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SYNCHRONIZING SYSTEM

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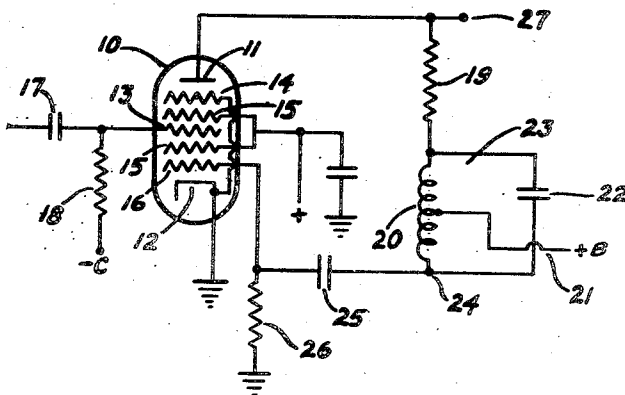


FIG. 1.



FIG. 2a.

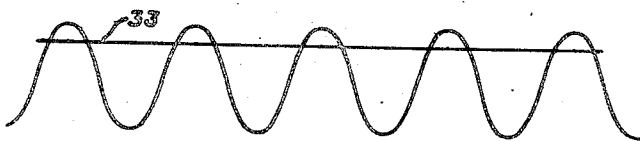


FIG. 2b.

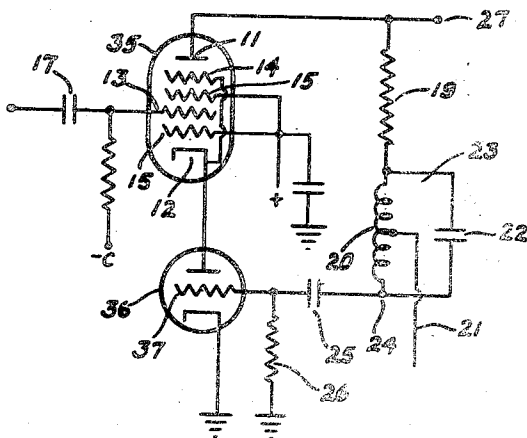


FIG. 3.

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SYNCHRONIZING SYSTEM

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1

This invention has to do with means for preventing transient electrical disturbances from interfering with the proper operation of certain signal leveling networks. It is applicable more especially to synchronizing signal pick-off systems employed in television receivers.

A received television signal may be of sufficient strength to enable the automatic volume control to fully function, in which event the average amplitude of the composite video signal derived from the receiver's second detector will lie within a certain predetermined narrow range. On the other hand, the received signal may be so weak that the automatic volume control is unable to maintain the aforementioned composite video signal at the desired level—which is to say, within the aforesaid narrow range. For that reason it is necessary to provide the synchronizing signal pick-off system with a signal leveling network which enables it to pick off the synchronizing pulses irrespective of whether the incoming signal is strong or weak.

The function of the signal leveling network is to provide bias for the input grid of the pick-off tube, which bias automatically varies in magnitude commensurately with the strength of the impressed composite video signal. Since said bias is produced by the composite video signal, its magnitude is proportional to the average strength of that signal. But if, in conjunction with the signal, there are received strong sporadic noise pulses, the magnitude of the bias will be momentarily affected thereby; and if the signal is weak compared to the noise the bias may be so badly impaired as to interfere with the proper functioning of the pick-off.

The primary object of the invention is to prevent transient noise pulses from adversely affecting the magnitude of the bias produced by a signal leveling network.

A more specific object is to prevent transient noise pulses from interfering with the operation of synchronizing pulse pick-off systems in television receivers.

The invention contemplates, broadly, the combination with a signal leveling network and rectifier of means controlled by the incoming signal for quenching the rectifier during certain periodically recurring portions of the signal so that strong sporadic noise pulses which may occur during such periods are not rectified and are thus prevented from causing the bias on the rectifier to depart from the value which it is intended to attain.

Specifically, the invention constitutes an im-

2

provement upon the conventional synchronizing signal pick-off in that it introduces means operative to render the pick-off tube unresponsive to all incoming signal voltages during the intervals between consecutive synchronizing pulses—thus rendering ineffective, so far as horizontal scanning is concerned, any noise accompanying the picture signal which may be received during such intervals.

In its preferred embodiment the invention is characterized by the provision, in association with the pick-off tube, of an oscillatory resonant circuit tuned to the frequency, or approximately so, of the horizontal synchronizing pulses and arranged to be activated by said pulses—which resonant circuit is, in turn, effective periodically to supply biasing voltage to an auxiliary grid of the pick-off tube whereby completely to cut off, or at least greatly reduce, the cathode current during the aforementioned intervals, thereby preventing objectionable charges being built up on the input grid as a consequence of heavy noise pulses.

In the drawing:

Fig. 1 is a schematic diagram illustrating a preferred embodiment of the invention;

Fig. 2a is a graph of a composite video signal;

Fig. 2b is a graph of the sine wave voltage employed periodically to quench the pick-off tube during the successive intervals between synchronizing pulses; and

Fig. 3 is a schematic diagram of an alternative embodiment of the invention.

In Fig. 1, vacuum tube 10 comprises an anode 11, cathode 12, signal-input grid 13, suppressor grid 14, screen grids 15 and auxiliary grid 16.

Connected to signal-input grid 13 is an input circuit comprising a signal leveling network consisting of a capacitor 17 and leak resistor 18.

The output circuit of tube 10 includes a load resistor 19, the upper terminal of which is connected to anode 11 while its lower terminal is connected to the plate voltage supply through a portion of inductance 20 and conductor 21.

Inductance 20 and shunt capacitor 22 form jointly an oscillatory tank circuit whereof the lower terminal 24 is connected via capacitor 25 to auxiliary grid 16; said grid being grounded through a leak resistor 26. Tube 10 functions as an amplitude-responsive signal pick-off device, and unidirectional synchronizing pulses are taken off output terminal 27.

With the exception of tank circuit 23 and auxiliary grid 16, the system of Fig. 1 is a conventional prior art synchronizing pulse pick-off

3

and its operation will first be described as if the tank circuit and auxiliary grid were not present.

A typical composite video signal such as would be impressed upon the input terminals of the pick-off is depicted in Fig. 2a. This comprises a recurrent series of video portions 30 interspersed with periodically recurring blanking portions 31, each of which is crowned with a horizontal synchronizing pulse 32. These pulses recur at a definite frequency which is known as the horizontal synchronizing pulse frequency.

Assuming that the signal depicted in Fig. 2a has an average amplitude which remains substantially constant, let us say for at least a substantial fraction of a second, a certain negative bias will be built up on grid 13, which bias is commensurate with the strength of the incoming signal and is of such predetermined value that the synchronizing pulses will be properly picked off. If the signal is strong the grid bias will be relatively highly negative, but if the signal is weak the bias will be correspondingly less negative; and in every case it will normally be of the right value to accommodate the particular signal.

If, however, the signal is weak and one or more strong noise pulses should come in therewith, grid 13 may, as a result, be caused to become momentarily excessively negative; and this momentary negative condition may subsist long enough to prevent one or possibly several of the synchronizing pulses being picked off—in which event the horizontal scanning would be interrupted. The visible result of such an occurrence is what is called "tearing out" of the picture.

By virtue of the present invention noise pulses occurring during the video intervals are prevented from influencing the bias on grid 13; and that end is accomplished by cutting off the cathode current and thus preventing grid-cathode rectification during those intervals.

Save for the influence of tank circuit 23, auxiliary grid 16 would be continuously biased above cut-off. Said tank circuit however, is tuned to the horizontal synchronizing pulse frequency and is reactivated each time a pulse occurs at output terminal 27. Each of said pulses is negative, and the concurrent potential at terminal 24 is positive. This latter follows from the fact that the plate current supplying conductor 21 is connected to a midpoint of inductance 22. The aforementioned positive potential at terminal 24 is transmitted via capacitor 25 to auxiliary grid 16 and does not cause any interruption of the cathode current. But the tank circuit is instantly set into oscillation at the horizontal synchronizing pulse frequency and the potential of terminal 24 immediately starts going negative sinusoidally, as depicted by the sine wave graph Fig. 2b.

Grid 16 is so biased that it will cut off the cathode current whenever the sine wave voltage impressed thereon goes below a certain level such as that represented by line 33 in Fig. 2b. Hence as will be clear from a comparison of Figs. 2a and 2b, tube 10 is non-conductive except during the blanking periods, or portions thereof including the horizontal synchronizing pulses. The pick-off is accordingly fully effective to perform its intended function although it is unresponsive to the video portion of the incoming signal. It will be evident that the time constant of the signal leveling network should be so chosen that the desired grid bias will result from grid-cathode rectification of the portions of the in-

4

coming signal which are not cut off by the auxiliary grid.

It is a factor of considerable importance that the bias on auxiliary grid 16 is obtained by virtue of rectification between said grid and the cathode, thus producing on the auxiliary grid a self-adjusting biasing potential which is at all times of such magnitude that the positive excursions of sine wave 33 render the tube conductive.

The arrangement illustrated in Fig. 3 is the equivalent of Fig. 1 but it differs therefrom in that the auxiliary grid is in a separate tube. Instead of the single heptode 10 there are employed a pentode 35 and a triode 36 in series. Grid 37 of the triode performs the same function as auxiliary grid 16 of Fig. 1. Otherwise the same reference numerals are used in Fig. 3 as in Fig. 1 to identify corresponding parts. In view of the foregoing explanation as to the mode of operation of Fig. 1, it would be unduly repetitious to include here an explanation of the mode of operation of Fig. 3.

Manifestly, a great many modifications and alternative embodiments are possible within the scope and purview of this invention.

What is claimed is:

1. In combination, a rectifier, an input circuit for said rectifier including a signal leveling network operative automatically to bias said rectifier proportionately to the average strength of a signal wave impressed upon said input circuit, an oscillatory circuit tuned to the frequency of periodically recurring pulses forming components of said signal wave, means for impressing said periodically recurring pulses on said oscillatory circuit for activating the same, and a grid in circuit with said rectifier, said grid being so associated with said oscillatory circuit as to derive oscillatory potential variations therefrom, said grid being effective by reason of the varying potential thereof, derived as before stated, to block the flow of current through said rectifier except during the periods coinciding with the arrival of the aforementioned pulses.

2. In a television receiver, a synchronizing pulse pick-off system operative to pick off horizontal synchronizing pulses from composite video signals and comprising a vacuum tube having an anode, a cathode, a signal-input grid, and an auxiliary grid interposed between said cathode and signal-input grid, an input circuit connected to said signal-input grid and including a signal leveling network operative to bias said signal-input grid proportionately to the average strength of the contemporaneous input signal, an output circuit for said tube, an oscillatory circuit tuned to the horizontal synchronizing pulse frequency and arranged to be energized periodically by horizontal synchronizing pulses derived from said output circuit, said auxiliary grid being so connected to said oscillatory circuit as to receive therefrom oscillatory biasing potential of suitable magnitude and so phased with respect to the incoming signal that the cathode current of said tube is cut off except during periodic intervals coincident with the arrival of horizontal synchronizing pulses.

3. In a television receiver, a synchronizing pulse pick-off system operative to pick off horizontal synchronizing pulses from composite video signals and comprising a vacuum tube having an anode, a cathode, a signal-input grid, and an auxiliary grid interposed between said cathode and signal-input grid, an input circuit connected to said signal-

5

input grid and including a signal leveling network comprising a series capacitor and shunt leak resistor, said network being operative by virtue of grid-cathode rectification to derive from the incoming signal an input-grid biasing potential which is proportionate to the average strength of the contemporaneous input signal, an output circuit for said tube, a parallel resonant oscillatory circuit tuned to the horizontal synchronizing pulse frequency and arranged to be energized periodically by horizontal synchronizing pulses derived from said output circuit, said auxiliary grid being so connected to said resonant circuit as to receive therefrom sinusoidal biasing potential of suitable magnitude and so phased with respect to the incoming signal that the cathode current is cut off during each successive video portion of the received signal but is not cut off during the intervals when the horizontal synchronizing pulses arrive.

4. In a television receiver, a synchronizing pulse pick-off system operative to pick off horizontal synchronizing pulses from composite video signals and comprising a vacuum tube having an anode, a cathode, a signal-input grid and an auxiliary grid interposed between said cathode and signal-input grid, an input circuit connected to said signal-input grid and including a signal leveling network comprising a series capacitor and shunt leak resistor, said network being operative by virtue of grid-cathode rectification to derive from the incoming signal an input-grid biasing potential which is proportionate to the average strength of the contemporaneous input signal, an output circuit connected to said anode and including a load impedance, a parallel resonant circuit tuned to the horizontal synchronizing pulse frequency and including an inductance, a portion only of said inductance being included in said output circuit, said load impedance and said auxiliary grid being connected to remotely separated terminals of said inductances, and a source of anode current connected to a terminal in said inductance which is intermediate of the two first-mentioned terminals.

5. In a television receiver, a synchronizing pulse pick-off system operative to pick off horizontal synchronizing pulses from composite video signals and comprising a vacuum tube having an anode, a cathode, a signal-input grid and an auxiliary grid interposed between said cathode and signal-input grid, an input circuit connected to said signal-input grid and including a signal leveling network comprising a series capacitor and leak resistor therefor, said network being operative by virtue of grid-cathode rectification to derive from

6

the incoming signal an input-grid biasing potential which is proportionate to the average strength of the contemporaneous input signal, an output circuit for said tube, a parallel resonant circuit tuned to the horizontal synchronizing pulse frequency, means for deriving from the incoming composite video signal and for periodically impressing upon said resonant circuit energizing pulses coinciding in time with the aforementioned horizontal synchronizing pulses, said auxiliary grid being connected to a point on said resonant circuit such that there is impressed on said auxiliary grid a sinusoidal biasing potential so phased and of such magnitude that the cathode current of said tube is allowed to flow only during recurrent short periods coinciding with the arrival of horizontal synchronizing pulses.

6. In a television receiver, a synchronizing pulse pick-off system operative to pick off horizontal synchronizing pulses from composite video signals, said system comprising a first vacuum tube and a second vacuum tube, the space paths of said tubes being connected in series, said first tube having a plate, a cathode and a signal-input grid, an input circuit connected to said signal-input grid and including a signal leveling network comprising a series capacitor and leak resistor therefor, said network being operative by virtue of grid-cathode rectification to derive from the incoming signal an input-grid biasing potential which is proportionate to the average strength of the contemporaneous input signal, an output circuit for said tube, said second tube having a plate, a cathode and a control grid, a parallel oscillatory circuit tuned to the horizontal synchronizing frequency, said oscillatory circuit being so operatively associated with said output circuit that it is energized by each succeeding horizontal synchronizing pulse, said control grid being connected to said oscillatory circuit to receive therefrom an oscillatory biasing potential of such magnitude and so phased that the potential of the control grid is above cut-off only during periodic intervals coinciding with the arrival of horizontal synchronizing pulses.

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