

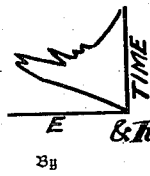
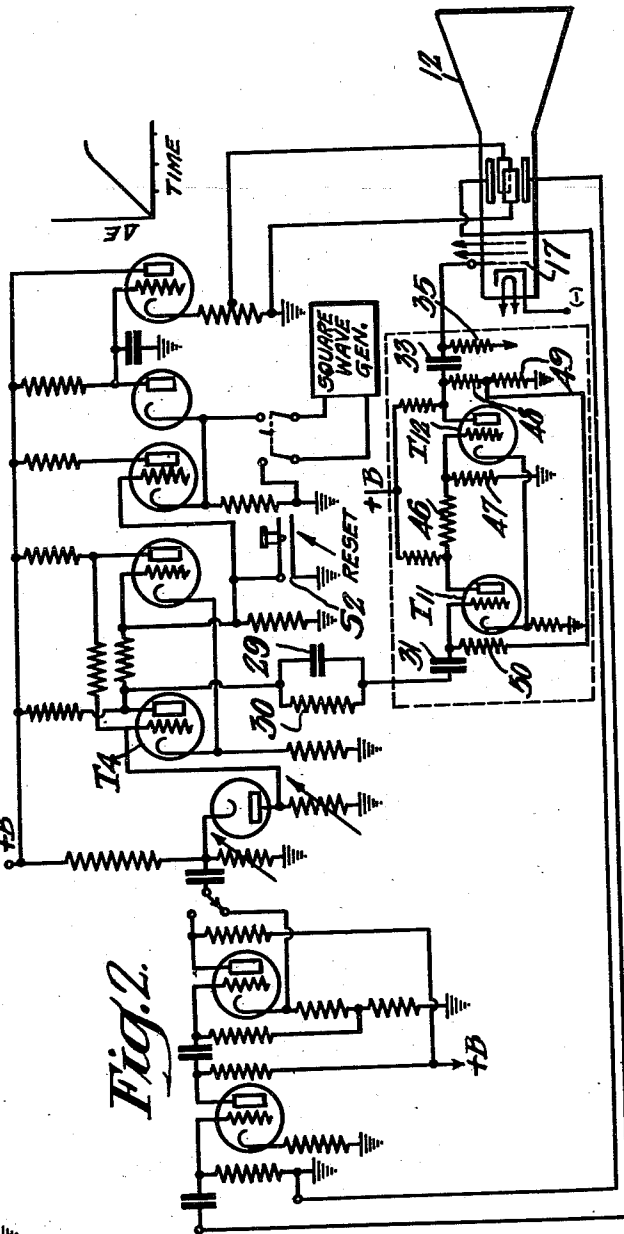
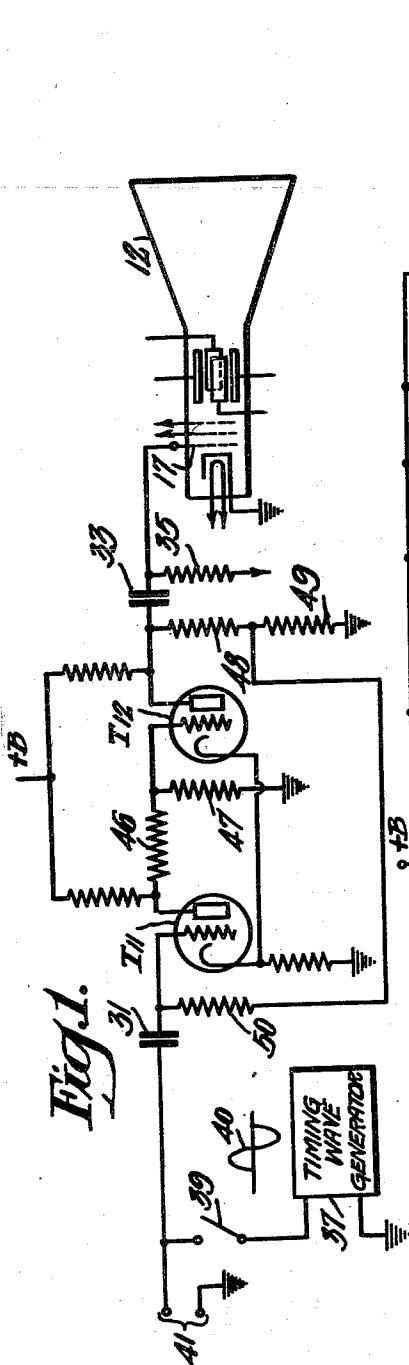
Nov. 28, 1944.

H. J. SCHRADER ET AL

2,363,810

BLANKING AMPLIFIER FOR CATHODE RAY OSCILLOGRAPHS

Filed Feb. 26, 1942



Inventors
Harold J. Schrader
& Ronald D. Scheldorf
CD Tusk
 Attorney

UNITED STATES PATENT OFFICE

2,363,810

BLANKING AMPLIFIER FOR CATHODE
RAY OSCILLOGRAPHS

Harold J. Schrader, Haddonfield, and Ranauld D.
Scheldorf, Haddon Heights, N. J., assignors to
Radio Corporation of America, a corporation of
Delaware

Application February 26, 1942, Serial No. 432,396

3 Claims. (Cl. 315-20)

This invention relates generally to cathode ray oscillographs and particularly to methods and circuits for producing increased or interrupted cathode ray intensity during predetermined time intervals.

The invention is an improvement over the method and circuit described in our copending U. S. application, Serial No. 431,626, filed February 20, 1942, insofar as the control of cathode ray intensity in an oscilloscope is concerned. In observing transients or signals of extremely short duration on a cathode ray oscilloscope, considerable difficulty has been experienced in obtaining sufficient illumination during the extremely rapid traversal of the fluorescent screen by the cathode ray. The extremely small amount of light energy available to the observer results in poor visibility, because the cathode ray intensity must be limited during absence of ray deflecting signals to prevent burning of the fluorescent screen. This invention provides means for temporarily increasing the intensity of a cathode ray during the time interval of the signal under observation.

Another problem with which considerable difficulty has been experienced is the suitable interruption of the cathode ray beam to produce a non-continuous trace. This has been accomplished in the past by modulating the cathode beam with sine wave or sawtooth voltages derived from a timing oscillator. Another method which has been used is the interruption of the grid bias circuit of the oscilloscope by means of an electronic relay. Both of these methods have the disadvantage that the interruption of the cathode beam is not clearly defined or involves the use of complicated circuits and apparatus.

An object of this invention is to provide an impulse actuated amplifier to produce signals of square wave form for modulating the control electrode bias on a cathode ray oscilloscope. Another object of the invention is to provide a method and circuit for temporarily increasing the cathode ray intensity during the time interval of a ray deflecting signal. Still another object is to provide a method and circuit for interrupting the cathode ray beam in an oscilloscope in such a manner that a sharply defined dashed cathode ray trace is obtained. Another object is to provide a method for increasing the visibility of a cathode ray oscillograph trace while preventing the possibility of burning the fluorescent screen due to high cathode ray intensity.

In describing the invention, reference will be

made to the drawing of which Figure 1 is a schematic diagram of one embodiment of the square wave amplifier and Figure 2 is a schematic diagram of another embodiment of the circuit. Similar reference characters are used for similar circuit components throughout the drawing.

Referring to Figure 1, a suitable source of timing signals 40 is obtained from the timing wave generator 37 and applied through the switch 39 and the blocking condenser 31 to the control electrode of a first amplifier tube T11. Voltages from any other source may be applied at the terminals 41. The anode of the tube T11 is coupled through a resistor network 46, 47 to the control electrode of a second amplifier tube T12. The anode of the tube T12 is coupled by a suitable resistor network 48, 49, 50 to the control electrode of the tube T11 and is also coupled through a blocking condenser 33 to a control electrode 17 of a cathode ray oscilloscope 12. A grid resistor 35 is provided for the control electrode 17 of the oscilloscope 12. The amplifier circuit, comprised of the tubes T11 and T12 and their associated resistance networks, provides a square wave output voltage of a frequency corresponding to the frequency of the timing signal input voltage which may be of any desired wave form. The operation of this amplifier circuit, sometimes known as a trigger circuit or "flip-flop" amplifier has been described in detail in our above-mentioned copending application.

In Figure 2 the amplifier circuit of Figure 1 has been incorporated in the circuit disclosed in our above-mentioned copending application to provide more clearly defined blanking of the cathode ray beam in synchronism with the timing voltage derived from a transient signal under observation. The operation of the amplifier circuit in this system is as follows: A voltage pulse derived from the transient signal under observation is obtained from the anode of the tube T4 and applied through the network comprising the capacitor 29 and the parallel resistor 30 to the input circuit of the amplifier comprising the tubes T11 and T12. The time constant of the circuit comprising capacitors 29 and 31 and resistor 30 is selected to provide suitable excitation for the tube T11. The square wave output voltage pulse derived from the anode of the tube T12 is applied to a control electrode 17 of an oscilloscope 12 through a blocking condenser 33. The duration of the blanking pulse applied to the control electrode 17 will depend,

in this case, on the time constant of the circuit comprising the blocking condenser 33 and the resistor 35.

The circuit of Fig. 1, including the timing generator 37, will produce a series of square wave pulses of the frequency of the timing generator, and can be used for interrupting the cathode ray beam of the oscilloscope 12 to provide a sharply defined dashed trace. The circuit of Fig. 2, on the other hand, can be used to provide temporarily increased cathode ray beam intensity in the oscilloscope 12 to improve the visibility of patterns of signals of extremely short duration which are under observation.

We claim:

1. A cathode ray oscillograph having two pairs of deflecting electrodes and a beam intensity control electrode, means for applying a transient potential variation to one pair of deflecting electrodes, means responsive to the transient potential variation for producing an energy pulse of a predetermined polarity, means responsive to the energy pulse for generating a single sweep deflection potential variation, means to apply the single sweep deflection potential variation to the other pair of electrodes, additional means responsive to the produced energy pulse for generating a positive polarity voltage variation of substantially rectangular wave form, means to apply the generated positive polarity voltage variation to the intensity control electrode of the cathode ray oscillograph to increase the intensity of the cathode ray beam developed therein simultaneous with the application of the single sweep deflection potential variation, and means to re-set the single sweep deflection generating means.

2. A cathode ray oscillograph having two pairs of beam deflecting elements and a beam intensity control electrode, means to apply potential variations to be observed to one pair of beam deflecting elements, means including a unilateral conducting device responsive to the potential

variations to be observed for producing an energy impulse having a predetermined polarity, means responsive to the produced energy impulse for generating a deflection voltage variation, means for applying the deflection voltage variation to the other beam deflecting element, additional means responsive to the produced energy impulse for developing a voltage variation of substantially rectangular wave form and of a positive polarity, the time duration of the developed voltage variation being at least co-extensive with the generated deflection voltage variation, and means to apply the produced voltage variation of positive polarity to the intensity control electrode of the cathode ray oscillograph to increase the intensity of the cathode ray beam developed therein during its deflection by said other beam deflection element.

3. The method of operating a cathode ray oscillograph having two beam deflecting elements and a beam intensity control electrode in response to the presence of a transient potential variations which comprises the steps of applying the transient potential variation to one of the beam deflecting elements, developing an energy impulse in response to the transient potential variation, generating a deflection voltage variation in response to the developed energy impulse, applying the generated deflection voltage variation to the other beam deflecting element, generating a positive potential voltage variation of substantially rectangular wave form in response to the developed energy impulse, and applying the generated positive potential voltage variation to the beam intensity control electrode simultaneous with the application of the generated deflection voltage variation whereby the intensity of the cathode ray beam may be increased during the observation interval.

HAROLD J. SCHRADER.
RANALD D. SCHELDORF.