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E. L. HUGHES ET AL

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PULSE-WIDTH DISCRIMINATOR CIRCUIT

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Fig. 1

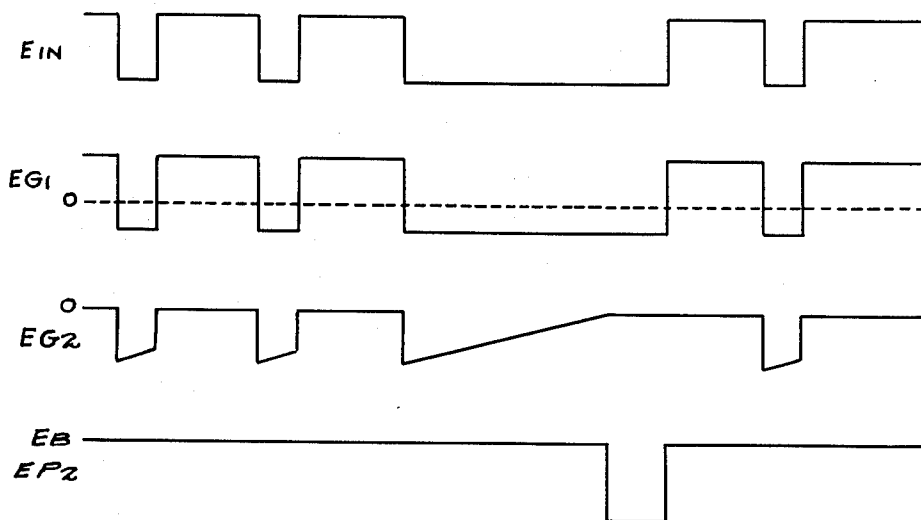
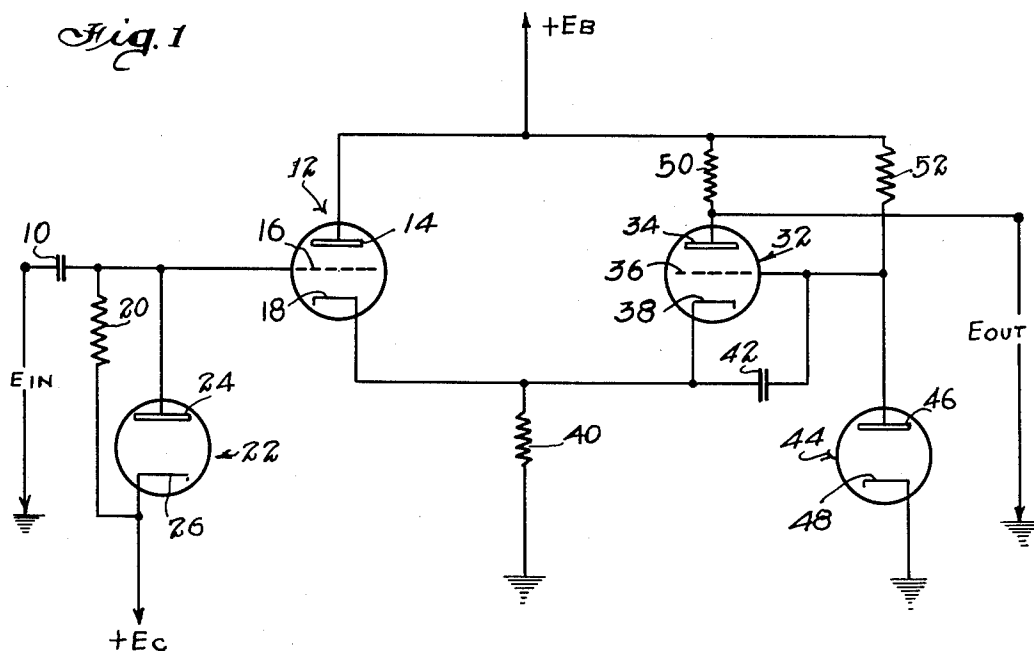


Fig. 2

EDWIN L. HUGHES
HAROLD B. ROSE
INVENTORS

BY *Lyon & Lyon*
ATTORNEYS

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PULSE-WIDTH DISCRIMINATOR CIRCUIT

Edwin L. Hughes, Sepulveda, Los Angeles, and Harold B. Rose, Los Angeles, Calif., assignors to International Telemeter Corporation, Los Angeles, Calif., a corporation of Delaware

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6 Claims. (Cl. 250-27)

This invention relates to electronic circuits used as pulse-width discriminators and, more particularly, to an improvement therein.

In decoding electrical signals of the type wherein the coding arrangement is in the form of pulses of different widths or time durations, a discriminator capable of providing an indication of having received pulses of different widths or time durations of pulses is required.

An object of this invention is to provide a novel pulse-width discriminator.

A further object of this invention is to provide a simple and useful electronic circuit capable of being employed as a pulse-width discriminator.

Still another object of the present invention is to provide an improved electronic pulse-width discriminator circuit.

These and other objects of the invention are achieved in an electronic circuit which includes a first and second tube. These are connected together with their cathodes to a common cathode load resistor. The second tube has an anode load resistor. A resistor is connected between B+ and the control grid of the second tube which is connected to ground through a diode. A condenser couples the common cathodes to the grid of the second tube. The first tube is biased to conduct when no signal is present. Such conduction maintains the second tube cut off by virtue of the common cathode coupling. Upon the application of a negative pulse to the first tube control grid, it is cut off. The negative pulse is transmitted through the coupling condenser between the cathodes and second tube control grid and maintains the second tube cut off. If the negative pulse being applied exceeds the interval required for the coupling condenser to lose its negative charge, an output pulse is obtained from the second tube when it goes conductive. If the input negative pulse is terminated before the coupling condenser loses its negative charge, no output is obtained from the second tube. The coupling condenser in the latter case is quickly discharged, so that the circuit may rapidly respond to a succeeding input signal. Thus, discrimination between pulses above and below a predetermined pulse width is provided.

The novel features that are considered characteristic of this invention are set forth with particularity in the appended claims. The invention itself, both as to its organization and method of operation, as well as additional objects and advantages thereof, will best be understood from the following description when read in connection with the accompanying drawings, in which:

Figure 1 is a circuit diagram of an embodiment of the invention; and

Figure 2 illustrates the wave shapes obtained with this invention.

Referring now to Figure 1, the input signal consists of negative-going pulses of different durations and these may be seen illustrated in Figure 2 and designated as E_{in} . These negative pulses are applied through a coupling condenser 10 to the control grid 16 of an electron

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discharge tube 12. The tube 12 also has an anode 14 which is directly connected to a source of B+ and a cathode 18. The tube 12 is maintained conductive in the absence of an input signal by voltage from a bias source designated as + E_c . This is applied to the control grid through a resistor 20. A diode 22 is connected across the resistor. Its anode 24 is connected to the control grid 16 and its cathode 26 is connected to the other side of the bias resistor. Thus the positive side of the grid waveform is clamped at the level + E_c . The voltage on the control grid is seen in Figure 2 and is designated as E_{g1} . The signal voltage is applied with an amplitude sufficient to insure that the first tube is cut off. A second tube 32 includes an anode 34, control grid 36, and cathode 38. The two cathodes 18, 38 are connected to a common cathode load resistor 40, which has its other end connected to ground. A condenser 42 is coupled between the common cathode connection and the control grid 36 of the second tube. Another diode 44 having an anode 46 and cathode 48 is connected between the second tube control grid and ground. An anode load 50 is connected between the anode 34 and B+. A second grid resistor 52 is connected between the control grid 36 and B+. The current flowing in the cathode of the first tube is sufficient to insure that the second tube is cut off by the voltage developed across the common cathode load.

Upon the application of the negative pulse to the first tube grid, which has a sufficient amplitude to cut off the first tube, the common cathode goes to ground potential. As a result, a negative pulse is applied to the second tube control grid via the coupling condenser 42. This pulse also maintains the second tube cut off. The signals which exist on the second tube control grid with the application of an input to the first tube control grid may be seen in Figure 2 and are designated as E_{g2} . As soon as a negative voltage exists across the coupling condenser 42, the diode 44, which normally serves to maintain the control grid of the second tube at ground potential is cut off. The coupling condenser begins to charge toward B+ through the resistor 52.

A certain predetermined time is required for the condenser to discharge, dependent upon the time constants of the components used in the system. Due to the condenser charging up toward B+ rather than toward ground potential, the waveform of the grid voltage is substantially linear over the discharge period. If the resistor 52 were returned to ground, the diode 44 would be eliminated but the voltage over the discharge portion would decay exponentially, which would result in a less sharply defined leading edge to the output pulse which is obtained from the anode of the second tube, as is described below. If the input pulse terminates before the condenser 42 has charged to ground, no output is derived from the anode of the second tube.

Upon the application of a negative pulse to the control grid of the first tube which has a sufficiently long duration to enable the condenser 42 to be charged, the second tube becomes conductive when the condenser has charged to ground, whereupon a negative output may be obtained from its anode, as shown in Figure 2 by the wave shape designated as E_{p2} . The voltage on the condenser reaches a value slightly above ground but is held clamped there by virtue of the conduction of the diode 44. This condition will obtain until the removal of the input pulse to the first tube control grid. At this time, the first tube will become conductive again and will cut off the second tube by reason of its common cathode connection. The positive pulse transmitted to the grid of the second tube through the capacitor at this time is quickly bypassed to ground through the diode connected

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to the grid. Thereby, the plate of the second tube goes positive again to its initial condition.

The gain of the circuit is set to a great extent by the ratio of the plate load resistor 50 to the common cathode load resistor 40. In order to keep the common cathode load resistor small and thereby maximize the gain of the system, the first tube can be one having larger current carrying capabilities than the second tube. It is also possible with this circuit to provide a unity gain device which provides an output pulse having the same polarity as the input pulse which has been sorted in accordance with time duration and which also has a fixed time delay before it starts. The circuit can respond very rapidly to succeeding pulses, since the condenser 42 is quickly discharged, after an input pulse is terminated, through the diode 44 and the cathode of tube 12.

Accordingly, there has been described and shown herein a novel and useful pulse-width discriminator.

We claim:

1. A pulse-width discriminator comprising a first and second electron discharge tube each having an anode, cathode, and control grid electrode, a common cathode impedance to which both said cathodes are connected, means to apply a bias to maintain said first tube conducting and said second tube cut off, a condenser connected between said cathodes and said second tube control grid, means to charge said condenser within a predetermined interval, means to apply a cut-off signal to said first tube control grid, and means to derive an output from said second tube when said cut-off signal is applied in excess of said predetermined interval.

2. A pulse-width discriminator as recited in claim 1 wherein said means to charge said condenser within a predetermined interval includes a source of operating potential for said first and second tubes, and a resistor connected between said control grid and said source of operating potential.

3. A pulse-width discriminator comprising a first and second electron discharge tube each having an anode, cathode, and control grid electrode, a common cathode load to which both said cathodes are connected, an anode load connected to said second tube anode, a source of operating potential connected between said anode load and said cathode load, a condenser connected between said cathodes and said second tube control grid, a resistor connected between said second tube control grid and said source of operating potential, means to apply a bias to maintain said first tube conducting and said second tube nonconducting, means to apply a sig-

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nal to said first tube to render it nonconducting, and means to derive an output from said second tube when the duration of the signal applied by said means exceeds the time required for said condenser to be charged through said resistor.

4. A pulse-width discriminator comprising a first and a second electron discharge tube each having anode, cathode, and control grid electrodes, a common cathode bias resistor, means connecting both said cathodes to one end of said common cathode bias resistor, a condenser connected between both said cathodes and said second tube control grid, an anode load resistor having one end connected to said second tube anode, means connecting said first tube anode to the other end of said anode load resistor, a bias resistor connected between said other end of said anode load resistor and said second tube control grid, a diode connected between said second tube control grid and the other end of said common cathode resistor, means to apply a bias to said first tube to render it conductive and said second tube cut off, means to apply input signals to said first tube control grid, and means to derive an output from said second tube anode.

5. A pulse-width discriminator comprising a first and a second electron discharge tube each having anode, cathode, and control grid electrodes, a common cathode bias resistor, means connecting both said cathodes to one end of said bias resistor, a condenser connected between both said cathodes and said second tube control grid, an anode load resistor connected between the anodes of said first and second tubes, a first bias resistor connected between said first tube anode and said second tube grid, a first diode connected between said second tube grid and the other end of said common cathode resistor, means to apply operating potential between said first tube anode and said other end of said common cathode resistor, a second bias resistor connected to said first tube grid, a second diode connected across said bias resistor, means to apply a bias through said bias resistor to said first tube to render it conductive and said second tube cut off, means to apply input signals to said first tube, and means to derive an output from said second tube anode.

6. A pulse-width discriminator as recited in claim 5 wherein said first and second diodes each have an anode and cathode, the anodes of first and second diodes being respectively connected to the control grids of said first and second tubes.

No references cited.