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BEAM INTENSITY CONTROL

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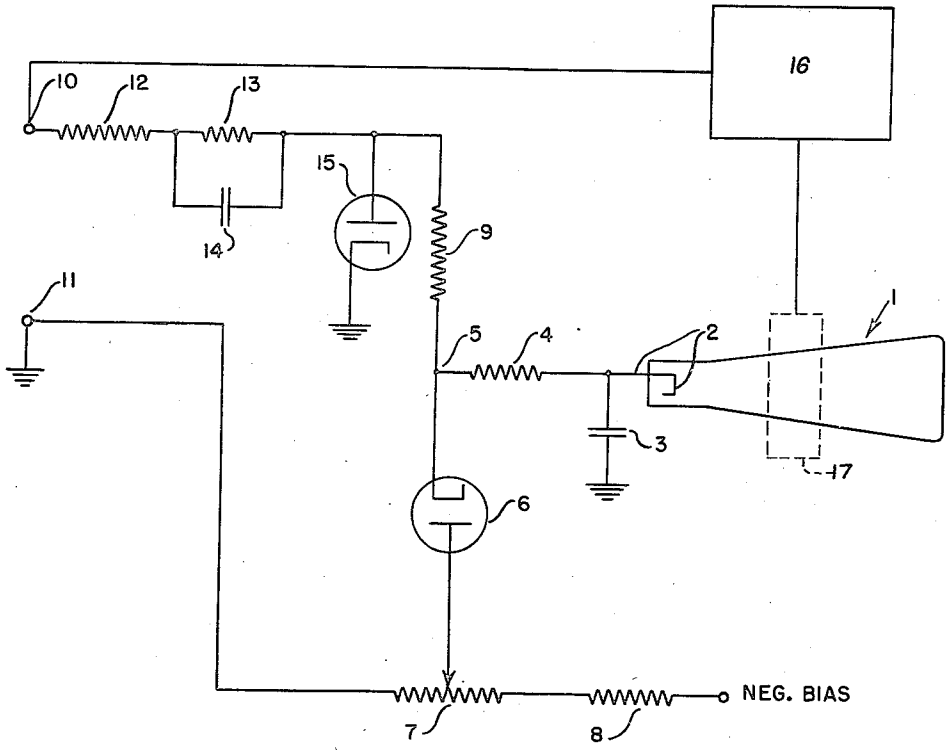

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BEAM INTENSITY CONTROL

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3 Claims. (Cl. 315—22)

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This invention relates to an electrical circuit and in particular to an electrical circuit for controlling the intensity of the electron beam of a cathode ray tube in accordance with the amount of deflection of the beam.

In cathode ray oscilloscopes it is necessary for the operator to control manually the intensity of the electron beam in order to have the beam sufficiently bright to produce a trace which can be readily seen and at the same time avoid burning the screen or blinding the operator temporarily when no deflection voltage is applied to the cathode ray tube. In many instances the beam is turned up to a sufficient intensity to enable the trace to be seen with a large deflection and the operator fails to reduce the intensity when necessary, thereby burning the screen and causing the tube to be discarded sooner than would otherwise be necessary.

It is accordingly an object of this invention to devise a circuit which will control the intensity of the electron beam in accordance with the amount of beam deflection.

It is a further object of this invention to devise a circuit which will reduce the intensity of the electron beam during zero or low deflection signal periods and increase the intensity of the beam during periods when large deflection signals are applied to the tube.

It is a further object of this invention to devise a circuit by means of which a signal, having at least a part of its cycle positive, will produce a negative potential on the cathode of a cathode ray tube.

Other objects and advantages will become readily apparent by referring to the hereinafter described specification.

The cathode of a cathode ray tube is connected to a capacitor and to a resistance network in such a way that when a sweep signal, having at least a portion of the cycle positive, is applied to the network, the average potential on the cathode becomes more negative, thus resulting in increasing the intensity of the electron beam. This sweep signal is the one applied to the deflecting plates of the tube or is proportional thereto. During the periods when no signal is received at the terminals of the network, the potential on the cathode becomes less negative thereby reducing the intensity of the beam and preventing the screen from being burned. This is a modification of the intensity controlling circuit described in the application of Robert M. Silliman (R. R. L. No. 113), Serial No. 639,649, filed January 7, 1946.

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The invention will be best understood by referring to the single figure of the drawing which shows a preferred embodiment of the circuit.

In the figure, a cathode ray tube 1 has its cathode 2 connected to ground through a capacitor 3. The cathode is also connected through a resistor 4 to point 5. Point 5 is connected to the cathode of diode 6; the anode of diode 6 is connected to a voltage divider consisting of potentiometer 7 and resistor 8 connected in series between a source of negative bias and ground. The bias on the anode of the diode can be adjusted by means of the movable contact of the potentiometer 7. Point 5 is connected through resistor 9 and through a network to terminal 10 to which is applied a sweep signal from sweep generator 16 having at least a portion of each cycle positive. Sweep generator 16 also applies a sweep signal to a suitable deflection means 17. Terminal 11, the other input terminal, is connected directly to ground. The network which causes a negative potential to be built up at the cathode of the cathode ray tube consists of a resistor 12 connected to terminal 10 and a resistor 13 by-passed by capacitor 14 and connected between resistor 12 and the anode of a diode 15.

When a sweep voltage is applied to terminal 10, the diode 15 will conduct during the positive portion of the cycle thereby causing the capacitor 14 to acquire a charge. During the positive portion of the cycle the potential at cathode 2 will momentarily become more positive thereby decreasing the intensity of the electron beam. However, at the instant the positive portion of the cycle ceases, the diode will cease to conduct, the potential at terminal 10 will become substantially ground potential, and the negative potential on the capacitor 14 will be applied to the cathode 2 thereby increasing the intensity of the electron beam. Due to the persistence of the screen and of the operator's eye, no flicker should be noticed. The cathode will continue to acquire a negative potential with application of a sweep voltage of greater amplitude to the terminal 10 until the potential at point 5 is slightly more negative than the potential on the anode of diode 6. When this occurs the diode will conduct and prevent any further increase in negative potential from taking place at the cathode of the cathode ray tube. If it is assumed that the potential on the grid remains constant, it can be readily seen that the electron beam intensity will increase as the cathode becomes more negative. The potentiometer 7 may, there-

fore, be used to adjust the maximum intensity of the electron beam. The minimum intensity may be adjusted by the conventional intensity controls. The value of resistor 9 partially determines the amount of signal voltage required to obtain maximum intensity of the electron beam. The function of resistor 13 is to prevent the brightening from being too intense. Resistor 12 is added to the circuit to increase the input impedance to prevent overloading the preceding stage from which the positive signals are obtained.

It will be apparent that there may be deviations from the invention as described which still fall fairly within the spirit and scope of the invention.

Accordingly I claim all such deviations which fall fairly within the spirit and scope of the invention as identified in the hereinafter appended claims.

What is claimed is:

1. In a cathode ray oscilloscope, a cathode ray tube having a cathode and a grid, a point of reference potential, a capacitor connecting the cathode of said cathode ray tube to said point of reference potential, a source of negative potential, a first vacuum tube having a cathode and an anode, a potentiometer having a first terminal connected to said point of reference potential and a second terminal electrically connected to said source of negative potential, the movable contact of said potentiometer being electrically connected to the anode of said first vacuum tube, a first resistor means electrically connecting the cathode of said cathode ray tube to the cathode of said first vacuum tube, a second vacuum tube having a cathode and an anode, said cathode of said second vacuum tube connected at said point of reference potential, means including a second resistor means for connecting the anode of said second vacuum tube to the cathode of said first vacuum tube, a terminal for receiving a signal having at least a portion of each cycle positive, a third resistor means electrically connecting said terminal to the anode of said second vacuum tube and a capacitor by-passing said third resistor means.

2. In a cathode ray oscilloscope, a cathode ray tube having a cathode and a grid, a point of reference potential, a capacitor connecting the cathode of said cathode ray tube to said point of reference potential, a first vacuum tube having a cathode and an anode, a source of adjustable negative bias, means electrically connecting the anode of said vacuum tube to said source of negative bias, resistor means electrically connecting the cathode of said cathode ray tube to the cathode of said first vacuum tube, a second vacuum tube having a cathode and an anode, means electrically connecting the anode of said second vacuum tube to the cathode of said first vacuum tube, means for connecting said cathode of said second vacuum tube to said point of reference potential, means for applying a signal to the anode of said second vacuum tube and a resistor-capacitor network interposed between said last mentioned means and the anode of said second vacuum tube.

3. In a cathode ray oscilloscope, a cathode ray tube having a cathode and a grid, a point of reference potential, a capacitor connecting the cathode of said cathode ray tube to said point of reference potential, a resistor having a first terminal and a second terminal, means connecting said first terminal to the cathode of said cathode ray tube, a vacuum tube having an anode and a cathode, the cathode of said vacuum tube being connected to said point of reference potential, the anode of said vacuum tube being connected to the second terminal of said resistor, a resistor connected to the anode of said vacuum tube, a capacitor by-passing said last mentioned resistor and means for applying a signal to said last mentioned resistor.

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