March 30, 1948. C. PUCKETTE, JR 2,438,717

BEAM SWITCH FOR SINGLE TRACE OBSERVANCE

Filed May 28, 1943

Fig. 1

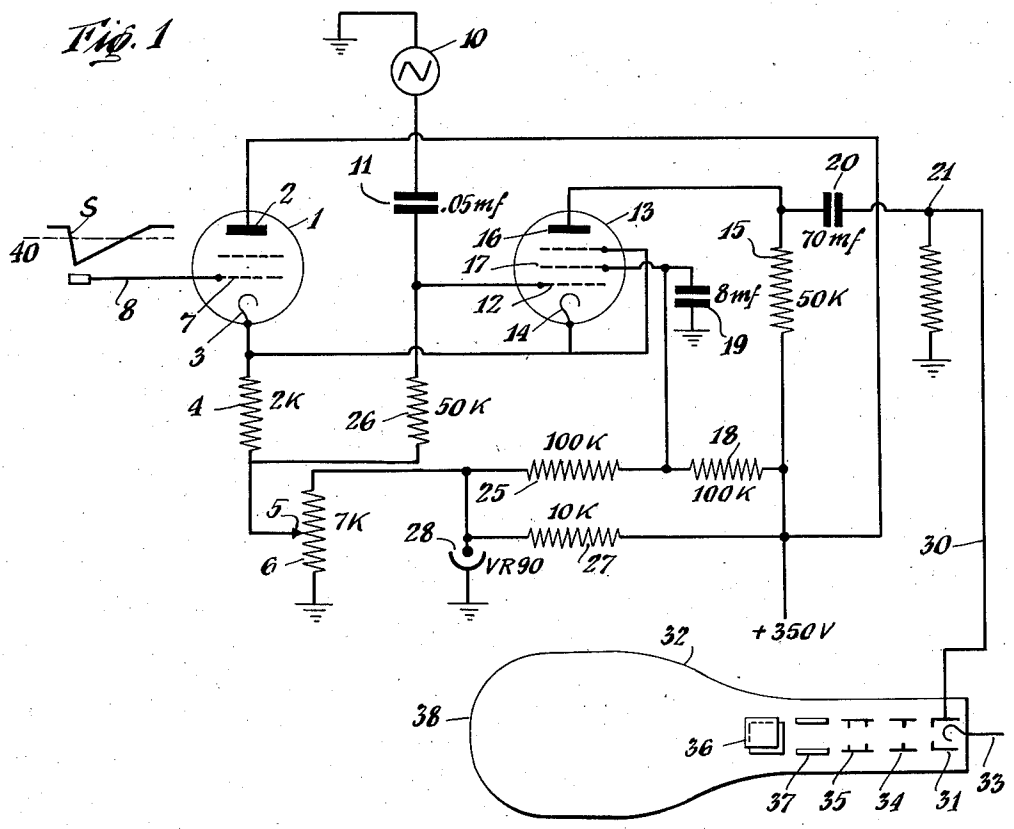


Fig. 2

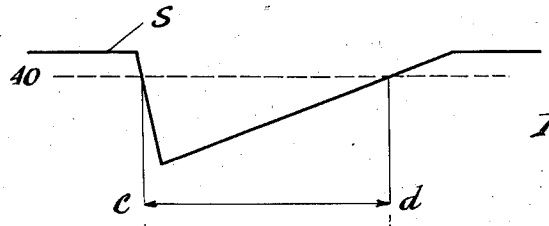


Fig. 3

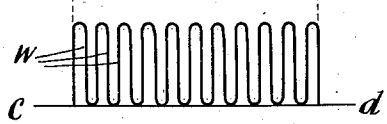
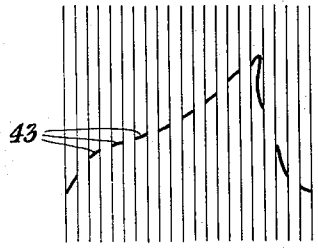


Fig. 4



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BEAM SWITCH FOR SINGLE TRACE OBSERVANCE

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3 Claims. (Cl. 315—22)

1

This invention relates to a device by which the cathode-ray or beam of an oscillograph can be caused to make a single sweep. The beam is cut off during its return trace. With this invention the halo effect is prevented from occurring on the screen of an oscillograph or cathode-ray tube when the residual trace of the beam is being observed, for example, on a tube that has a long persistence screen.

With this invention a longer effective observing time of the residual trace is provided and less distraction is caused by the halo effect than has heretofore been the case.

The invention is of particular use with a single sweep cathode-ray oscillograph and enables transients to be observed by a single sweep method. With this invention a single sweep trace provides its own intensity control through an electronic switch which controls a high frequency signal that is applied to the z-axis or control grid of the cathode-ray tube. The electronic switch is controlled by a local sweep circuit in such a way that both the brightness and the timing of the brightening of the trace is regulated.

The invention may be understood from the description in connection with the accompanying drawings, in which:

Fig. 1 shows a diagram of connections for carrying out the invention; and

Figs. 2, 3 and 4 are diagrams showing the operation of the device.

In the drawing, reference character 1 indicates a vacuum tube to the plate 2 of which a positive potential of, say, 350 volts is applied. The cathode 3 is loaded with or biased by an impedance 4, which may be a resistance, an inductance, or both, which is connected by sliding contact 5 to resistor 6 one end of which is grounded. A signal S, such as a sawtooth wave from a sawtooth generator, is applied to the grid 7 of tube 1 by lead 8.

A generator 10, which may be a high frequency sine wave generator, for example, is coupled by capacitor 11 to the control grid 12 of pentode 13. The cathode 14 of this tube 13 is directly connected to the cathode 3 of tube 1. A source of potential which may be 350 volts is connected through resistor 15 to the plate 16 of tube 13 and the screen grid 17 of this tube is connected through resistor 18 to this 350 volt source. A capacitor 19 is connected between screen grid 17 and ground. The plate 16 is coupled by capacitor 20 to the terminal 21 from which connection is made to the control grid 31 of the cathode-ray tube 32.

2

A resistance 25 is located between resistances 6 and 18, a resistance 26 is located between grid 12 and contact 5, and resistance 27 is located between the voltage regulator 28 and the voltage source. The positive side of this regulator is connected at the junction of resistances 6, 25 and 27, and its negative side to ground.

The lead 30 extends from terminal 21 to the control grid 31 of the cathode-ray tube 32 which is somewhat diagrammatically represented as a tube having a cathode 33, anodes 34 and 35, and pairs of deflecting plates 36 and 37.

The operation is as follows, with the device adapted to produce a single trace on the face 38 of the cathode-ray tube 32 so that it can be observed. The signal that produces the trace that is to be observed is applied in the known way to the y-axis deflection plates 37, and is also used to synchronize the sawtooth wave generator which generates the wave S which is applied to the x-axis plates 36 of the cathode-ray tube 32. At the same time it is applied to grid 7 of tube 1.

When no potential is applied to the grid of tube 1 the potential on its plate causes current through it and through resistance 4 to raise the potential of cathode 3 and cathode 14 to the point where no current flows through tube 13. However, when the potential of signal S decreases to the cut-off value of tube 1, represented by dotted line 40 in Fig. 1 and in Fig. 2 on a larger scale, current ceases to flow through tube 1 during the time interval c—d of Fig. 2.

This causes the potential of cathode 14 to decrease, thus permitting the high frequency sine wave signal from source 10 which is applied to grid 12 of tube 13 to be passed by tube 13 as shown in Fig. 3, during the time interval c—d. This wave W is coupled by condenser 20 and lead 30 to the control grid 31 which is known as the z-axis of the cathode-ray tube 32. The intensity control of the cathode-ray beam of cathode-ray tube 32 is normally adjusted to cut off in the known way when the beam is at rest, but when the signal S causes the signal from source 10 to trigger tube 13, the trace of the cathode-ray beam in tube 32 is intensified to observable brightness. The signal is cut off at the end of the sweep caused by signal S and the beam is blanked out.

The trace being observed on the face 38 of the cathode-ray tube 32 appears as a succession of dots or dashes of light, as indicated at 43 in Fig. 4, the number of them being determined by the frequency of the source 10. By the use of a long persistence screen 38 on cathode-ray tube 32, a single trace may be observed for a considerable

length of time and the position of the line 40, which determines the length of time that the signal appears on the screen 38, can be changed by the position of the contact 5 on resistor 6.

The values of resistances and capacitances indicated on the drawing are illustrative and may be varied considerably for different conditions.

What is claimed is:

1. A device for producing upon the screen of a cathode-ray tube a series of dots, which comprises a vacuum tube to the control grid of which a sawtooth wave of potential is applied, another vacuum tube having its cathode directly connected to the cathode of said first named vacuum tube, an adjustable resistor between the cathodes of said tubes and ground and a source of potential of higher frequency than said sawtooth wave connected to the control grid of said other vacuum tube, another resistor, a source of positive potential connected through said last named resistor to the plate of said second named vacuum tube and to the ungrounded end of said adjustable resistor, and a condenser coupling said plate to the control grid of said cathode-ray tube.

2. The device of claim 1 in which said source of positive potential is connected directly to the plate of said first named vacuum tube.

3. The device of claim 1 in which said source of positive potential is connected to ground through resistors in series one of which is said adjustable resistor.

CHARLES PUCKETTE, JR.

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