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CATHODE-RAY OSCILLOGRAPH CIRCUIT

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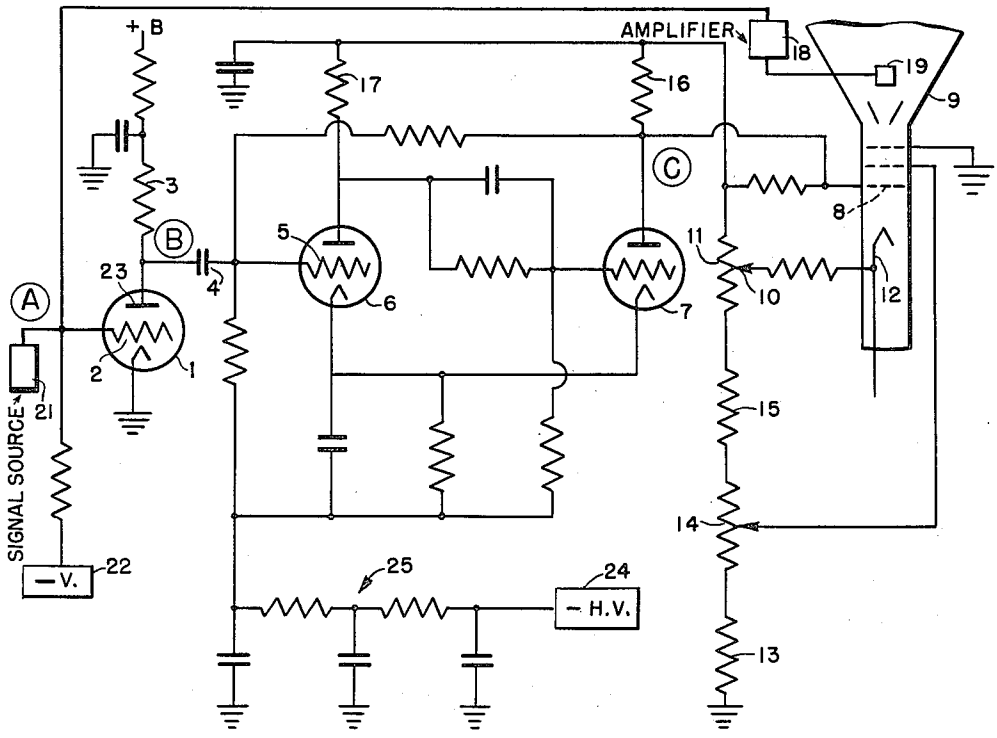


Fig. 1

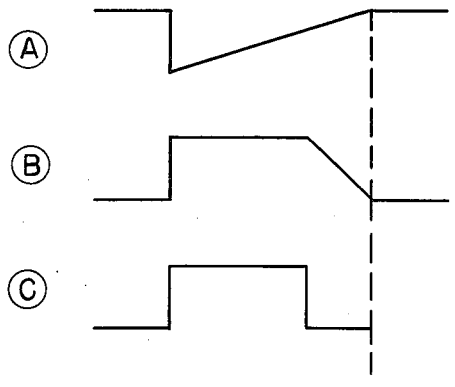


Fig. 2

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CATHODE-RAY OSCILLOGRAPH CIRCUIT

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2 Claims. (Cl. 315—22)

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This invention relates to electronic circuits and particularly to the operation of a cathode ray tube and control of the electron beam therein.

In studying the cathode ray tube presentation of signals to be observed, it is often desirable to present a trace on the face of the tube only during that period of time when the signal desired to be observed is present. In photographically recording a transient wave for instance, it is desirable to eliminate the trace when the signal is not present so as to avoid film exposure and fogging.

Accordingly, it is among the objects of this invention to brighten the trace of a cathode ray tube periodically and alternately increase and decrease the intensity of the electron beam in accordance with the presence of the signal to be observed.

Other objects are: to provide means for deriving a substantially square wave gating pulse from a signal of sawtooth wave form and having substantially the same duration; to provide an electronic trigger circuit which becomes a series element of a cathode ray tube bleeder circuit avoiding the necessity of a separate plate supply voltage; and to provide means for capacitively coupling a gating signal at a low potential to a circuit at a different potential without deterioration of the wave form thereof.

Other objects will be apparent from the following description, claims and drawings, in which—

Figure 1 shows in schematic form the circuit of one embodiment of this invention, and

Figure 2 shows wave forms of voltages existing at various points of the circuit of Figure 1.

Referring to Figure 1, a source 21 of signals having a sawtooth wave form is connected to the grid 2 of a thermionic tube 1 and also through an amplifier 18 to one set of deflection plates 19 of the cathode ray tube 9. The grid 2 of the tube 1 is maintained at a desired bias by connection to a source 22 of negative voltage. The anode 23 of tube 1 is connected to a source of positive voltage through a load resistor 3 and through a capacitor 4 to an input grid 5 of a second thermionic tube 6.

The second tube 6 is interconnected with a third thermionic tube 7 to form a conventional Eccles-Jordan trigger circuit or "flip-flop" circuit. The anodes of the two tubes 6 and 7 comprising the Eccles-Jordan circuit are connected through respective load resistor 17 and 16 to a common point at one end of a resistor 11. This resistor 11 is connected in series through additional resistors 13, 14 and 15 to ground.

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The normally negative side of the Eccles-Jordan trigger circuit represented by the cathode and grid connections of the two tubes 6 and 7 in this circuit are connected to a source 24 of negative high voltage through a filter network 25 comprising conventional resistors and capacitors as shown in the drawing. With this arrangement, a bleeder type circuit is formed with the grounded end representing the positive potential with respect to the grid and cathode side of Eccles-Jordan circuit. The Eccles-Jordan circuit is in series with the plurality of resistors 13, 14, 15 and 11 so as to become a series element of the bleeder circuit.

Operating voltages for the electrodes of the cathode ray tube 9 may be provided by connecting the electrodes to ground, either directly for a higher potential, or through a resistor such as resistor 14 for lower variable potentials. The cathode 12 of the cathode ray tube 9 is connected through a suitable resistor to a variable tap on the resistor 11 having a voltage more negative than ground. The control grid 8 of the cathode ray tube 19 is connected through a suitable resistor to the top end of the resistor 11. The square wave output from the Eccles-Jordan trigger circuit from the anode of tube 7 is fed through this same point to the control grid 8 of the cathode ray tube 9.

The operation of the circuit is as follows:

A vacuum tube 1 is operated with its grid bias near zero so that in the absence of any signal applied to its grid 2, the tube conducts its rated plate current. When a negative sawtooth signal of the wave form shown at A in Figure 2 is applied to the grid 2 of this tube, the tube is cut off, generating across its plate load resistor 3 a triggering gate voltage with the wave form as shown at B in Figure 2. At the same time, this negative sawtooth signal is applied through the amplifier 18 to deflecting plates 19 of the cathode ray tube 9.

The above described triggering gate voltage is coupled through a capacitor 4 to the control grid 5 of the vacuum tube 6 representing the input of the Eccles-Jordan trigger circuit. The plate loads are balanced so that the current is constant in either of the two stable operating conditions. This makes it possible to utilize the trigger circuit as a series element of the cathode ray tube bleeder.

The positive side of the high voltage supply for the beam accelerating and focussing circuits of the cathode ray tube is grounded, and the various potentials needed for proper operation are

obtained from various points of the "bleeder," or potential divider comprising the series of fixed resistors connected between ground and the negative side of the high voltage supply. The two tubes of the Eccles-Jordan trigger circuit, tubes 6 and 7, are connected in series with the fixed resistors of the bleeder and become an element of this divider. The polarity is such that the plates of these tubes are connected through their load resistors 16 and 17, to a more positive potential than that to which their cathodes are connected. Since the plate loads of this trigger circuit are balanced, the current drawn from the bleeder is constant in either of the two stable operating conditions of the trigger circuit. The plate of one of the tubes is connected directly to the control grid of the cathode ray tube so that the potential at this point is changed with respect to the voltage at its cathode when the trigger circuit changes from one operating condition to the other. The voltage on the grid can never go more positive than that on the cathode because of this series arrangement.

The gating voltage appearing at the plate of tube 7 is shown at C in Figure 2, and is applied to the control grid 8 of the cathode ray tube 9. This gate is square-topped and rises and falls at speeds determined only by the changeover time of the "flip-flop" or Eccles-Jordan circuit.

By means of a slider 10 on resistor 11 which forms a portion of the bleeder circuit, the voltage of the cathode 12 may be adjusted to a value more positive than that of the grid 8, so that the beam is completely cut off in the absence of the brightening gate C.

One of the advantages of the above described circuit is that the triggering gate B, derived from the plate of the first vacuum tube 1 may be coupled to a circuit of a higher or lower potential without deteriorating its wave form.

The first vacuum tube 1 and its associated circuits have been described as used in this specific embodiment of the invention but it is understood that other circuits which may be controlled in their characteristics and which will generate a triggering gate voltage such as is shown at B in Figure 2 may be used, and other square wave pulse generators may be used which exhibit the characteristic of constant plate current with changing operating conditions such as that described and which will produce a substantially

square wave pulse for application to the cathode ray tube grid.

While the foregoing description has specifically described this circuit as it may be used in connection with a cathode ray tube, my invention is by no means limited to this use, as other uses will become apparent to those skilled in the art.

What is claimed is:

1. A cathode ray tube circuit comprising a cathode ray tube having a screen, beam deflecting plates, a cathode, a control electrode and focusing electrodes, a source of signals to be observed, a source of negative potential, a bleeder circuit connected to said source of negative potential to provide operating potentials to said cathode, control electrode and focusing electrode, a multi-vibrator flip-flop circuit connected as an element of said bleeder, said beam deflecting plates being connected to said source of signals, said multivibrator circuit being also connected to said source of signals and to said grid, whereby said multivibrator circuit is triggered by a signal from said source to change the potential applied to said grid and brighten the representation on said screen.

2. The circuit of claim 1, in which said multivibrator flip-flop circuit derives its plate power from the same source as that supplying said cathode ray tube.

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