

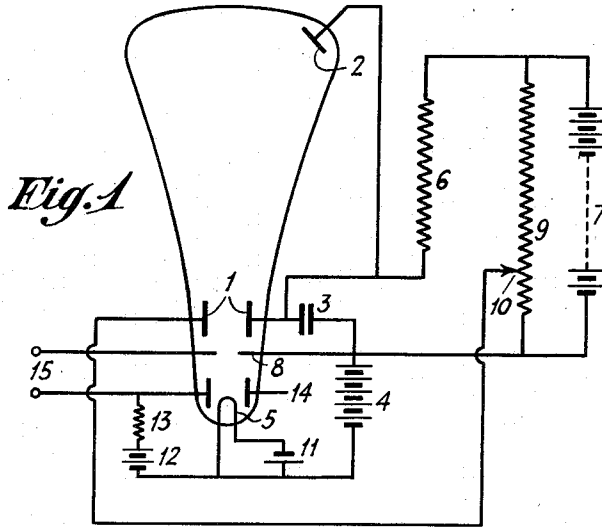
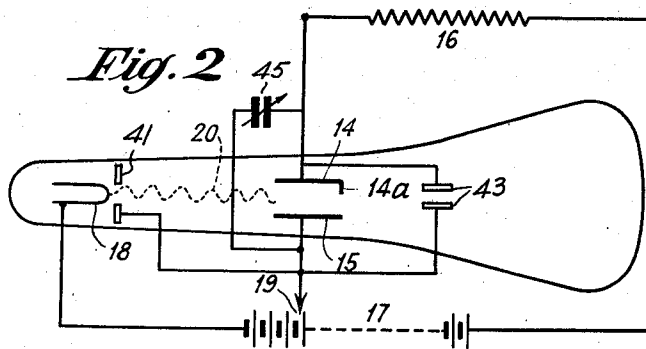
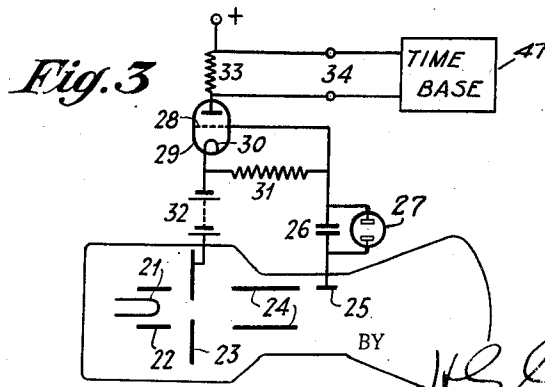
Oct. 29, 1940.

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2,219,902

CATHODE RAY TUBE OSCILLOGRAPH APPARATUS

Filed Dec. 19, 1935



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2,219,902

CATHODE RAY TUBE OSCILLOGRAPH
APPARATUS

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Application December 19, 1935, Serial No. 55,152
In Great Britain December 21, 1934

10 Claims. (Cl. 250—27)

This invention relates to cathode ray tube oscillograph apparatus suitable for use for television and similar oscillograph apparatus.

The object of the invention is to provide improved oscillograph arrangements having simplified and reliable scanning means, i. e., means whereby the cathode ray beam may be caused to scan a predetermined picture area.

It is common practice at the present time to obtain scanning action in a cathode ray tube oscillograph apparatus by means of angularly disposed cathode ray deflecting devices to which suitable current or voltage wave forms are applied, said wave forms being derived from relaxation oscillation generators of the kind wherein a condenser is charged at a predetermined rate and discharged as nearly as possible instantly at predetermined intervals.

According to this invention scanning action in a cathode ray tube oscillograph arrangement is obtained under the control of the cathode ray beam itself.

In one way of carrying out this invention scanning action in a cathode ray tube oscillograph is obtained by means of a scanning wave form derived by continuously charging a condenser and discharging the same at predetermined intervals, the invention being characterised by the fact that the discharge of the condenser is obtained by completing a circuit including at least a part of the cathode ray beam itself said circuit being completed when the said beam reaches one end of a scanning path.

One form of cathode ray tube in accordance with this invention comprises at least one electrode (additional to the normally provided ray deflecting plates in the case of a tube designed for electrostatic deflection) said electrode being so positioned as to be struck by the cathode ray beam at the ends of its paths of traversal. In the usual arrangement wherein scanning action is obtained by deflection of the beam in mutually perpendicular directions so that the beam is scanned in a series of substantially parallel and substantially straight lines the tube is provided with two mutually perpendicular electrodes (additional to electrostatic deflector plates, if any) which together either constitute two adjacent edges of the picture area scanned or, more usually constitute two adjacent edges of a projection of said area.

The invention is illustrated in the accompanying drawing in which

Fig. 1 shows one embodiment of my invention wherein an auxiliary electrode is positioned with-

in a cathode ray tube to cooperate with the beam for producing deflecting potentials;

Fig. 2 shows a modification of the embodiment of my invention shown in Fig. 1 in which the auxiliary electrode is dispensed with; and

Fig. 3 shows a further embodiment of my invention and a modification of that shown in Fig. 1.

Referring to Figure 1, the tube therein schematically represented comprises the usual electron gun and two mutually perpendicular pairs of electrostatic deflecting plates. Associated with each pair of deflecting plates is an additional strip-like electrode, said strip-like electrodes being mutually perpendicular and being positioned along two of the adjacent edges of the area to be scanned by the beam. For the sake of convenience in description and drawing only one pair 1 of electrostatic plates and one additional strip-like electrode 2 are illustrated in Figure 1 and described below (this simplified method of representation is adopted for all the figures), but it is to be understood that there are two pairs of plates and two additional strip-like electrodes in perpendicular relationship, the operation being similar for both of the two perpendicular arrangements.

The strip-like electrode 2 is connected to one of the electrostatic deflecting plates of the pair 1 which co-operate therewith and said one plate is connected through a condenser 3 to the positive terminal of a source 4 of potential whose negative terminal is connected to the cathode 5. Said one plate is also connected through a resistance 6 to the positive terminal of a second source 7 of potential whose negative terminal is connected to the anode 8 of the electron gun and also to the positive terminal of the source 4. The source 7 is shunted by a potentiometer resistance 9 an adjustable tapping point 10 upon which is connected to the other of the pair 1 of electrostatic deflecting plates. The filament 5 of the electron gun is heated in the usual way by means of a battery 11 and has one leg connected to the negative terminal of the source 4 the said leg being also connected through a suitable bias battery 12 in series with a resistance 13 to the Wehnelt cylinder 14 or equivalent electrode of the gun. Input signals are applied at 15 between the anode 8 of the gun and the said Wehnelt cylinder or equivalent electrode 14.

The action of the apparatus is as follows:

The condenser 3 which is connected between the anode 8 and the strip-like electrode 2 is continuously charged through the resistance 6 so

that for a period of time which will depend upon the constants of the circuit, that terminal of the condenser 3 which is directly connected to one of the deflector plates 1 will become more and more positive and the electron beam in the tube will be consequently deflected further and further until it finally impacts upon the strip-like electrode 2. Thereupon the condenser will be discharged at a high speed and the beam will return to its original position. The speed at which the operating action takes place is controlled largely by the value of the resistance 6. This resistance though shown in Figure 1 in the ordinary conventional manner is preferably constituted by some constant current device such as a diode so as to ensure rectilinear operation. The adjustable tapping point 10 upon the potentiometer resistance 9 serves for centering purposes.

The single pair 1 of deflector plates and co-operating condenser 3 resistance 6 and strip-like electrode 2 provide one component of scanning. The other component of scanning may be provided in a similar manner.

In a modification (not illustrated) the incidence of the cathode ray on the strip-like electrode is not utilized directly to discharge the condenser 6 but instead impulses caused by that incidence are applied to the grid of a thermionic valve—for example, a triode—whose anode-cathode space is shunted across the condenser, the arrangement being such that when said impulses are applied to said grid the internal resistance of the valve becomes of low value and thus the condenser is discharged.

In another way of carrying out this invention there is provided in association with a cathode ray tube a condenser which is continuously charged at a predetermined rate and one terminal of which provides potential for deflecting the cathode ray beam. The arrangement is such that when the cathode ray beam has been deflected a predetermined amount—that is to say the potential of said condenser terminal has risen to a predetermined value—the cathode ray beam itself completes a circuit for discharging the condenser (preferably directly through the said beam) whereupon the said beam returns to its original position and is again deflected as the potential of the said condenser terminal rises again due to the continuous charging of the said condenser.

In the construction shown in Figure 2 and which operates generally as set forth in the last paragraph, there is provided within a cathode ray tube a pair of condenser electrodes 14, 15, one (14) of which is connected through a charging resistance 16 of say 1 to 2 megohms to a suitable source 17 of potential—for example a 1,000 volt source—having its negative terminal connected to the cathode 18 of the electron gun. The charging resistance 16 may be a constant current device, such as a diode, in order to ensure rectilinearity of charge or, if this is not convenient, the values of the circuit may be so selected that the charging only takes place over the substantially straight portion of the normal exponential charging curve of the condenser. The other electrode 15 of the condenser is connected to a suitable tapping point 19 upon the source 17 and also to the anode of the electron gun whose cathode is shown at 18. The electrodes 14, 15, are so positioned in the tube that the length of the cathode ray beam between the cathode and the said condenser is such as to

give a desired electron jet resistance, e. g., one somewhere about 1 megohm. This jet resistance is represented in broken lines at 20 in Figure 2. The electrode 14 may be connected to one of a pair of deflector plates 43 the other plate being connected to a point of fixed potential, for example the anode of the electron gun. It will be seen that with this arrangement as the potential of the condenser electrode 14 rises due to the accumulation of charge in the said condenser, the cathode ray beam will be deflected further and further, and the arrangement is such that when the required deflection has been obtained the said cathode ray beam strikes the said condenser electrode 14 (which may have one edge bent over as shown at 14a to receive the beam, if desired) the condenser being accordingly discharged through the electron beam to the electron gun. If desired, and preferably the condenser is constituted by the capacity existing between a pair of electrostatic deflector plates provided for deflecting the beam, i. e., the electrodes 14, 15, also constitute the deflector plates. As will be obvious Figure 2 is purely schematic—for example there is shown only a simple filament 18 though, of course, in practice an electron gun with a control electrode would be provided.

The speed of scan and the ratio of scan time for "fly back time" will depend upon the value of the condenser 14—15, the value of the charging resistance 16 and the other constants of the circuit. If desired the condenser may be shunted by an adjustable condenser 45 provided outside the tube. It will be appreciated that the arrangement just described will provide for one component of scanning and of course the second normally perpendicular component of scanning may be obtained in a similar way.

In the modification shown in Figure 3 the cathode of the tube is represented at 21, the control electrode (Wehnelt cylinder) at 22, the electron gun anode at 23, and one pair of deflector plates at 24. A conductor strip 25 is provided just beyond one of the plates 24 and is connected through a condenser 26 shunted by a suitable short circuiting arrangement 27—e. g., a glow discharge tube—to the grid 28 of a triode 29—said grid being also connected to the cathode 30 of the triode through a resistance 31. The circuit is completed from cathode 30 to gun anode 23 through a battery 32 whose positive terminal is towards the anode. Signals set up across the output resistance 33 of the valve 29 are applied via terminals 34 to control a time base circuit 47. With this arrangement when the cathode ray strikes the strip 25 a circuit is completed through the ray and via elements 25, 27, 31, 32 to 23. When this circuit is completed a small proportion of the electron current will pass through resistance 31, this being made possible by reason of the provision of the battery 32. Such current flow through 31 causes signals to be applied to grid 28 and the consequent impulses set up across resistance 33 control the frequency of the time base circuit.

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. A cathode ray device comprising an envelope, means within the envelope to develop a beam of electrons, a parallel plate condenser within the envelope, means to direct the beam of electrons between the plates of said condenser means to

charge the condenser, and means to discharge the condenser through the developed beam.

2. In a cathode ray system, means for developing a beam of electrons, means for moving said beam along a predetermined path, and a serially connected resistor and voltage source connected directly to said second named means and cooperating with the developed beam of electrons for cyclically moving said beam over the predetermined path.

3. A cathode ray device comprising an envelope, means within the envelope to develop a beam of electrons, a parallel plate condenser within the envelope, means to charge the condenser, means to direct the beam between the plates of the condenser, and means to discharge the condenser through the developed beam.

4. A cathode ray device comprising an envelope, means within the envelope to develop a beam of electrons, a parallel plate condenser within the envelope, means to charge the condenser, means to direct the beam between the plates of the condenser, an auxiliary electrode within the envelope, and means to discharge the condenser through the developed beam and the auxiliary electrode.

5. A saw-tooth wave generator comprising an envelope, means within the envelope to generate a beam of electrons, a parallel plate condenser within the envelope, means to direct the beam of electrons between the plates of said condenser, a serially connected battery and resistor for charging the condenser, and means to discharge the condenser through the developed beam.

6. A saw-tooth wave generator comprising an envelope, means within the envelope to generate a beam of electrons, a parallel plate condenser within the envelope, a serially connected battery and resistor for charging the condenser, an auxiliary electrode within the envelope, and means to discharge the condenser through the developed beam and the auxiliary electrode.

7. A cathode ray device comprising an envelope, a right angle plate mounted within said envelope, a second plate parallel to one face of the right angle plate mounted within the envelope, means within the envelope for developing a beam of electrons, means to electrically charge the two plates, means to direct the developed beam of electrons between the two plates whereby the beam is deflected toward the right angle plate in accordance with the electrical charging of the plates, and means to discharge the plates through the developed beam whenever the developed beam impinges upon the right angle plate.

8. In a cathode ray tube wherein is provided means for generating a beam of electrons together with a pair of deflecting plates, the method of generating a saw-tooth deflecting potential which comprises the steps of providing a source of potential, charging the pair of deflecting plates from the source of potential, and discharging the charge through the generated beam of electrons.

9. A cathode ray device, comprising means for developing a beam, a pair of electrodes, serially-connected resistance and condenser connected between said electrodes, electrical supply means for passing current through said resistance to charge said condenser and means for discharging said condenser through the developed beam.

10. A cathode ray device, comprising means for developing a beam, a pair of electrodes, serially-connected resistance and condenser connected between said electrodes, electrical supply means for passing current through said resistance to charge said condenser, an auxiliary electrode connected to one terminal of said condenser, and means for discharging said condenser through the developed beam and auxiliary electrode.

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