Feb. 12, 1952 C. L. LONGMIRE 2,585,803

PULSE WIDTH DISCRIMINATOR CIRCUIT

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FIG. 1

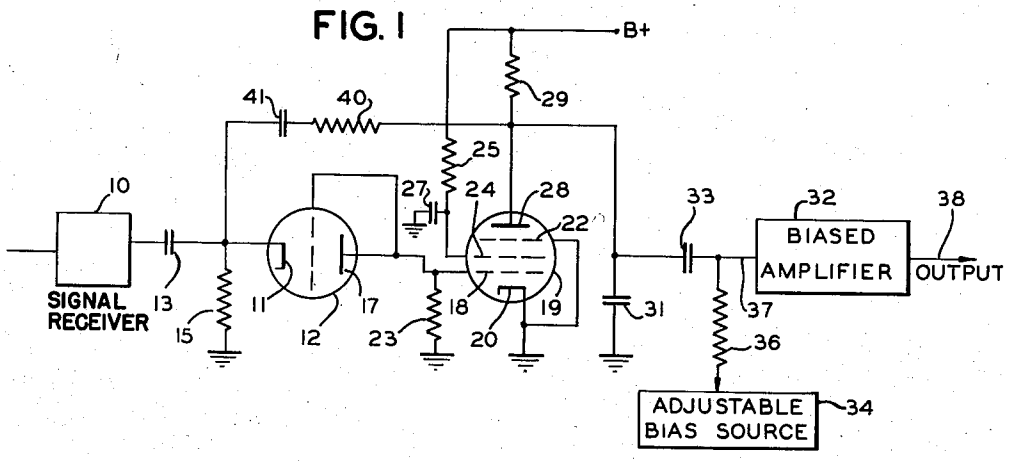
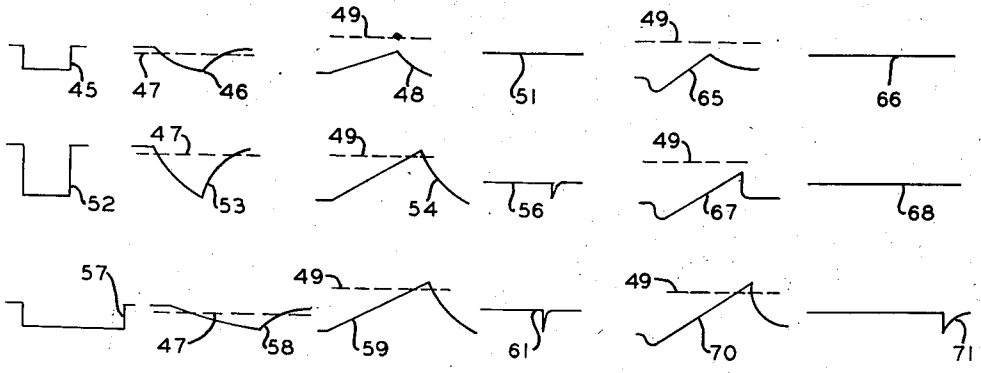


FIG. 2



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PULSE WIDTH DISCRIMINATOR CIRCUIT

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5 Claims. (Cl. 250—27)

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This invention relates to communication system and more particularly to circuits adapted to operate in response to signals of predetermined time duration and varying amplitude.

Communication systems have been devised in which it is possible to discriminate between signals of varying time duration. However, in operating these systems it has been found that the quality of discrimination is impaired where the amplitude of the signals fed to the discriminator circuits of the systems varies materially. The varying amplitude of the signals fed to these discriminator circuits may be due to various reasons. For example, they may be due to the varying distance of the transmitters from the receivers in the systems, or the varying power used at the various transmitters.

One of the objects of the present invention, therefore, is to provide pulse discrimination systems which will result in improved discrimination against signals of predetermined time duration and varying amplitude.

In accordance with the present invention there is provided a novel circuit which includes a source for supplying signals which may vary in time duration and also in amplitude. The source signals are fed to a sawtooth generating means which produces signals of an amplitude substantially proportional to the time duration of the source signals. Means are also provided for passing signals of predetermined amplitude from the sawtooth generating means.

For a better understanding of the invention, together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawings.

In the accompanying drawings:

Fig. 1 is a schematic diagram of a discriminator circuit employing the present invention; and

Fig. 2 illustrates signals of varying time duration and varying amplitude and their different wave forms in various stages of the circuit shown in Fig. 1.

Referring now more particularly to Fig. 1 of the drawings, there is shown schematically one form of a discriminator circuit embodying the present invention. This particular circuit includes a source of signals, for example a receiver 10, which provides signals that may vary in amplitude and time duration.

Receiver 10 is connected to a cathode 11 of an electron tube 12 through a capacitor 13. The electron tube 12 may be a triode connected as a diode as shown, or it may be any suitable diode

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tube. The cathode 11 is connected to ground through a resistor 15. Plate 17 of the electron tube 12 is connected to a control grid 18 of an electron tube 19. Electron tube 19 may be a pentode as shown, or it may be any other suitable electron tube having a control grid. Cathode 20 of tube 19 is connected to ground, and suppressor grid 22 is connected to the cathode 20. The control grid 18 is connected to ground through a resistor 23. A screen grid 24 of the electron tube 19 is connected to a suitable B+ voltage source through a resistor 25. The screen grid 24 is bypassed to ground through a capacity 27. Anode 28 of the tube 19 is connected to a suitable B+ voltage source through a resistor 29. The anode 28 is also connected to ground through capacitor 31. The anode 28 of tube 19 is connected to biased amplifier 32 by means of a capacitor 33. An adjustable bias source 34 is connected by an isolating resistor 36 to the input 37 of the amplifier 32. An output may be obtained from the amplifier 32 at point 38. Amplitude-compensating means, comprising resistor 40 and capacitor 41, are connected from cathode 11 of tube 12 to anode 28 of tube 19.

Referring now to Fig. 2, there is shown a series of wave forms that may appear at various stages of the circuit illustrated in Fig. 1. These wave forms will be referred to in the description of the operation of the circuit of Fig. 1.

In the operation of the circuit of Fig. 1 it will be assumed that the compensating means 40 and 41 are omitted. Signal 45 (Fig. 2), in this example a one microsecond pulse, is applied to the receiver 10. Wave form 46 (Fig. 2) shows the wave form of the pulse output of the receiver 10. The wave form 46 is an integration of signal 45. The voltage represented by wave form 46 is applied through tube 12 to the control grid 18 of tube 19. The dotted line 47 indicates the potential necessary to cause plate current cutoff in tube 19. Wave form 48 (Fig. 2) represents the voltage produced at anode 28 of the tube 19 when the voltage represented by wave form 46 is applied to grid 18. Wave form 48 is applied to the input 37 of amplifier 32. A dotted line 49 represents the minimum potential necessary at input 37 to produce an output at point 38. The level of the dotted line 49 is set by the bias source 34. Wave form 51 indicates that the output at point 38 is zero when wave form 48 is applied to input 37.

If now, still assuming that compensating means 40 and 41 are omitted, a signal illustrated by wave form 52 (Fig. 2), also of one microsecond

time duration but having a substantially greater amplitude, is applied to receiver 10, the output of receiver 10 will be as illustrated by wave form 53 which is an integration of signal 52. It will be noted that the time during which the wave form 53 lies below the line 47 is greater than the time wave form 46 was below the line 47. This will cause the tube 19 to be cut off for a greater length of time, and the voltage at anode 28, therefore, will rise to a greater amplitude. This is illustrated by wave form 54 (Fig. 2). In this example it has been assumed that wave form 54 rises above line 49, and, therefore, the amplifier 32 has an output as illustrated by wave form 56. Since this circuit is a pulse width discriminator, no output should have been obtained at point 38 when wave form 52 was applied to receiver 10.

If now, still assuming that compensating means 40 and 41 are omitted, a signal illustrated by wave form 57, for example a two-microsecond pulse of the same amplitude as wave form 45, is applied to receiver 10, the output of receiver 10 will be as shown by wave form 58 which is an integration of wave form 57. It will be noted that wave form 58 lies below line 47 for a longer time than either wave form 53 or 46. The voltage at anode 28 will, therefore, continue to rise as illustrated by wave form 59 to a point somewhat above the line 49. This will cause an output at point 38 as illustrated by wave form 61. It was desired to have the two-microsecond pulse produce an output at point 38.

However, with the compensating means 40 and 41 as an integral part of the circuits, the output at point 38 caused by wave form 52 will be eliminated without substantially affecting the output caused by wave form 57. Thus, when wave form 45 is now applied to receiver 10, the voltage at anode 28 will be as illustrated by wave form 65. The initial drop in the wave form 65 is caused by the effect of wave form 46 being applied to anode 28 through the compensating means 40 and 41. Since wave form 65 lies entirely below line 49, the output at point 38 will be zero as illustrated by wave form 66. It will be seen that a similar drop in potential will occur at anode 28 when wave form 52 is applied to receiver 10. The circuit is so designed that the drop in potential is sufficient to overcome the additional rise that was described in connecttion with wave form 54. This condition is illustrated by wave form 67. It will be noted that wave form 67 lies entirely below line 49; therefore, the output at point 38 as illustrated by wave form 68 is zero. This is the desired condition. The drop in potential at anode 28 will still be present if wave form 57 is applied to receiver 10, but due to the fact that anode 28 rises in potential for a much greater period of time than was the case in either wave form 67 or 65, the potential at the input of amplifier 32 rises above the value necessary to give an output at point 38. Wave form 70 illustrates this fact in that the input 37 of amplifier 32 rises above the critical potential illustrated by line 49. The output of amplifier 32 is shown by wave form 71. It will be noted that compensating means 40 and 41 avoided the output which would otherwise have been caused by the narrow pulse of high amplitude 52 but did not substantially affect the output caused by the wide pulse 57.

The constants of the compensating means 40 and 41 may be so selected that the initial drop in potential at anode 28 approximately compensates for the additional rise in potential at anode 28 caused by distortion of the input signal by the receiver 10. If the constants are so selected, the output of the circuit will be substantially independent of the amplitude of the input pulse, and will depend substantially upon the time duration of the pulse and the setting of the bias source 34.

While there has been described what is at present considered the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention.

What is claimed is:

1. A translating circuit for signals of varying time duration and varying amplitude, comprising a normally conducting vacuum tube having at least cathode, anode and control grid electrodes, a condenser connected between said anode and cathode, a source of potential, a resistor connecting said source of potential to said anode, means to impress a first portion of said signals upon said control grid to render said vacuum tube nonconducting and to charge said condenser through said resistor, whereby sawtooth waves are generated substantially coincident with said source signals, a second resistor and a second condenser in series combination, said series combination being coupled to a second portion of said source signals, means connected to said anode and to said series combination of said second resistor and said second condenser for combining said sawtooth waves and said source signals in phase opposition to produce resultant signals, and means for producing a signal when said resultant signals exceed a predetermined level.

2. The method of distinguishing pulse signals having greater than a predetermined duration from pulse signals having less than said duration and varying amplitudes comprising deriving from each pulse signal a sawtooth voltage signal substantially in coincidence therewith and having an amplitude varying directly with said signal duration, combining each pulse signal with the sawtooth voltage signal derived therefrom in opposition to derive resultant signals, and detecting resultant signals which are greater than a predetermined amplitude, whereby only pulses of longer than a given duration are distinguished.

3. A pulse width discriminator circuit comprising means for deriving integrated pulses from input square wave pulses of varying amplitudes and durations, a sawtooth generator coupled to said means and responsive to said integrated pulses for deriving from each of said integrated pulses a single sawtooth signal of substantially the same duration as said integrated pulse and substantially coincident with said integrated pulse whose amplitude is a function of the duration of said integrated pulse, a resistive-capacitive network connected to the first mentioned means, means coupled to said network and to said generator for combining each integrated pulse in opposition with the sawtooth signal derived therefrom, and means coupled to said last means for producing a signal when the output thereof exceeds a predetermined voltage.

4. A pulse width discriminator circuit comprising means for integrating input square wave pulses of varying amplitudes and durations, a normally inoperative sawtooth voltage generator coupled to said means and responsive to said integrated pulses for deriving from each of said integrated pulses a single sawtooth signal of substantially the same duration as said integrated pulse and substantially coincident with said in-

tegrated pulse whose amplitude is a function of the duration of said integrated pulse, amplitude compensating means coupled to the first mentioned means and to the output of said generator for combining each integrated pulse with the sawtooth signal derived therefrom in opposition, and means coupled to said last means for producing a signal when the output thereof exceeds a predetermined voltage.

5. A pulse width discriminator circuit comprising means for deriving integrated pulses from input square wave pulses of varying amplitudes and durations, means for deriving from each integrated pulse a single substantially linear sawtooth pulse having an amplitude that is proportional to the duration of said integrated pulse, means for combining at least a portion of each integrated pulse with the sawtooth pulse derived therefrom in opposition to produce a resultant pulse, and means for producing a signal when said resultant pulse exceeds a predetermined amplitude.

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