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CIRCUIT ARRANGEMENT FOR SEPARATING ELECTRIC PULSES

Filed May 17, 1939

2 Sheets-Sheet 1

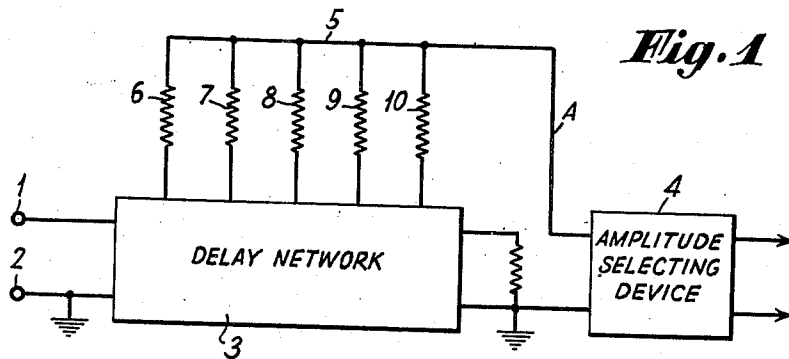


Fig. 2

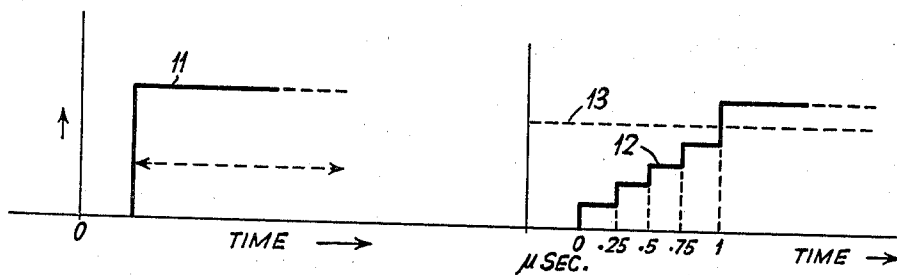
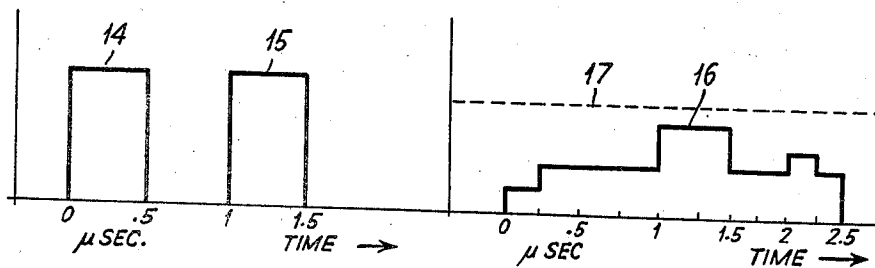


Fig. 3



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Fig. 4

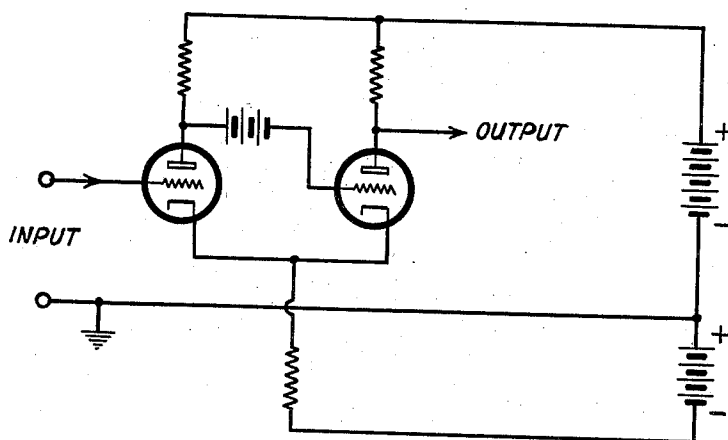
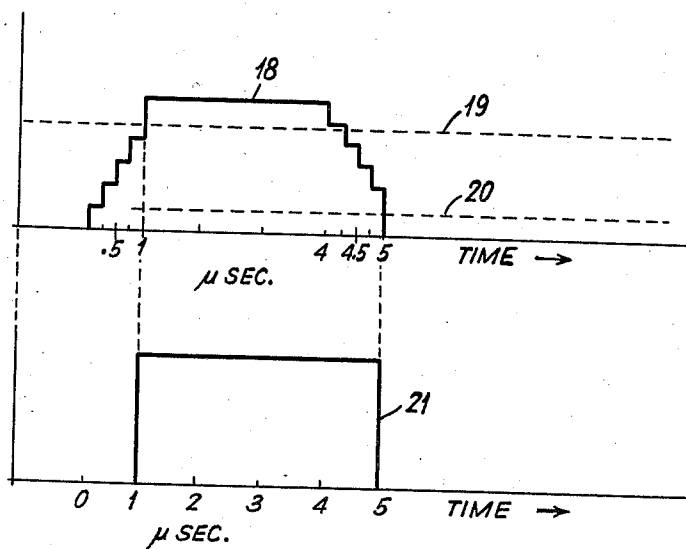


Fig. 5



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UNITED STATES PATENT OFFICE

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CIRCUIT ARRANGEMENT FOR SEPARATING
ELECTRIC PULSES

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3 Claims. (Cl. 178—44)

This invention relates to circuit arrangements for separating electric signal pulses and is concerned more particularly with the suppression of interference in signal circuits.

In shortwave signal systems such as television systems interference of the type most commonly experienced, is spark interference from the ignition systems of motor cars for example, and this interference takes the form of narrow pulses the width of which is approximately equal to twice the reciprocal of the passband of the receiver or other network through which the spark interference has passed. Thus in the case of a high definition television receiver the width of an interfering pulse is of the order of one half micro-second.

According to the present invention a circuit arrangement for separating electric pulses contained in a mixture of pulses of long and short duration, in which the shorter pulses may be constituted by undesired interference pulses, includes a delay network to which the mixture of pulses is applied, the delay in the network being greater than the duration of the narrow pulses but less than that of pulses of a given longer duration, and an amplitude selecting device which provides an output only when the pulses are present simultaneously at the input and the output of said delay network. A modified circuit arrangement according to the invention, includes a control device having two positions of equilibrium and which is controlled by input signals applied to it from two or more points along a delay network, said device being switched into one position when a pulse is present simultaneously at at least two positions on the delay network and switched into its second position when a pulse is absent simultaneously from at least two positions on the delay network. The input to the controlled device may be derived from a plurality of points along the delay network, this input constituting the sum of the signals derived from these points, the arrangement being such that a signal of greater amplitude is derived from the final point on the delay network than from any one of the preceding points on the delay network.

In order that the invention may be more clearly understood and readily carried into effect, a form of interference suppressing arrangement embodying the invention will now be described by way of example in greater detail with reference to the accompanying drawings in which:

Figure 1 shows such a system diagrammatically.

Figures 2, 3 and 5 are explanatory diagrams and

Figure 4 is one form of amplitude selecting device.

Referring to Figure 1 of the drawings, signals containing pulses to be suppressed are applied to the terminals 1, 2 of a delay network 3, the total delay in which is of the order of 1 micro-second. In this arrangement an amplitude selecting device 4 is arranged to operate not on the sum or mean value of the potentials present at the beginning and end of the delay only but on the mean value of potentials present at several points along the delay network. These potentials may be combined by a resistance network 5 including resistances 6, 7, 8, 9 and 10 which may be of different values in order to produce different outputs from the various points in the delay network for a pulse of given amplitude. It is desirable that the output from the final point in the delay network, on the application of which the amplitude selecting device is required to operate, provided that outputs are still supplied from all the other points in the delay network, should be at least as great as any of the other outputs. In Figure 2, 11 represents a pulse lasting at least one micro-second and assuming such a pulse is applied to the terminals 1 and 2 in Figure 1, the potential waveform at the point A in Figure 1 will appear as shown at 12 in Figure 2, the output obtained from the resistance 10 having, in this example, twice the effect of the outputs from the preceding resistances. The operating potential 11 of the amplitude selector is represented in Figure 2 by the dotted line 13. It is assumed that the delay produced between the tapped points in the delay network are each equal to 0.25 micro-second.

Referring to Figure 3, 14 and 15 represent two interfering pulses each lasting one half of a micro-second and spaced apart by a half micro-second. The output from the delay network in Figure 1 assuming the pulses 14 and 15 are applied to the terminals 1 and 2 is represented by the waveform 16 in Figure 3. The operating level of the amplitude selecting device is represented by the dotted line 17 and it will be seen that the incidence of the second interfering pulse 15 is not sufficient to cause the output of the delay network to reach the operating level of the amplitude selecting device.

Figure 4 shows a form of amplitude selecting device suitable for use in connection with the present invention, this device constituting a regenerative amplifier which operates as described in British Patent No. 373,309. The arrangement shown in Figure 4 has the advantage that it pro-

vides a ready adjustment of the conditions at which operation will be effected by the applied potentials in the two directions. By setting these operating potentials at equal differences from the upper and lower limits of the incoming pulses, the selector may be made to work in the same manner for the termination of a pulse as for its arrival. Thus the width of the regenerated pulse is equal to the incident pulse, although delayed by one micro-second. This effect is illustrated by the waveforms shown in Figure 10. The waveform 18 represents the output at the point A in Figure 1 due to a signal pulse lasting 4 micro-seconds. The operating level of the amplitude selector for increasing potentials is represented by the dotted line 19. The operating level for decreasing potentials is represented by the line 20, the distance between the lines 19 and 20 representing an adjustable "back-lash" of the selecting device. The waveform 21 represents the output from the amplitude selector due to an input pulse 4 micro-seconds long when the amplitude selector is of the form shown in Figure 4.

In order to obtain the greatest possible freedom from interference the delay in the network 3 should be made nearly equal to the width of the shortest signal pulses. Thus, in the case of the present British Broadcasting Company standard television synchronising pulses the delay should be less than 10 micro-seconds but a delay of this order may give rise to difficulties when signals in another channel, for example television picture signals, have to be delayed by the same amount in order to keep them in phase. This particular difficulty does not arise when the invention is applied to systems for repeating telegraph code signals.

I claim:

1. A circuit arrangement for separating electric pulses contained in a mixture of pulses of long and short duration in which the shorter pulses may be constituted by undesired interference pulses, comprising in combination a delay network, means for applying said mixture of pulses to said delay network, the delay in said network being greater than the duration of the short pulses, but less than that of pulses of a given longer duration, an amplitude selecting device, and means for connecting the amplitude

selecting device to the delay network whereby an output can be obtained from the amplitude selecting device only when pulses are present simultaneously at the input and the output of said delay network.

2. A circuit arrangement for separating electric pulses contained in a mixture of pulses of long and short duration in which the shorter pulses may be constituted by undesired interference pulses, comprising in combination, a controlled device having two positions of equilibrium, control means for said device comprising a delay network, the delay in said network being greater than the short undesired pulses, means for selecting input signals from two or more points along said delay network, means for applying said input signals to said controlled device, said controlled device being switched into one position when a pulse is present simultaneously at at least two points along said delay network, and switched into its second position when a pulse is absent simultaneously from at least two points along said delay network.

3. A circuit arrangement for separating electric pulses contained in a mixture of pulses of long and short duration in which the shorter pulses may be constituted by undesired interference pulses, comprising in combination an electronic device having two conditions of operation, control means for said device comprising a delay network, the delay in said network being greater than the short undesired pulses, means for selecting input signals from two or more points along said delay network, means for applying said input signals to said device, said device being switched into one condition of operation when a pulse is present simultaneously at at least two points along said delay network, and switched into its second condition of operation when a pulse is absent simultaneously from at least two points along said delay network, the input to the device as derived from points along the delay network constituting the sum of the signals derived from these points, the arrangement being such that a signal of greater amplitude is derived from the final point of the delay network than from any one of the preceding points of the delay network.

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