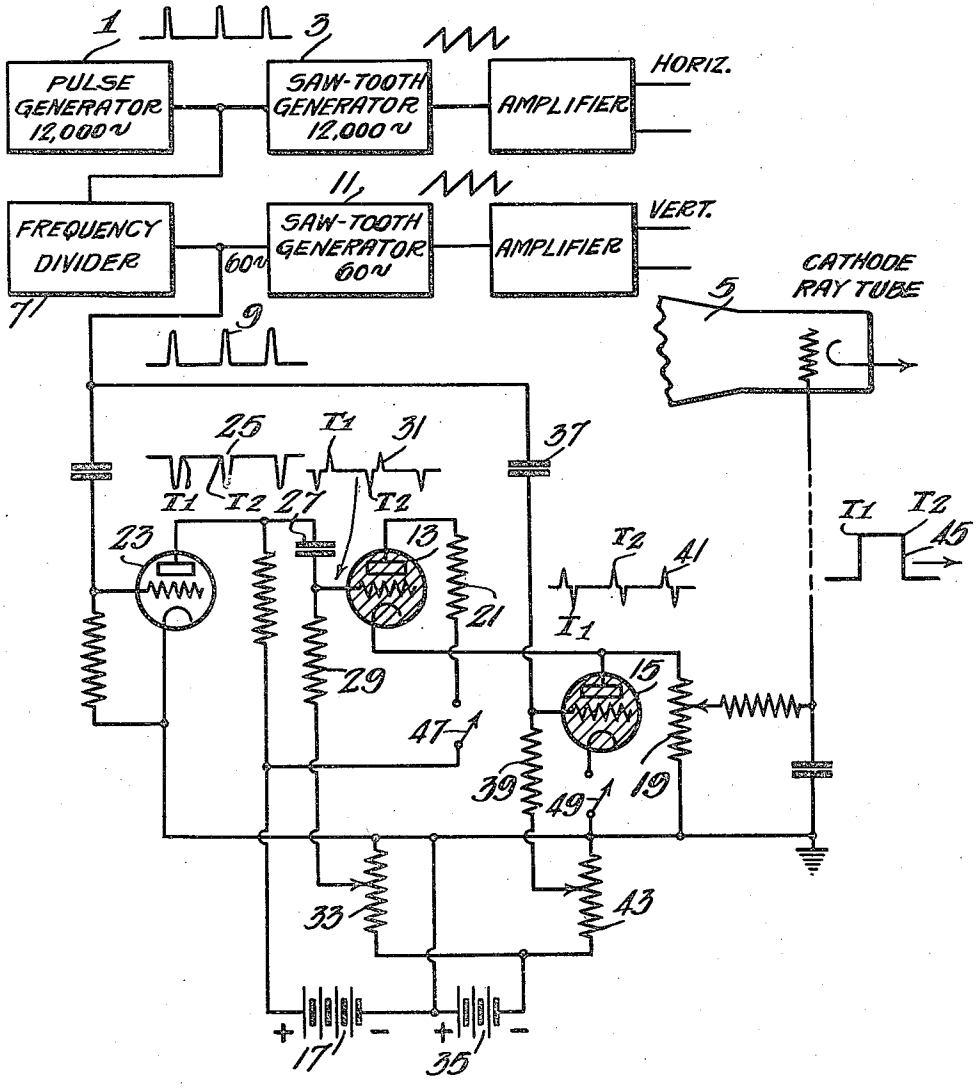
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SYSTEM FOR PRODUCING A SINGLE NON-REPETITIVE SCANNING TRACE

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SYSTEM FOR PRODUCING A SINGLE NON-REPETITIVE SCANNING TRACE

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5 Claims. (Cl. 315—22)

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This invention relates to electronic triggering systems and more particularly to circuits adapted to be controlled by successive short duration voltage pulses to produce a single non-repeating square wave of predetermined voltage and a duration time substantially equal to the period between the two successive controlling pulses. A circuit of this character is useful in the measurement of persistence of various phosphors used in cathode ray tubes, when it is desirable to excite a single complete scanning pattern consisting of only one beam trace from upper left corner to the lower right corner of the pattern. This can be done by biasing the control grid of the cathode ray tube to cut off the beam, and applying a square wave of voltage in opposition to the bias voltage during one scanning period.

It is an object of this invention to provide a method and means for generating a square wave of predetermined amplitude and of a length determined by the interval between two control pulses. A further object is the provision of means for exciting a single discrete scanning pattern on the face of a cathode ray tube. Another object is to provide means for controlling the grid of a cathode ray tube by a single square wave pulse derived from the voltage used to control a deflection voltage generator connected to said tube.

These and other and incidental objects will become apparent to those skilled in the art upon consideration of the following description of the invention, with reference to the accompanying drawing, which is a schematic diagram of a trigger circuit according to the invention. A block diagram of a circuit for generating scanning voltages is shown, comprising a pulse generator 1 connected to control a sawtooth generator 3 for horizontal scanning at a relatively high frequency, for example, 12,000 cycles per second. The sawtooth generator 3 is connected to the horizontal deflection circuit (not shown) of a cathode ray tube. The output of the pulse generator 1 is also connected to a frequency divider 7 which produces voltage pulses 9 similar in shape to the pulses 11 generated by the generator 1, but at a much lower frequency, for example, 60 cycles. The pulses 9 control a sawtooth generator which is connected to the vertical deflection circuit of the cathode ray tube 5. The system thus far described will produce on the screen of the cathode ray tube 5 a scanning pattern of substantially rectangular outline comprising 200 parallel horizontal lines, repeated 60 times per second. The beam describes a zig zag path down the area of the pattern, travelling much faster from right to left, during the retrace periods, than it does from left to right. In order to produce a single trace of the pattern, it is necessary to turn the beam on at the

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beginning of a scanning cycle and cut it off at the end of that cycle. A circuit for this purpose is illustrated, comprising two gas filled grid controlled discharge tubes 13 and 15, with their plate circuits connected in series across a direct current source 17 when switches are closed. A load resistor 19 is connected across the tube 15. Thus when the tube 13 is conductive and the tube 15 is cut off, current will flow from the source 17 through the tube 13 to the resistor 19, producing a voltage drop across the resistor. When both tubes are conducting, the resistor 19 is effectively short circuited by the tube 15, and current from the source flows through the two tubes 13 and 15 but does not cause a substantial voltage across the resistor 19. A resistor 21 is provided in the plate circuit of the tube 13 to limit the current drawn from the source 17 when both tubes are conductive. Thus it is possible to produce a voltage pulse of square wave form across the resistor 19 by causing the tube 15 to conduct for ending the pulse. The operation cannot be repeated until the plate circuit of the tubes is broken, allowing the grids to regain control of the plate current. Control voltages for the grids of the tubes 13 and 15 are derived from the synchronizing pulse 9 by means of a pulse differentiating circuit, disclosed and claimed in copending application Serial No. 448,210, filed by O. H. Schade on June 24, 1942. A single stage amplifier 23 inverts the wave 9 to the form 25; the wave 25 is applied to a differentiating circuit comprising a capacitor 27 and a resistor 29, producing a wave 31 across the resistor 29. A steady bias potential taken from a voltage divider 33 across a source 35 is added to the wave 31 and the sum of the two voltages is applied to the grid of the tube 13. The voltage divider 33 is adjusted so that the first positive peak in the wave 31, occurring at a time T1, will overcome the bias and fire the tube 13, which will continue to conduct thereafter regardless of the voltage applied to its grid until the plate circuit is broken. Control voltage for the tube 15 is also derived from the synchronizing pulse 9, which is differentiated in a circuit comprising a capacitor 37 and a resistor 39 to produce a wave 41. A steady bias derived from a voltage divider 43 across the source 35 is added to the wave 41, and adjusted so that the first positive peak of the wave 41 occurring after the plate voltage is applied to the tube 15 through the tube 13 will fire the tube 15. This happens at the time T2. Thus a voltage 45 is produced across the resistor 19, starting at the beginning of a scanning cycle as determined by the timing wave 9, and ending at the end of the same scanning cycle, without repetition. In order to reset the circuit, switches 47 and 49 are provided in the plate cir-

cuit of the tubes 13 and 15. Opening either switch stops the plate current.

To provide repeated scanning at predetermined intervals, one of the switches, for example, the switch 47, may be opened and closed periodically by a clockwork mechanism, not shown, while the switch 49 remains closed.

Thus the invention has been described as means for producing a single square wave voltage pulse during the interval between two successive pulses of a repeating voltage wave. This is accomplished by using the first control pulse to connect a voltage source to a utilization circuit through a grid controlled gaseous discharge tube, and using the second pulse to short circuit the utilization circuit through a second gaseous discharge tube. Since the grid of a tube of this type loses control over the plate current after its flow is initiated, the square wave pulse is not repeated until the circuit is reset by breaking the plate circuits.

I claim as my invention:

1. A system for producing a single-nonrepetitive scanning trace on the face of a cathode ray tube, including a source of control impulses, a sawtooth wave generator controlled by said control impulses and connected to one deflecting circuit of a cathode ray tube, a frequency divider arranged to derive a voltage subharmonically related in frequency to said control pulses, a second sawtooth wave generator controlled by the output of said frequency divider and connected to a second deflecting circuit of said cathode ray tube, means for applying a bias to a beam control electrode of said cathode ray tube so as to cut off the electron beam of said tube; means for overcoming said bias during the period between two successive maxima of the output voltage of said second sawtooth wave generator comprising a source of direct current, a resistor coupled to the circuit of said beam control electrode and connected to said direct current source through a gaseous discharge tube, a second gaseous discharge tube connected to shunt said resistor, and means responsive to two successive pulses in the output of said frequency divider to fire respectively said first and second gaseous discharge tubes, whereby the electron beam of said cathode ray tube is enabled to reach the fluorescent screen of said tube during the period of a single complete scanning cycle.

2. A system for producing a single non-repetitive scanning trace on the face of a cathode ray tube, including deflection voltage generators connected to the deflection circuits of a cathode ray tube, means arranged to supply a bias to a beam control electrode of said tube whereby the electron beam of said tube is cut off, and means for overcoming said bias during the period between two successive maxima of the voltage produced by one of said deflection voltage generators including a source of direct current, a resistor coupled to said beam control electrode and connected to said direct current source through a voltage responsive switching device, a second voltage responsive switching device connected to shunt said resistor, and means for deriving voltages related to the output of one of said deflection voltage generators to operate said switching devices successively.

3. A system for producing a non-repetitive voltage pulse of predetermined amplitude and duration including a source of cyclically repeating control impulses, a voltage responsive switching device having a control input circuit, a source of direct current, a load connected to said direct current source through said voltage responsive switching device, a second voltage responsive switching device connected in parallel with said load and having a control input circuit, differentiating circuits connected between said source of control impulses and said control input circuits of said voltage responsive switching devices, and means for applying said control impulses to said differentiating circuits in opposite polarities whereby said first voltage responsive switching device is actuated upon the occurrence of one of said control impulses to connect said direct current source to said load, and said second voltage responsive device is actuated upon the occurrence of the next following control impulse to short circuit said load.

4. The invention set forth in claim 3 wherein said voltage responsive devices comprise electron discharge tubes.

5. A system for producing a single non-repetitive scanning trace on the face of a cathode ray tube provided with deflection control circuits and an intensity control electrode, including a source of control impulses, deflection voltage generators controlled by said impulses and connected to said deflection control circuits, means for supplying a bias to said intensity control electrode whereby the electron beam of said tube is cut off, and means for overcoming said bias during the period between two successive maxima of the voltage produced by one of said deflection voltage generators including a source of direct current, a resistor coupled to said intensity control electrode and connected to said direct current source through a voltage responsive switching device, a second voltage responsive switching device connected in parallel with said resistor, differentiating circuits connected between said source of control impulses and said voltage responsive switching devices, and means for applying said control impulses to said differentiating circuits in opposite polarities whereby said first voltage responsive switching device is actuated upon the occurrence of one of said control impulses to connect said direct current source to said resistor, and said second voltage responsive device is actuated upon the occurrence of the next following control impulse to short circuit said resistor.

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