Oct. 15, 1940. C. L. FAUDELL ET AL 2,218,067

TELEVISION SYSTEM

Filed Feb. 4, 1939

Fig. 1

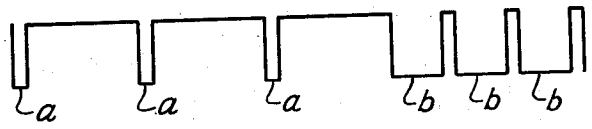


Fig. 2

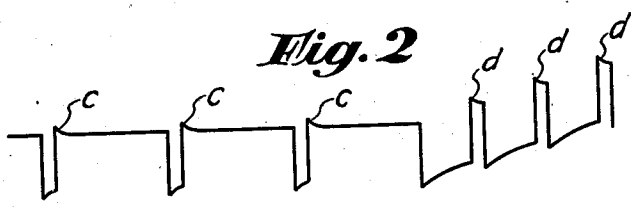


Fig. 4



Fig. 3

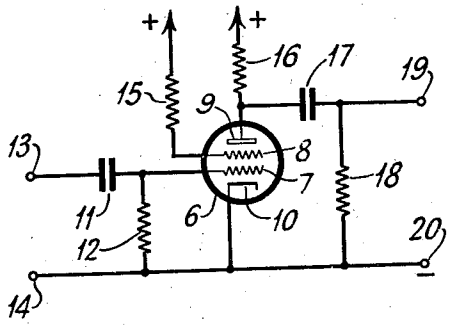
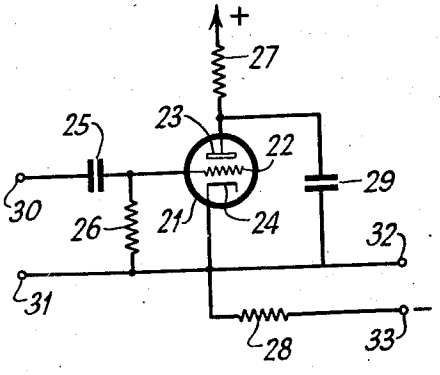


Fig. 5



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Patented Oct. 15, 1940

2,218,067

UNITED STATES PATENT OFFICE

2,218,067

TELEVISION SYSTEM

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Application February 4, 1939, Serial No. 254,574
In Great Britain February 4, 1938

7 Claims. (Cl. 178—69.5)

The present invention relates to systems for converting impulses and has particular but not exclusive reference to television systems where it is desired to separate pulses of the same amplitude but of different duration.

In certain known television systems synchronisation is effected by using synchronising pulses which are transmitted in the opposite sense to the picture signals, so that the synchronising pulses can be separated from the picture signals by amplitude selection. In such systems it is usual to make the frame synchronising pulses of longer duration than the line synchronising pulses but of substantially the same amplitude and various methods have been proposed for the separation of the frame and line pulses.

Since the frequency of the frame synchronising pulses is much lower than the frequency of the line synchronising pulses it has been proposed to separate the line pulses from the frame pulses by passing the pulses through a low pass filter, the resulting pulses being applied either to an amplitude filter or directly to a sawtooth oscillation generator, such, for example, as a blocking oscillator which requires a pulse of greater than a critical amplitude to trigger it.

The disadvantages of such a method have been discussed in British patent specification No. 455,375 and an alternative method of pulse separation was suggested therein, whereby the pulses were applied to an integrating device which resolved pulses of differing duration into pulses of differing amplitudes, which pulses were subsequently passed to the sawtooth oscillation generator.

It is the object of the present invention to provide an improved method and apparatus which facilitates the separating of a set of impulses from another set of impulses of a different duration.

According to the present invention a method is provided of converting impulses of substantially the same amplitude but of different durations into impulses of different amplitudes which method comprises applying the impulses of the same amplitude to a converting circuit from which derived impulses are obtained, said converting circuit serving to convert the applied impulses into two portions, the first portions being of the same sign as the applied impulses and the second portion being of the opposite sign to the applied impulses, the applied impulses of shorter duration producing impulses of small amplitude in the second portion and the applied impulses of longer duration producing impulses of relatively larger amplitude in the second portion.

According to a further feature of the invention, the derived impulses are applied in such a way to the applied impulses that the first portion of the derived impulses is effectively cancelled.

The present invention also comprises the additional step of separating the converted pulses by amplitude selection.

Where the method according to the invention is employed in a television receiving system, the converted pulses may be applied to a generator of frame scanning oscillations which is so arranged as to be affected substantially only by the impulses of relatively larger amplitude.

Whereas in the prior specification No. 455,375 separation is affected by an integration process, it will be apparent that the converting circuit employed in the present invention functions in a manner which is analogous to differentiation.

The invention also comprises an apparatus for carrying out the methods set forth above.

In order that the said invention may be clearly understood and readily carried into effect, it will now be more fully described with reference to the accompanying drawing, in which:—

Figures 1, 2 and 4 are explanatory diagrams, and

Figures 3 and 5 are circuit arrangements for carrying out the methods according to the invention.

Referring to Figure 1 which shows a portion of the wave-form of the synchronising pulses of a well-known system of television, the pulses marked *a* are the line synchronising pulses and those marked *b* are the frame synchronising pulses. It will be appreciated that the picture signals (not shown) will be superimposed on the waveform in the opposite sense to the direction of the synchronising impulses. In this system the duration of a pulse *b* is four times as long as the duration of a pulse *a*, the amplitudes being the same.

Referring to Figure 3, which shows a circuit arrangement in which the invention may be incorporated, 6 is a screen grid valve, which is used for the purpose of separating the picture signals from the synchronising pulses. The composite television signal comprising the picture signals and synchronising pulses is applied to the grid 7 of the valve 6 through a condenser 11, the grid 7 being connected to the cathode 10 by means of a grid leak 12, and the synchronising pulses being applied in the positive sense. The

screen grid 8 of the valve is connected to a positive source of potential through resistance 15, whilst the anode is also connected through a resistance 16 to a source of positive potential. As is well known synchronising pulses in the negative sense and free from picture signals are obtainable from the screen grid 8 and the anode 9 of the valve due to the self-biasing action of the grid circuit, the waveform being of the form shown in Figure 1. If necessary the potentials at the screen grid 8 may be conveyed to the line scanning oscillator for the purpose of synchronising it.

To the anode 9 is connected a condenser 17 and a resistance 18 in series, the end of resistance 18 being connected to the negative source of potential 20. By a suitable choice of the time constant of the converting circuit comprising the resistance and condenser it is possible partly to differentiate the pulses obtained on the anode 9 thus obtaining pulses at the junction 19 of the resistance 18 and condenser 17, which pulses are of different amplitudes and are in a positive sense and are superimposed on the pulses in the negative sense. The positive pulses obtained across the resistance 18 thus comrpise small pulses due to the line pulses and larger pulses due to the frame pulses, the waveform being similar to that shown in Figure 2.

It will be seen from Figure 2 that at the end of a line pulse a pulse *c* of small amplitude is produced in the opposite sense to the line pulse, whilst at the end of a frame pulse a pulse *d* of greater amplitude than pulse *c* is also produced in the opposite sense to the frame pulse. It is possible to separate these pulses *c* and *d* by amplitude separation or it is possible to apply the differentiated waveform directly to the synchronising electrode of the sawtooth oscillation generator. The time constant of the differentiating circuit should be of the order of or greater than the duration of a line pulse and less than the duration of a frame pulse. Although in Figure 3 a particular type of amplitude separator is described, it will be obvious that any other method of separation of picture signals from synchronising pulses is applicable. It is also to be understood that an inductance may be used for the purpose of differentiating, or other means may be provided for the purpose of reducing the lower frequency components of the synchronising pulses.

A further feature of the invention consists in mixing the original synchronising pulse waveform as in Figure 1 in opposite phase with the differentiated waveform of Figure 2. By this means a waveform of the type shown in Figure 4 is obtained. It will be seen that the line synchronising pulses produce very small pulses as shown at *c*, whilst the frame synchronising pulses produce much larger pulses *f*. These large pulses may be used directly to control the frame scanning generator or they may be separated from the small pulses by amplitude separation before utilization. If desired the frame frequency generator may be triggered during the occurrence of any of the pulses of larger duration. For example it may be arranged that the frame frequency generator is triggered before a half-line period has elapsed from the beginning of a frame pulse.

A circuit arrangement in which the further feature of the invention may be incorporated is shown in Figure 5. In Figure 5 the valve 21 is used for the purpose of separating the synchronising pulses from the picture signals. This circuit also employs the self-biasing method of separation, the grid condenser 25 being connected to the input terminal 30 and the other input terminal 31 being connected to the cathode 24 of the valve 21 and to the grid leak resistance 26. Between the cathode 24 and a negative source of potential 33 is connected a resistance 28. The anode 23 of the valve is connected through resistance 27 to a positive source of potential and a condenser 29 is connected between the anode 23 and the cathode 24 and terminal 32. The output is taken from terminals 32 and 33.

In operation, composite television signals are applied between terminals 30 and 31 with the synchronising pulses in a positive sense. Due to the limiting action of the grid circuit the cathode of the valve tends to follow the synchronising pulses. Simultaneously, however, the differentiated pulses passed through condenser 29 tend to oppose the cathode variation with the result that pulses of the waveform shown in Figure 4 appear across the output terminals 32 and 33, and these may be applied directly to the frame scanning generator or to an amplitude separator or other device. Of course, systems of picture signal separation other than that shown are equally applicable to this method of pulse selection.

Alternative methods of mixing the original and differentiated pulses are possible. For example, a signal as shown in Figure 1, may be applied to one control grid of a hexode valve and a differentiated signal, as in Figure 2, may be applied in the opposite sense to the other control grid of the hexode, the output being taken from the anode circuit. In this case a triode-hexode type of valve can be conveniently used, the triode section forming the picture signal separator. Also circuits using two triodes, for example, may be employed for the purpose of additively mixing the two types of waveform.

The invention is not limited to the use of a condenser and a resistance as the converting device; since different elements can be used for this purpose; for example, the condenser can be replaced by an inductance of such a value as to function as a storage device.

We claim:

1. An apparatus for converting impulses of substantially the same amplitude but of differing duration into impulses of differing amplitudes comprising a thermionic vacuum tube having anode, cathode and at least one control electrode, a time constant circuit connected in the control electrode-cathode circuit of said tube, means for impressing said impulses of substantially the same amplitude but differing duration onto said time constant circuit, a circuit for producing a wave form of a differential of the wave form applied to the time constant circuit connected in the anode-cathode circuit of said tube, and terminal means for taking from a portion of said differentiating circuit impulses of differing amplitudes.

2. Apparatus in accordance with claim 1 wherein said differentiating circuit comprises a condenser and a resistive member serially connected, and the terminals for withdrawing the impulses of differing amplitudes are connected across said resistance element.

3. Apparatus in accordance with claim 1 wherein said thermionic tube comprises a multigrid tube.

4. Apparatus for converting impulses of substantially the same amplitude but of differing

durations into impulses of differing amplitudes comprising a thermionic vacuum tube having anode, cathode and at least one control electrode, a time constant circuit connected in the control electrode-cathode circuit of said tube, means for impressing said impulses of differing duration onto said time constant circuit, a circuit for producing a wave form bearing a differential relationship to the wave form applied to the time constant circuit, said latter circuit being connected in the anode-cathode circuit of said thermionic tube, means for combining the impulses impressed on the control electrode of said tube with the differential wave form developed, and terminal means for withdrawing the wave form resulting from the combining of the differential wave form with the original impulse wave form.

5. The method of converting electrical impulses having substantially the same amplitude but differing durations into impulses having differing amplitudes which comprises the steps of developing a wave form bearing a differential relationship to the original impulses, said wave form having a portion thereof corresponding to the original wave form and a second portion thereof differing from the original wave form, and combining said developed wave form with said original wave form in such a manner that the similar portions of each of the wave forms is cancelled out.

6. Apparatus for converting electrical impulses having substantially the same amplitude but of differing duration into impulses having differing amplitudes comprising a thermionic vacuum tube having anode, cathode and at least one control electrode, means for impressing said impulses to be converted onto the control electrode-cathode circuit of said tube, means for energizing the anode of said tube, resistance means connected serially with said anode energizing means and with said anode, a condenser substantially shunted across the anode and at least one side of the cathode of said tube, a second resistance means connected serially with the negative side of said anode energizing means and the cathode of said tube, and terminal means for withdrawing the wave form developed across said second resistive means.

7. Apparatus in accordance with claim 6 wherein there is provided in addition, a time constant circuit connected in the control electrode-cathode circuit of said tube.

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