July 29, 1952 L. BESS 2,605,423

BLOCKING OSCILLATOR

Filed Feb. 5, 1946

FIG. 1

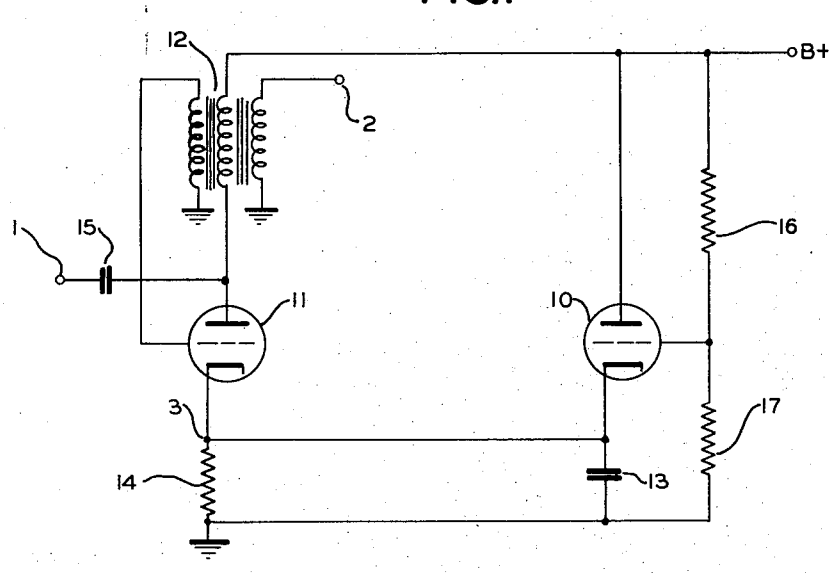
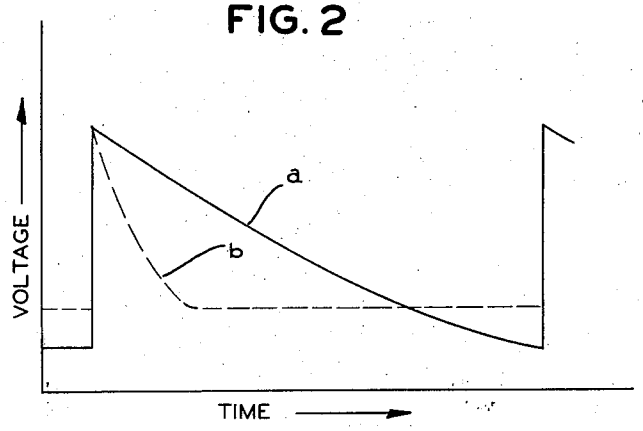


FIG. 2



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Patented July 29, 1952 2,605,423

UNITED STATES PATENT OFFICE

2,605,423

BLOCKING OSCILLATOR

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Application February 5, 1946, Serial No. 645,621

5 Claims. (Cl. 250—36)

1

This invention relates to blocking oscillators and more specifically to a fast recovery cathode biased blocking oscillator.

The orthodox blocking oscillator has a relatively long recovery time determined by the time constant of the resistor and capacitor combination used to cause blocking. When triggered operation is desired, this time constant must be longer than the triggering interval to prevent self triggering. This necessitates a long time constant which leads to a degree of instability.

The object of this present circuit is to eliminate the above stated difficulty by providing a cathode biased blocking oscillator which has a short time of recovery.

An additional object is to provide a blocking oscillator employing a cathode follower to provide the cathode bias.

A still further object is to provide a cathode biased blocking oscillator which will be stable in triggered operation.

These and other objects will be apparent from the following specification when taken with the accompanying drawing, in which:

Fig. 1 is a diagram of the basic circuit of the invention; and

Fig. 2 shows certain waveforms which arise in the operation of the invention.

In Fig. 1, the circuit consisting of electron tube 11, the source of plate potential B+, transformer 12, and the cathode bias system capacitor 13 and resistor 14; forms a standard cathode biased blocking oscillator. In operation, this circuit will draw a single cycle of current during which sufficient bias will be developed to keep the circuit inactive for a relatively long period of time. Output from the blocking oscillator may be taken from a winding of transformer 12 at terminal 2. For triggered operation, a trigger may be applied at the plate of electron tube 11 through capacitor 15 from terminal 1. Electron tube 10, in conjunction with the cathode bias system of the blocking oscillator, forms a cathode follower circuit with the grid returned to a fixed potential as determined by the voltage divider consisting of resistors 16 and 17.

Consider, in Fig. 1, the operation of the blocking oscillator circuit with electron tube 10 removed. When electron tube 11 starts to conduct, current flows through the center winding of transformer 12 inducing a positive potential on the winding connected to the grid. This increase in potential on the grid of electron tube 11 causes the tube to conduct more current and the action is cumulative until the tube reaches

2

saturation. At this time the current ceases to increase through the center winding of transformer 12 and the potential on the winding connected to the grid drops toward zero. The drop in grid potential decreases the conduction of electron tube 11, and again the action is cumulative. During this cycle of conduction by electron tube 11, a charge was built up on the cathode bias capacitor 13. This charge is of such polarity as to make the cathode of electron tube 11 (point 3) positive with respect to ground. At the end of one cycle the grid of electron tube 11 has returned to ground potential, while the cathode is held above ground by the charge on capacitor 13. This has the effect of keeping electron tube 11 from conducting and the tube will not conduct until the charge on capacitor 13 can be removed by the flow of current through the cathode resistor 14. The potential at point 3 will decrease at an exponential rate as shown in Fig. 2 curve *a*. The slope of the trailing edge of this curve is determined by the combination of capacitor 13 and resistor 14. This curve respresents the recovery time of the circuit. If triggered operation is desired, the time of recovery must be longer than the longest triggering interval and the voltage at the time of triggering will depend upon the triggering interval.

When electron tube 10 is replaced in the circuit and the blocking oscillator fires, a charge will be built up on capacitor 13 as before. As the grid of electron tube 10 is at a fixed potential determined by the voltage divider resistors 16 and 17, the rise in potential at point 3 will be sufficient to cause electron tube 10 to cease conduction. As capacitor 13 discharges through resistor 14, the potential at point 3 decreases until the relation between the grid and cathode potentials of electron tube 10 is such as to cause tube 10 to become conducting. As the potential at point 3 decreases, the current through electron tube 10 increases until an equilibrium point is reached. At this point the potential at point 3 will remain fixed as the current through electron tube 10 will equal the discharge current of capacitor 13. This final value of potential may be varied by varying the voltage divider resistors 16 and 17 which determine the grid potential of electron tube 10.

The presence of electron tube 10 allows the use of a smaller value of cathode resistor 14 or capacitor 13. This decreases the time required for the blocking oscillator circuit to recover. Fig. 2 curve *b* shows the cathode potential point 3 waveform with tube 10 in place, and the values of

resistor 14 and capacitor 13 adjusted as permitted by the operation of electron tube 10 to provide the shorter recovery time.

While tube 10 has been shown as a biased triode, it is to be understood that a diode may be used in its place with the necessary and known biasing to provide the limiting action. However the disclosed embodiment in the drawing has the advantage of lower power consumption.

The invention is only to be limited by the appended claims.

What is claimed is:

1. A blocking oscillator comprising, a first electron tube including cathode, grid, and plate, a source of plate potential, a transformer having a first winding joining said plate and said source and a second winding joining said grid and ground so connected as to couple a change in voltage at said plate to said grid in inverse relationship, a cathode bias system consisting of a parallel combination of a single resistor and a capacitor joining said cathode and ground, a second electron tube including cathode, grid, and plate, said plate connecting to said source of plate potential, said cathode connecting directly to the cathode of said first electron tube, and said grid being so biased as to cause said second electron tube to become conducting when said cathode is at a predetermined potential.

2. A blocking oscillator comprising, a first electron tube including cathode, grid and plate, a source of plate potential, a transformer having a first winding joining said source of plate potential and said plate, and a second winding joining said grid and ground, said windings being so poled as to couple a voltage change at said plate to said grid in inverse relationship, a cathode bias system consisting of a parallel combination of a resistor and capacitor, joining said cathode and ground, a second electron tube including cathode, grid, and plate, said plate connecting to said source of plate potential, said cathode connecting to said cathode of said first electron tube, a voltage divider consisting of two resistors in series connecting said source of plate potential and ground, said grid of said second electron tube connecting to junction of said voltage dividing resistors, said voltage divider determining potential of said grid which determines potential of said cathode at which said second electron tube becomes conducting.

3. A blocking oscillator comprising, first and second electron tubes including cathode, grid and plate electrodes, means for coupling a voltage change at said first tube plate to said first tube grid to induce oscillation, a cathode bias system including said second tube for biasing said first tube, a capacitor shunting said bias system and charged by said oscillation to a potential biasing said tube to nonconduction, and means for applying a predetermined potential to said second tube grid to control said bias at a predetermined potential.

4. A blocking oscillator comprising, a first electron tube including a cathode, a grid and an anode, means for coupling a voltage change at said plate to said grid to induce oscillation, a single cathode bias resistor for biasing said tube, a capacitor shunting said bias resistor and charged by said oscillation to a potential biasing said tube to nonconduction, a second electron tube having its electron path connected to share said cathode bias resistor, and means biasing said second electron tube to become conducting at a predetermined potential of said cathode to control said first electron tube bias.

5. A blocking oscillator comprising, a first electron tube and having a cathode, a control grid and a plate, a source of plate potential, a transformer having a first winding joining said plate on said source and a second winding joining said grid and ground so connected as to couple a change in voltage at said plate to said grid in inverse relationship, a cathode bias system consisting of a parallel combination of a single resistor and a capacitor joining said cathode and ground, said capacitor being charged by the conduction of said first tube to bias said first tube to nonconduction and being discharged by said resistor to render said tube conductive, a second electron tube including cathode, grid and plate, said plate connected to said source of plate potential, said cathode connected directly to the cathode of said first electron tube, said second tube being driven to cutoff by the action of said first tube, and means for biasing said second electron tube to become conducting when said cathodes are at a predetermined potential to control the bias potential applied to said first electron tube.

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