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CATHODE RAY TUBE SWEEP CIRCUIT

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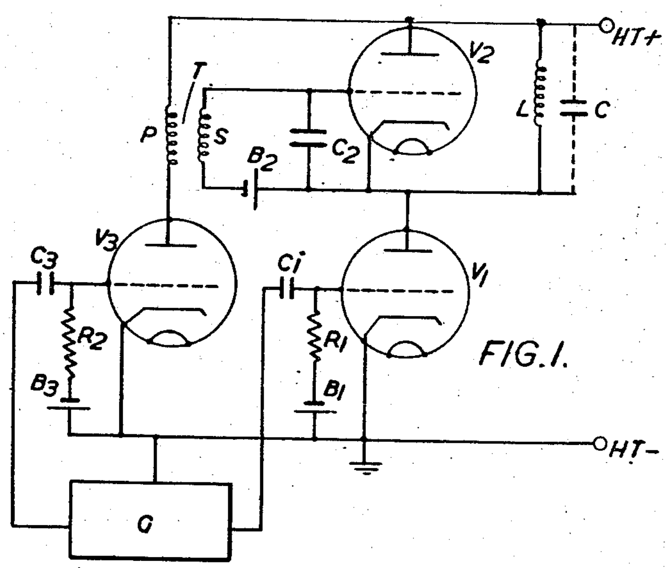
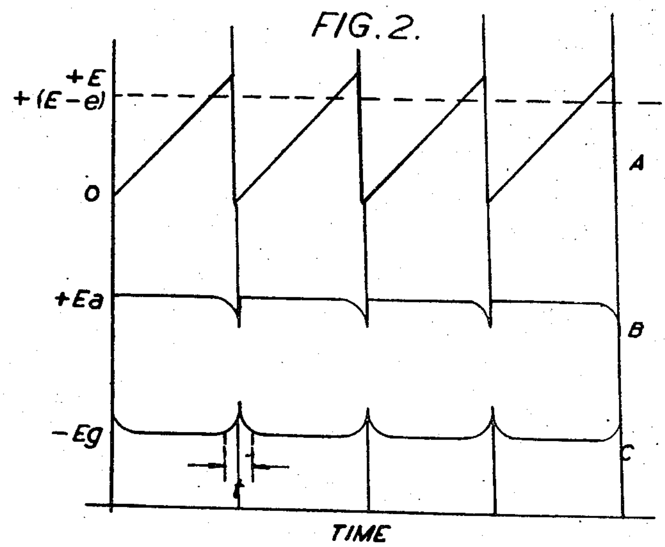


FIG. 1.

FIG. 2.



Inventor
P. K. Chatterjea
D. M. Ambrose
By
Attorney

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CATHODE-RAY TUBE SWEEP CIRCUIT

Prafulla Kumar Chatterjea and Dermot Min Ambrose, London, England, assignors to Standard Telephones and Cables Limited, London, England, a British company

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1 Claim. (Cl. 175—335)

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The present invention relates to electro-magnetic scanning arrangements in television tubes and in particular concerns means for eliminating undesired oscillations which tend to occur during the fly-back stroke.

In television systems, it is usual to generate waves of saw-tooth form and to apply them to deflecting coils associated with a transmitting or receiving tube for obtaining the horizontal and vertical scanning. On account of the self inductance of the coils or of the windings of the transformer which may be used to connect deflecting plates or coils to the saw-tooth generator, resonance effects often occur during the fly-back stroke, producing unwanted oscillations. Various means have been tried hitherto for damping out these oscillations, but these means have not been altogether satisfactory. Such means include shunting the coil with various rectifier devices and they have generally been difficult to control and are found to distort the saw-tooth waves.

The present invention overcomes these difficulties by shunting the coil with the anode circuit of an ordinary hard valve normally biassed beyond the cut-off, so that it presents a substantially infinite impedance. Just at the end of each deflection stroke of the saw-tooth wave an impulse is applied to the control grid of the valve so that it becomes conducting and damps the coil during the period of the fly-back stroke, thus preventing any oscillations. Excepting at this time, the damping valve has no effect on the saw-tooth waves and therefore cannot produce distortion.

The invention accordingly provides a scanning arrangement for a television tube comprising a generator of saw-tooth waves, an inductive circuit for applying the waves to the electron beam of the tube, and a hard valve normally biassed beyond the cut-off and having its anode circuit connected to shunt the inductive circuit, means being provided for unblocking the valve only during the periods of the fly-back strokes of the saw-tooth waves.

Fig. 1 of the accompanying drawing shows a schematic circuit diagram of one embodiment of the invention. For explaining its action reference will be made to the waveform diagrams of Fig. 2. In Fig. 1 there is shown an inductive circuit L which is intended to represent the means for applying scanning waves to a television tube (not shown). The circuit L may comprise the usual deflecting coils or may include a transformer used for supplying the waves to the deflecting coils or plates of the tube, or may comprise any arrangement the impedance of which has similar characteristics. This circuit will generally have in addition self-capacity, and the apparatus and leads connected thereto will generally introduce some capacity, so that the circuit L will in effect be shunted by a condenser represented by C in Fig. 1. A parallel resonant circuit is thus formed, and the impulse which is in effect applied at each fly-back stroke may produce oscillations unless the circuit is sufficiently heavily damped.

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The circuit L is supplied with waves from a saw-tooth generator G (which may be operated from an impulse generator or synchronised with incoming waves in the usual way by arrangements not shown), through an amplifying valve V_1, the circuit L being connected in series with the anode circuit of the valve. V_2 is an ordinary hard valve, that is a valve with a high vacuum in which there can be no appreciable ionisation. The anode circuit of V_2 is connected across L with the cathode at the end nearest to the anode of V_1. The valve V_2 is supplied with saw-tooth waves from G through an amplifying valve V_3. The control grids of V_1 and V_3 are shown biased from conventional batteries B_1 and B_3 through grid resistances R_1 and R_2, and the saw-tooth waves are applied from G through condensers C_1 and C_3. The valves V_3 and V_2 are shown coupled by a transformer T, the primary winding P of which is connected in series with the anode of V_3, and the secondary winding is connected between the control grid and cathode of V_2, a conventional biassing battery B_2 being included as shown. The control grid of V_2 is shunted by a condenser C_2 whose function will be explained later. Positive potential for the anodes of V_1 and V_3 is obtained from the terminal HT+ and is supplied through L and P respectively.

The potential of the battery B_2 should be so chosen that the valve V_2 is biassed beyond the cut-off for the maximum potential which can appear across the circuit L, so that there can be no appreciable anode current. The anode circuit impedance is thus substantially infinite.

Referring now to Fig. 2, curve A represents the voltage wave applied from the generator G to the control grid of valve V_3. In each operating stroke the voltage rises from zero to $+E$ and then flies back very nearly instantaneously to zero again. The negative potential of the battery B_3 should be so chosen that the valve is substantially blocked until the applied potential has risen to some value $+(E-e)$, where e is small compared with E, so that no plate current flows except just at the end of the operating stroke of the wave A. The anode voltage of V_3 then remains constant at some value $+Ea$ as shown in curve B, Fig. 2, until just before each of the fly-back strokes of curve A when it falls relatively quickly giving the downward peaks shown. The transformer T is so poled that a phase reversal is obtained so that the peaks applied to the control grid of V_2 are effectively positive. These peaks should be of sufficient amplitude quickly to unblock the valve V_2 and to cause a relatively large anode current to flow, so that the valve puts a heavy load on the circuit L to damp it, thus to prevent the oscillations which might be produced by the fly-back stroke.

The condenser C_2 is provided to delay the blocking of the valve V_2 until after the fly-back stroke is completed. It will be clear that on removal of the voltage applied from the valve V_3, the condenser will take a short time to discharge through the resistance of the coil S and will maintain the potential of the valve V_2 above the cut-off value for a short period after the time of the fly-back stroke. Curve C in Fig. 2 shows the grid voltage $-Eg$ of the valve V_2, the peaks being approximately symmetrical. The valve V_2 is thus unblocked for a short period t which embraces the fly-back stroke, and could generally be about equal to the fly-back time.

It will be seen that the damping valve has no effect at all on the waves except just at the time of the fly-back stroke, and the saw-tooth waves themselves are used to condition the damping valve at the right time so that it operates only when required.

It will be understood that although triode valves have been shown for simplicity the invention is not confined to the use of such valves, which can have any number of electrodes. Any suitable biassing arrangements may be used to replace the batteries B_1, B_2 and B_3 which are conventional, and other coupling circuits may be employed, the only condition being that the polarity of the impulses reaching the grid of V_2 should be such that unblocking occurs; actually valve V_3 itself it not absolutely essential, as the waves could

be applied direct from G to V_2 (no phase reversal being then necessary), but it is preferable to include V_3 in order to obtain a large amplitude at the control grid of V_2, so that it can be sharply blocked and unblocked.

What is claimed is:

In an electromagnetic type of sweep system for cathode ray tubes, a sweep generator adapted to be triggered by suitable synchronizing pulses and having a sweep voltage output varying in the general manner of a saw-tooth, means for applying said sweep output to an inductive circuit, a high vacuum tube having at least a cathode, grid and an anode, a condenser connected across the input circuit to said high vacuum tube, said condenser having sufficient capacity to maintain said grid above cut-off after said grid has reached cut-off potential, for a predetermined time, connections to shunt said tube across a circuit including said inductive circuit so that said inductive circuit may be completed through said tube, means for feeding the output of said sweep generator to an amplifier stage, said amplifier stage having a transformer primary in the output thereof, a secondary for said transformer connected between the cathode and control grid of said high vacuum tube, means for biasing said control grid below cut-off, said bias being sufficient to prevent said control grid from rising above cut-off only when said saw-tooth voltage has reached a predetermined peak value whereby said tube discharges said inductive circuit in predetermined phase relationship to said sweep.

PRAFULLA KUMAR CHATTERJEA.
DERMOT MIN AMBROSE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,170,847	Banks	Aug. 29, 1939
2,315,073	Norton	Mar. 30, 1943