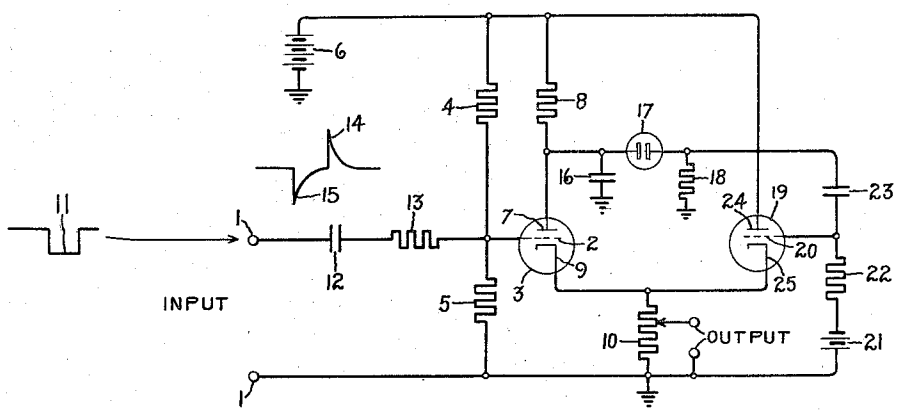
March 13, 1951 R. F. FOSTER 2,545,349

GENERATOR OF ACCURATELY TIMED PULSES

Filed Dec. 17, 1947



Inventor:
Raymond F. Foster,
by Merton D Morse
His Attorney.

Patented Mar. 13, 1951 2,545,349

UNITED STATES PATENT OFFICE

2,545,349

GENERATOR OF ACCURATELY TIMED PULSES

Raymond F. Foster, Stratford, Conn., assignor to General Electric Company, a corporation of New York

Application December 17, 1947, Serial No. 792,119

4 Claims. (Cl. 250—27)

1

This invention relates to signal generating systems and the like, and more particularly to such a system wherein a single accurately timed signal is developed in response to a control signal.

It is an object of this invention to provide an improved signal generating circuit, wherein the duration and amplitude of the generated signal is independent of the characteristics of the control signal.

It is a further object of this invention to provide an improved signal generating circuit which is insensitive to noise and other extraneous interfering signals that may be received with the control signal.

A further object of this invention is to provide an improved circuit of the above-mentioned type in which the generated signal is initiated in response solely to a control signal of predetermined characteristics.

Yet another object of this invention is to provide improved means in such a circuit whereby the generated signal is delayed a predetermined time with respect to the initiating signal.

Still a further object of this invention is to provide in a circuit of the above-mentioned type means to accomplish the above enumerated objects by means of a gaseous discharge device incorporated in the signal generating circuit, and without the need of additional electron discharge devices and associated components.

The features which are believed to be new are set forth with particularity in the appended claims. The invention itself, however, together with further objects and advantages thereof, may best be understood by reference to the accompanying drawing wherein the single figure shows a preferred embodiment of the signal generating system of my invention.

Referring now to the drawing, there is shown one form of signal generating circuit adapted to generate a pulse of predetermined time duration, the operation being initiated in response to a unidirectional control pulse supplied from suitable signal receiving apparatus, not shown.

The received control pulse is impressed across the input terminals of the present circuit indicated by 1. This circuit is designed so that a predetermined minimum value of control potential is necessary across its input to initiate the control sequence. The circuit is further designed to be responsive solely to signals of a predetermined duration, and shorter signals even though of greater magnitude, such as those produced by noise, have no effect on the operation of the circuit. The manner in which these features are realized will now be described.

2

The control signals impressed on terminals 1 are applied to the control electrode 2 of electron discharge device 3. The bias on control electrode 2 is such that device 3 is normally conducting. This bias is obtained by the potentiometer arrangement of resistor 4 and grid leak resistor 5 which are shunted across a unidirectional potential source 6, the common junction of resistors 4 and 5 being connected to control electrode 2. Anode 7 of device 3 is connected to this source 6 through a resistor 8, and the cathode 9 completes the circuit of device 3 to ground through impedance 10.

When a control pulse of waveform such as that shown at 11 is impressed across the terminals 1, this pulse is applied to control electrode 2 through a capacitor 12 and resistor 13. The pulse 11 is differentiated by capacitor 12 and resistors 13 and 5, producing a wave on the control electrode 2 having a form such as that represented at 14. The negative peak 15 of wave 14 biases device 3 to a point of anode current cutoff.

A capacitor 16 is connected in shunt with device 3, which, when conducting, provides a low impedance discharge path for the capacitor 16 and maintains the potential thereacross at a relatively low value. However, when device 3 is rendered nonconductive by a control pulse, the capacitor 16 immediately begins to charge. The charging circuit of capacitor 16 comprises source 6 and resistor 8, and the potential across this capacitor rises at a rate determined by the time constants of this circuit. A gaseous discharge device 17, for example a neon tube, and a resistor 18 are serially connected across capacitor 16. The device 17 remains nonconductive until the potential across the capacitor 16 rises to a predetermined threshold value. At this threshold value device 17 ionizes and becomes conductive causing a voltage pulse to be developed across resistor 18 as capacitor 16 discharges. The constants of the various circuit elements are such that the time required for capacitor 16 to charge to the ignition point of device 17 is somewhat less than the time interval during which device 3 is maintained nonconductive by the control signal.

It is apparent that unless a signal is received on terminals 1 which lasts more than a predetermined time interval, no potential is developed across resistor 18 as device 17 has not been rendered conductive. Therefore, a time delay is effectively introduced between the occurrence of a signal at terminals 1 and the appearance of a signal across resistor 18, and undesired transient signals lasting less than this predetermined minimum time interval have no effect on the opera-

tion of the pulse generating circuit, now to be described.

Device 19 is normally nonconductive, the control electrode 20 being biased beyond the cutoff point of this device by the unidirectional biasing source 21. The negative terminal of biasing source 21 is connected to control electrode 20 through resistor 22. Control electrode 20 is also coupled to device 17 through a capacitor 23, as shown. The anode 24 of device 19 is directly connected to the unidirectional source 6, and cathode 25 of this device is connected to ground through the common cathode impedance 10. The output of the pulse generating circuit may be taken across impedance 10 as shown.

In the absence of a control signal the device 3 is conductive. Upon receipt of a control signal of predetermined amplitude and duration control electrode 2 of device 3 is suddenly driven negative beyond the cutoff value of this device and conduction ceases. Capacitor 16 then commences to charge by means of energy received from source 6 through resistor 8. When the control signal has the correct characteristics, device 3 remains nonconductive for an interval sufficient for the charge on capacitor 16 to build up a potential across this capacitor of such a value as to render device 17 conductive. A potential then appears across resistor 18 the characteristics of this potential being independent of the control pulse characteristics, and being dependent only upon the values of resistors 8 and 18, capacitor 16 and potential source 6.

The potential appearing across resistor 18 is applied to the control electrode 20 of device 19 through capacitor 23 driving this control electrode positive and rendering device 19 suddenly conductive. The current through device 19 causes a rise in potential across cathode resistor 10 which further biases device 3 and this device is maintained in a nonconductive state.

The device 3 is maintained nonconductive and device 19 is maintained conductive as long as the potential on the control electrode 20 exceeds a certain value. This potential decreases at a predetermined rate as capacitor 23 charges through resistors 18, 22 and biasing source 21. As capacitor 23 charges, the control electrode 20 becomes less positive thereby reducing the current in device 19 and rendering the cathode 9 of device 3 similarly less positive. At the end of a predetermined time interval, the positive potential on cathode 9 is sufficiently reduced to allow the device 3 to draw a small current through resistor 8. The consequent decrease in the potential of anode 7 is transferred through device 17 and capacitor 23 to control electrode 20, which causes a further decrease in the current through the device 19. The effect is cumulative, and the device 3 is quickly returned to its normal conductive state. When device 3 is in its normal state, the potential impressed upon device 17 is not sufficient to exceed the discharge threshold of this device and this device also returns to its normal nonconductive state.

Output may be taken across impedance 10, and it can be seen that the potential developed across this impedance, in response to a control pulse of a predetermined duration, has a waveform which is essentially independent of the waveform of the control pulse, and is also delayed a desired time interval therefrom.

While a particular embodiment of this invention has been shown, it is obvious that modifications may be made, and the appended claims are intended to cover all such modifications as fall within the true scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A signal generating system adapted to be actuated by a control signal, comprising, a normally conductive electron discharge device and a second electron discharge device normally biased to a non-conductive state, each of said devices having an anode, a cathode and a control electrode, means responsive to said control signal for rendering said first-mentioned electron discharge device non-conductive for a predetermined time interval, means for rendering said second discharge device conductive at a predetermined point of said time interval, said last-mentioned means including a gaseous discharge device and capacitance means connected between the anode of said first-mentioned electron discharge device and the control electrode of said second electron discharge device, and means for returning said electron discharge devices to their normal state after a further predetermined time interval.

2. A signal translating system comprising a normally conductive electron discharge device having an anode circuit and a normally non-conductive electron discharge device having a control electrode circuit, signal control means for causing the anode potential of said first-mentioned device to increase for a predetermined time interval, means for rendering said second electrol discharge device conductive at a predetermined point of said time interval, said last-mentioned means including a gaseous discharge device and capacitance means coupled between said anode circuit and said control electrode circuit, and means for returning said electron discharge devices to their normal state after a further predetermined time interval.

3. In a signal generating system, a first and a second electron discharge device each having a grid circuit and an anode circuit, a cathode load impedance common to all said circuits, biasing means for rendering said first device normally conductive and said second device normally non-conductive, a separate anode load impedance in the anode circuit of said first device, means for impressing a control signal on the grid circuit of said first device so as to render said first device non-conductive for a predetermined time interval and thereby to increase the voltage on said anode load impedance, means for rendering said second device conductive at a predetermined point of time in said time interval, said last-mentioned means comprising a capacitance shunting the anode load impedance of said first device and a gaseous discharge device serially coupling said anode load impedance to the grid circuit of said second device, means responsive to the current in said common cathode impedance for returning said discharge devices to their normal states after a further predetermined time interval, and an output load circuit coupled to said common cathode impedance.

4. In combination, a first and a second electron discharge device, each of said devices having an anode, a cathode and a control electrode, common impedance means for coupling said cathodes to a point of reference potential, means for positively biasing the control electrode of said first discharge device to render this device normally conductive, means for negatively biasing the control electrode of said second discharge device to render this device normally non-conductive, control signal means for rendering said first device

non-conductive for a predetermined time interval, means for rendering said second device conductive at a predetermined point of said time interval, said last-mentioned means comprising a capacitance coupling the anode of said first device to a point of reference potential and a gaseous discharge device coupling said anode to the control electrode of said second discharge device, and means for returning said electron discharge devices to their normal state after a further predetermined time interval.

RAYMOND F. FOSTER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,266,154	Blumlein	Dec. 16, 1941
2,405,843	Moe	Aug. 13, 1946
2,446,850	Root	Aug. 10, 1948