

June 10, 1941.

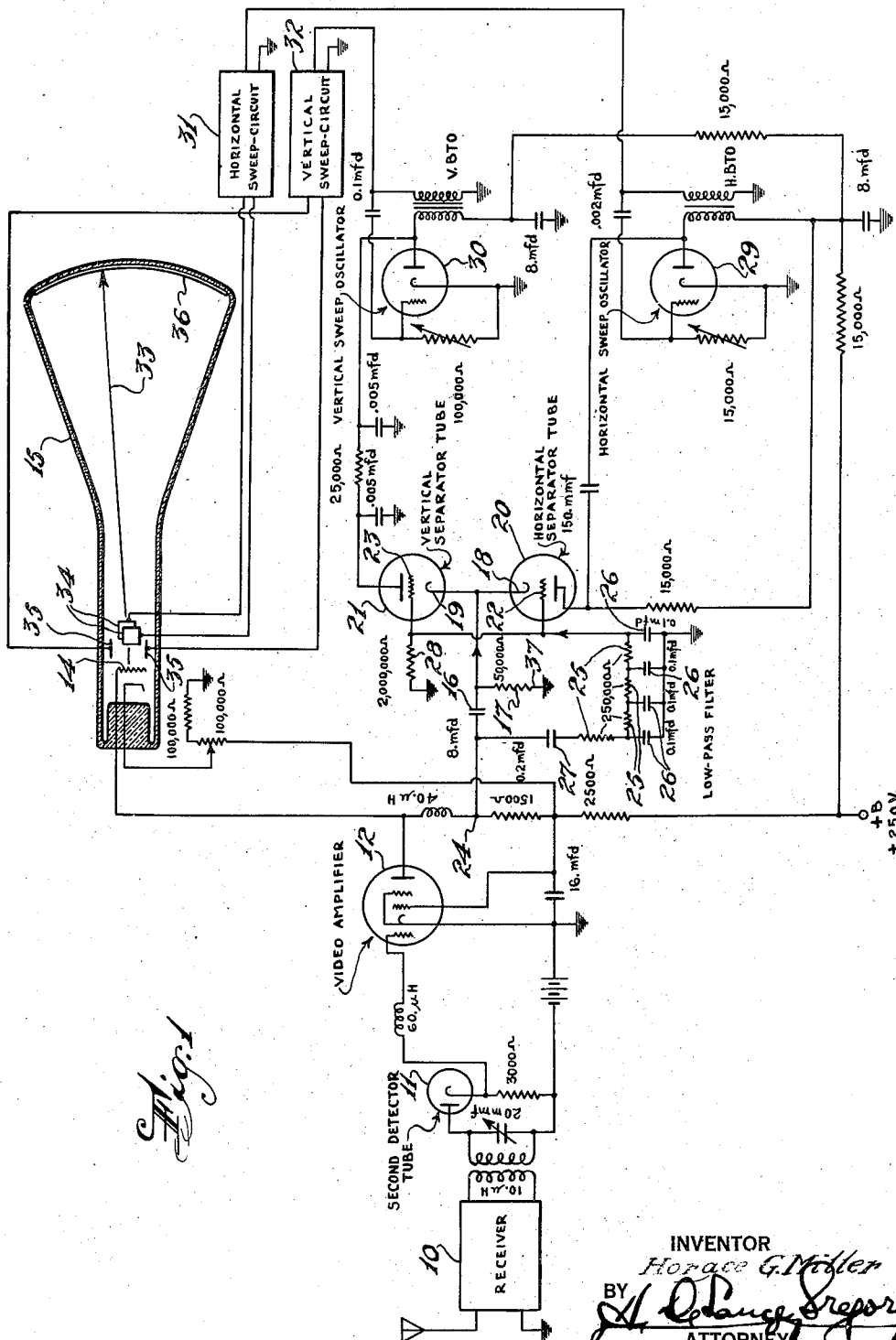
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2,245,409

METHOD AND SYSTEM FOR TELEVISION COMMUNICATION

Filed Aug. 2. 1939

2 Sheets-Sheet 1



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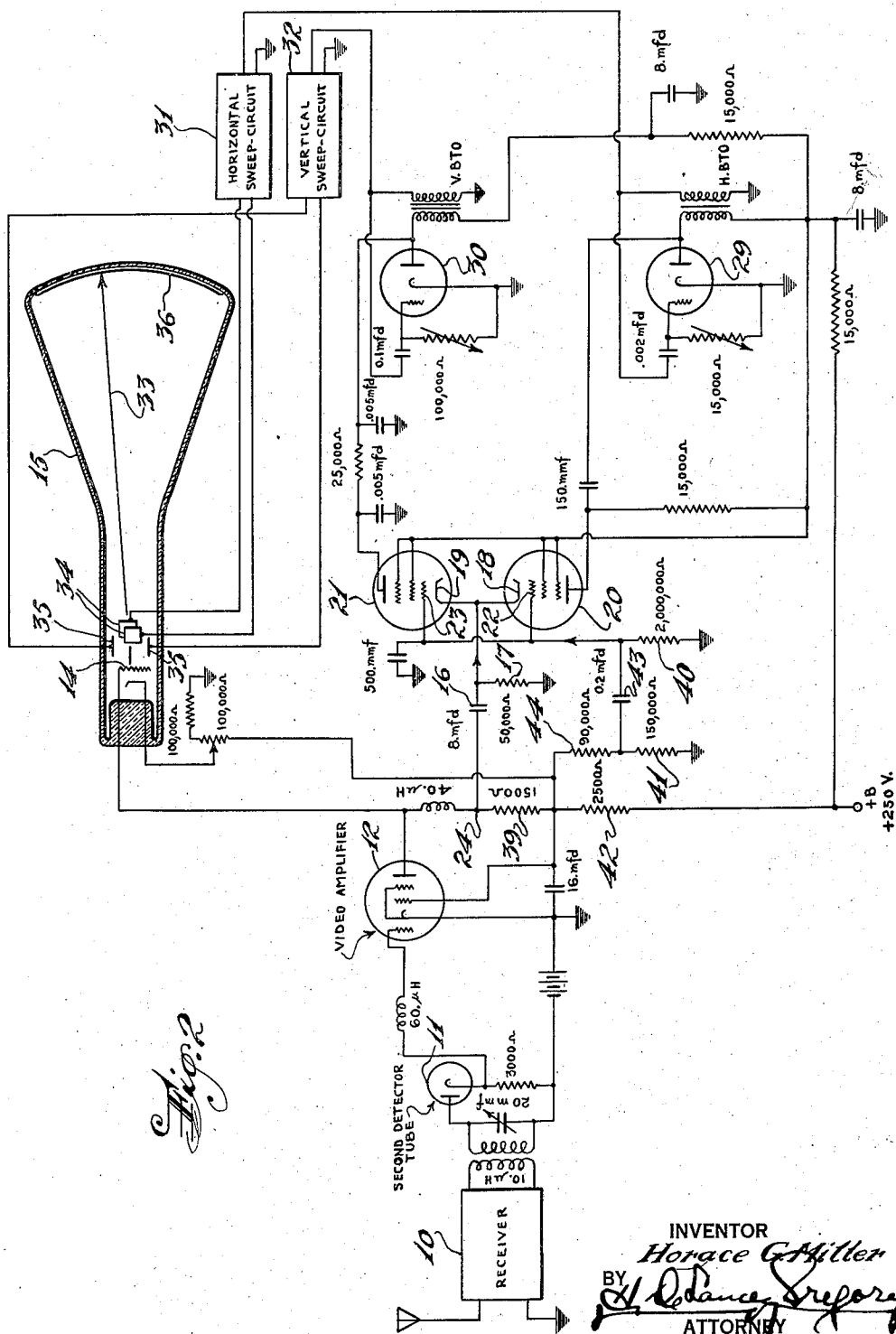
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

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METHOD AND SYSTEM FOR TELEVISION COMMUNICATION

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Application August 2, 1939, Serial No. 287,940

6 Claims. (Cl. 178—7.5)

My invention relates to improvements in methods and systems for television communication, and more particularly for the separation, at the receiver, of the video signals from the synchronizing signals.

In television communication the matter of obtaining satisfactory synchronization between the transmitter and receiver has presented many difficulties and problems, and particularly so in the use of cathode-ray tubes and an interlaced pattern. Many methods and systems proposed heretofore for this purpose have been unsatisfactory because the synchronizing action was not strong enough. Prior methods and systems in which the synchronizing action was strong enough either required a relatively large number of tubes, or produced unstable results. That is, one or more of the following undesirable actions were found to be present. The synchronizing action varied widely with the instantaneous background level of the composite video signal, so that a sudden change of scene caused a disagreeable jump in all or part of the reproduced picture raster, or even caused temporary loss of synchronization. Power supply surges affected the synchronization, causing undesired motion or temporary loss of synchronism in the reproduced raster. Conduction currents in the input circuit of the synchronizing separator tube or tubes produced distortion of the composite video signal waveform, causing non-uniform horizontal synchronism and some times variable interlace or loss of vertical synchronism. Some of the picture portion of the composite video signal occasionally passed through the synchronizing separator tubes, producing ragged edges on the reproduced picture raster. Received static or other noise interference produced undue loss of synchronism in the reproduced picture. Since synchronizing action varies greatly with shape and size of synchronizing pulses, reception from different transmitters required readjustment of synchronizing and/or sweep speed controls when changing from one transmitter to another. Cross-feed between horizontal and vertical synchronizing separator circuits caused variable interlace. Poor amplitude discrimination in one or both separators allowed the blanking signals to be transmitted through the separator, causing variable interlace and/or ragged horizontal synchronizing.

With the foregoing in mind, it is one of the objects of my invention to provide an improved method and system for television communication which eliminates or greatly reduces the

above-mentioned sources of instability and produces strong, steady synchronizing with excellent interlace under widely varying conditions.

Other objects and advantages will hereinafter appear.

For the purpose of illustrating my invention, an embodiment thereof is shown in the drawings, wherein

Figure 1 is a simplified, diagrammatic showing of a television receiving system constructed and operating in accordance with my invention; and

Fig. 2 is a view similar to Fig. 1, showing a modification.

With reference to Fig. 1, the numeral 10 designates a conventional receiver for video signals and horizontal and vertical synchronizing pulses. This composite signal is taken from the output circuit of the second detector tube 11 and amplified by the video amplifier tube 12. From the output of the tube 12, the composite video signal is applied as shown, at high level, to the grid 14 of a scanning device 15 in the form of a conventional cathode-ray tube.

The composite signal, comprising the video signals and the horizontal and vertical synchronizing pulses, is also taken from the output of the video amplifier tube 12, at high level, and applied through a large condenser 16 and a large resistor 17 to the respective cathodes 18 and 19 of the separator tubes 20 and 21. The separator cathodes 18 and 19 are therefore automatically biased to nominal cutoff potential, and only the negative, horizontal and vertical synchronizing peaks of the composite signal get through the separator means.

The respective grids 22 and 23 of the separator tubes are connected through the low-pass filter shown, to the same point 24 as the cathodes 18 and 19 are driven from.

In operation, the video signal does not reach the grids 22 and 23, but any low-frequency surges of whatever origin arriving at the condenser 16 are transmitted to the grids 22 and 23 as well as to the cathodes 18 and 19. Thus, such undesirable surges cancel out in the separator tubes and accordingly do not get through the same or affect the separator action. The low-pass filter may take the form shown in Fig. 1, in which the resistors 25 and the condensers 26 are elements of a multisection filter.

The numeral 27 designates a large blocking condenser, and the numeral 28 designates a grid-leak for the separator tubes 20 and 21.

The horizontal and vertical synchronizing pulses from the separator tubes 20 and 21, re-

spectively, may be fed to horizontal and vertical sweep oscillator tubes 29 and 30, respectively. The output of the sweep oscillator tubes 29 and 30 may be applied, as represented, to drive the respective, local, horizontal and vertical sweep-circuits 31 and 32 for saw-tooth deflection of the scanning electron ray 33 by the respective plates 34 and 35. The transmitted scene or picture is thereby reproduced on the fluorescent screen 36 in the well-known manner.

The value of resistor 17 is rather critical in order to obtain proper cutoff and large synchronizing output from the separator tubes 20 and 21 under widely varying signal-level conditions. A value of about 50,000 ohms for resistor 17 has been found to be suitable for use with average triode tubes.

As an alternative, the low-pass filter might be omitted, and the grids 22 and 23 of the separator tubes connected directly to the low-potential end 37 of resistor 17. It has been found, however, that such an arrangement does not provide as good stability in the separator tubes.

From the foregoing, it will be seen that in my improved method and system, a composite video signal of the maximum amplitude available anywhere in the video amplifier, is applied to the separator input circuit. That is, the signals are taken from the output of the video amplifier, at high level, and applied in the novel manner shown to the cathodes 18 and 19 and the grids 22 and 23 of the separator tubes.

In the modification shown in Fig. 2, the various parts or elements corresponding to and serving the same purpose as the respective parts or elements in Fig. 1, have been designated by the same respective reference numerals as the latter. In Fig. 2, the separator tubes 20 and 21 are shown as pentodes rather than as triodes, simply to illustrate the flexibility of my improved method and system. The condenser 16 and resistor 17 serve to transmit the composite video signals to the separator cathodes, as in Fig. 1. Condenser 16 and resistor 17 transmit all frequencies down to say one cycle per second. In Fig. 2, however, the source of the extraneous and undesirable low-frequency surges is assumed to be local, that is, within the circuits of the receiver. Such surges are cancelled out or rendered void in their effect on the separator tubes 20 and 21 by applying them to the separator grids 22 and 23 through an attenuator or voltage divider, as shown.

A small condenser 38 operates to prevent high-frequency voltages from building up on the separator grids 22 and 23.

In Fig. 2, resistor 17 should be large in comparison to resistor 39, resistor 40 should be large in comparison to resistor 41, and resistor 41 should be large in comparison to resistor 42. Also, the product of resistor 17 and condenser 16 should be approximately equal to the product of resistor 40 and condenser 43. Under these conditions, cancellation of internally-generated disturbances is obtained when the quotient obtained by dividing the value of resistor 41 by the sum of the respective values of resistors 44 and 41 equals the difference between unity and the product of G and the value of resistor 39, where G is the screen-to-plate transconductance of the video amplifier 12. If the video amplifier 12 is a triode tube, G becomes zero and the value of resistor 44 becomes zero. Under conditions ordinarily met with in practice, the product of G and the value of resistor 39 is less than unity.

While my invention has been described more in connection with television communication, it will be seen that it has a broader application, and might be used in connection with facsimile apparatus, telephone or telegraph apparatus, or in fact in any case where a separation of different signals and electrical surges is desirable.

In the drawings, the various values of resistance, conductance and capacity have been given by way of example, and may be varied to suit particular requirements. Furthermore, it will be understood that modifications within the conception of those skilled in the art are possible without departing from the spirit of my invention or the scope of the claims.

I claim as my invention:

1. In the art of television communication, the method of operation which comprises transmitting video signal and synchronizing signal together as a composite signal, applying the composite signal to an input circuit of separator means and in such manner that only the negative peaks of the composite signal get through said separator means by way of said input circuit, and applying to another input circuit of said separator means only undesirable electrical surges which occur and which are simultaneously applied with the composite signal on said first-named input circuit whereby such surges applied simultaneously to said input circuits cancel out and are accordingly prevented from getting through said separator means.

2. In a system for amplifying and separating signals of relatively high frequency from electrical surges of relatively low frequency, an amplifier for the high-frequency signals and the low-frequency surges, separator means comprising an electron tube having a cathode and a grid, connecting means for applying both the amplified high-frequency signals and the amplified low-frequency surges from the output circuit of said amplifier to said cathode, and connecting means for applying only the amplified low-frequency surges from the output circuit of said amplifier to said grid whereby such surges cancel out within the separator tube itself causing only the amplified signals of relatively high frequency to appear in the output circuit of said tube.

3. In a picture-transmission system, means for amplifying video signals and synchronizing signals and electrical surges of relatively low frequency as compared to the frequency of the synchronizing signals, a scanning device for picture-reproduction, connecting means for applying the video signals to said device from the output circuit of said amplifying means, separator means comprising an electron tube having a cathode and a grid, connecting means for applying both the amplified synchronizing signals and the amplified low-frequency surges from the output circuit of said amplifying means to said cathode, connecting means for applying only the amplified low-frequency surges from the output circuit of said amplifying means to said grid whereby such surges cancel out within the separator tube itself causing only the amplified synchronizing signals of relatively high frequency to appear in the output circuit of said tube, and means controlled from the output circuit of said tube for governing scanning action of said device.

4. In a television system, means for amplifying video signals and synchronizing signals and electrical surges of relatively low frequency as compared to the frequency of the synchronizing signals, a cathode-ray tube for picture-repro-

duction, connecting means for applying the video signals from the output circuit of said amplifying means to an electrode of said tube, separator means comprising an electron tube having a cathode and a grid, connecting means for applying both the amplified synchronizing signals and the amplified low-frequency surges from the output circuit of said amplifying means to said cathode, connecting means for applying only the amplified low-frequency surges from the output circuit of said amplifying means to said grid whereby such surges cancel out within the separator tube itself causing only the amplified synchronizing signals of relatively high frequency to appear in the output circuit of said tube, and means controlled from the output circuit of said electron tube for causing deflection of the scanning electron ray of said first-named tube.

5. In a television system, means for amplifying video signals and horizontal and vertical synchronizing signals and electrical surges of relatively low frequency as compared to the frequency of the horizontal synchronizing signals, a cathode-ray tube for picture reproduction, connecting means for applying the video signals from the output circuit of said amplifying means to an electrode of said tube, separator means comprising a pair of electron tubes each having a cathode and a grid, connecting means for applying both the amplified synchronizing signals and the amplified low-frequency surges from the output

circuit of said amplifying means to said cathodes, connecting means for applying only the amplified low-frequency surges from the output circuit of said amplifying means to said grids whereby such surges cancel out within the separator tubes causing only the amplified horizontal and vertical synchronizing signals to appear in the respective output circuits of said separator tubes, and means controlled from the output circuits of said separate tubes for causing simultaneous horizontal and vertical deflection of the scanning electron ray of said first-named tube.

6. In a system for amplifying and separating signals of relatively high frequency from electrical surges of relatively low frequency, an amplifier for the high-frequency signals and the low-frequency surges, separator means comprising a pair of electron tubes each having a cathode and a grid, connecting means for applying both the amplified high-frequency signals and the amplified low-frequency surges from the output circuit of said amplifier to said cathodes, and connecting means for applying only the amplified low-frequency surges from the output circuit of said amplifier to said grids whereby such surges cancel out within the separator tubes causing only the amplified signals of relatively high frequency to appear in the output circuits of said tubes.

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