so as to change its potential in accordance with changes of the input signal with respect to the reference potential, a phase reversing tube, variable means for impressing a portion of the amplified input signal onto a control electrode of the phase reversing tube, means for impressing a portion of the output of the phase reversing tube onto a modulating electrode of the cathode ray tube, and adjustable means for biasing said modulating electrode with respect to the cathode of the cathode ray tube whereby the electrostatic relationship between the anode, cathode and modulating electrodes is maintained substantially constant.

5. In a cathode ray apparatus, amplifying means, variable means for impressing input signals onto the input of one of said amplifying means, a cathode ray tube including anode, cathode and modulating electrodes, a reference potential, variable means for impressing a portion of the amplified input upon the cathode of the cathode ray tube so as to change its potential in accordance with changes of the input signal with

respect to the reference potential, a phase reversing tube, variable means for impressing a portion of the amplified input signal onto a control electrode of the phase reversing tube, said aforementioned variable means being uni-controlled, and means for impressing a portion of the output of the phase reversing tube onto a modulating electrode of the cathode ray tube whereby the electrostatic relationship between the anode, cathode and modulating electrodes is maintained substantially constant.

6. In a cathode ray apparatus, means for receiving A. C. signals, a cathode ray tube including cathode, anode and modulating electrodes, a reference potential, means for impressing a portion of said signals onto the modulating electrode of the cathode ray tube so as to change the potential of said electrode with respect to the reference potential in accordance with variations in the input signals, and means for impressing another portion of said received signals onto the cathode of the cathode ray tube in opposite phase to those impressed on the modulating electrode whereby the potential of the electrode is varied in accordance with variations in the input signal with respect to the reference potential and whereby shifting of the cathode ray beam and variations in cross-section area of the beam due to variations in amplitude of said input signal are substantially neutralized.

7. In a cathode ray apparatus, means for receiving A. C. signals, a cathode ray tube including cathode, anode and modulating electrodes, a reference potential, means for impressing a portion of said signals onto the modulating electrode of the cathode ray tube so as to change the potential of said electrode with respect to the reference potential in accordance with variations in the input signals, means for impressing another portion of said received signals onto the cathode of the cathode ray tube in opposite phase to those impressed on the modulating electrode whereby the potential of said electrode is varied in accordance with variations in the input signal with respect to the reference potential, and variable means for controlling the frequency response of said cathode ray tube.

8. In a cathode ray system wherein the cross sectional area of the cathode ray beam in the tube is distorted and said beam is deflected due to variations in the input signals to said tube, the method of correcting for said aforementioned distortion which comprises the steps of developing potentials of a like frequency but of opposing phase from said input signals, and maintaining the electrostatic relationship between the electrodes of the tube substantially constant by means of said oppositely phased developed potentials.

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