

June 4, 1940.

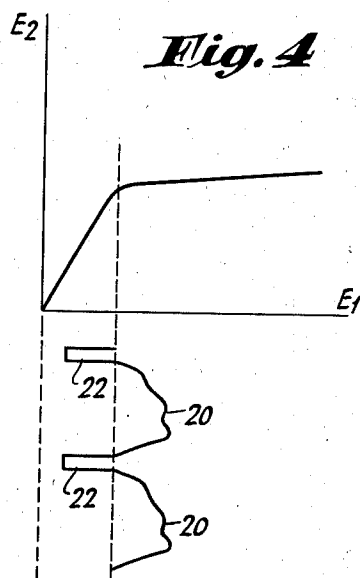
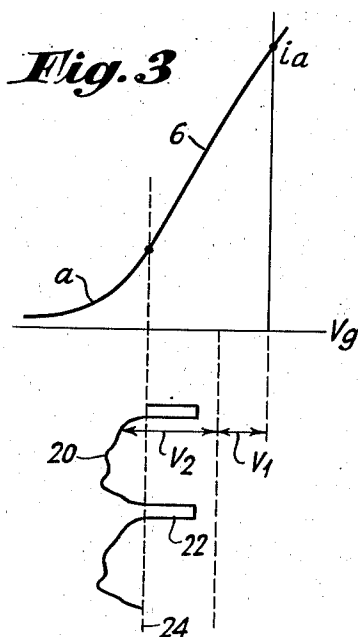
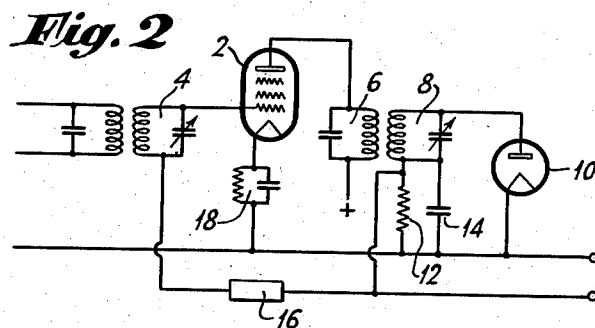
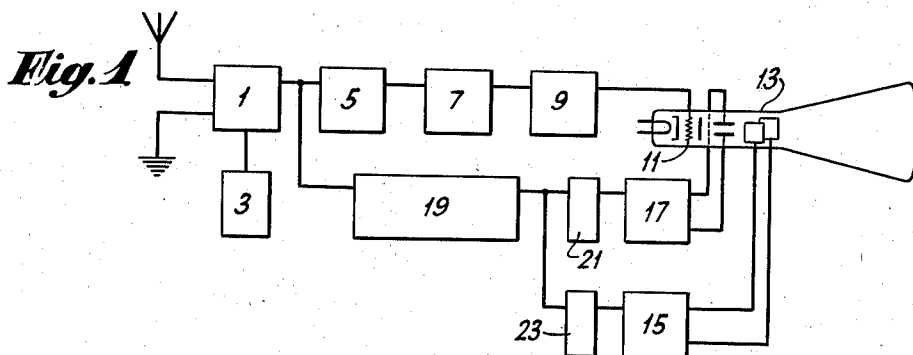
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2,203,634

TELEVISION SYSTEM

Filed Dec. 28, 1937

2 Sheets-Sheet 1



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Fig. 5

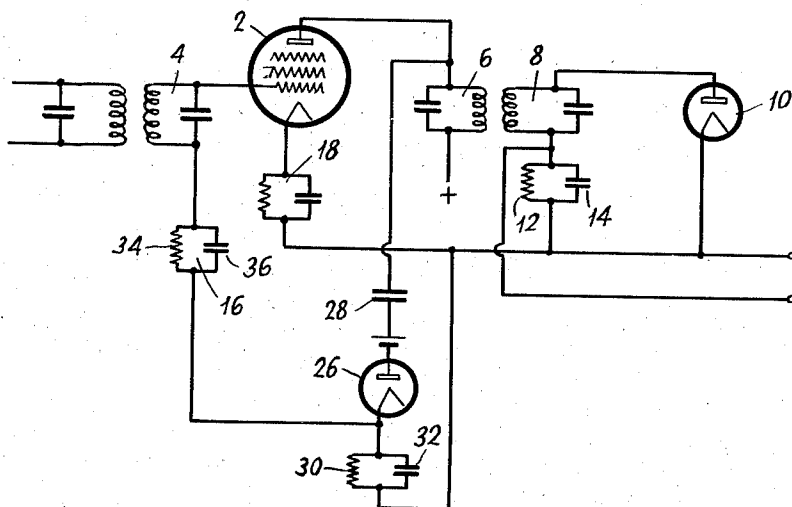
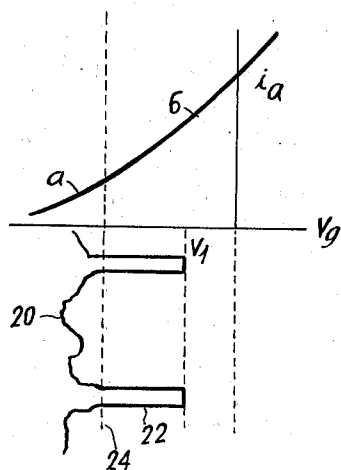


Fig. 6



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UNITED STATES PATENT OFFICE

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TELEVISION SYSTEM

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3 Claims. (Cl. 178—7.5)

The invention relates to a television receiving installation and more particularly to that part of the installation which serves to synchronize a television receiver with the transmitter to be received.

For the purpose of synchronizing a transmitter and a receiver it has previously been suggested to transmit simultaneously with the picture current on the same carrier wave synchronizing impulses which are modulated in opposite sense on the carrier wave and which are utilized at the receiver for controlling the scanning movement.

In order to avoid that at the receiver the devices which control the scanning movement are troubled by the picture currents received, it is customary to separate the picture currents from the synchronizing impulses prior to the supply of these impulses to one or more devices which control the scanning movement.

The invention has for its object to provide a television receiving system wherein a new circuit arrangement is employed for separating from one another synchronizing impulses and picture currents which are modulated in opposite senses on a carrier wave.

The novel feature of the circuit arrangement according to the invention consists in the provision of an additional high or intermediate frequency amplifier whose rectified output voltage is supplied to one or more devices for controlling the scanning movement, the amplification of these devices being regulated, in dependence of the instantaneous value of the modulation, in such manner that during the occurrence of the picture currents the amplification decreases when the amplitude of the modulated oscillations received increases and, during the occurrence of the synchronizing impulses, is equal to the amplification obtained when the non-modulated carrier wave is received.

The rectified output voltage of the additional high or intermediate frequency amplifier should preferably be supplied to an electrode of one or more tubes present in said amplifier, said tube or tubes being adjusted in such manner that at the minimum instantaneous value of the picture currents this tube or these tubes operate at a point of the characteristic curve which is located at the boundary between a substantially straight and a highly curved portion.

The invention will be explained more in detail with reference to the accompanying drawings wherein:

Figure 1 represents diagrammatically one em-

bodiment of a complete television receiver according to the invention.

Figure 2 represents one mode of realization of that part of the receiver according to the invention which is denoted in Fig. 1 by 19.

Fig. 3 is an explanatory curve.

Figure 4 is an explanatory curve.

Figure 5 shows another embodiment of my invention.

Fig. 6 is an explanatory curve.

Fig. 1 represents a television receiver adapted to receive synchronizing impulses which are transmitted together with the picture currents and which bring about a decrease of the carrier wave amplitude, wherein a cathode ray tube is employed as a reproducing device. At the receiver the modulated high frequency oscillations received by an aerial are supplied to a first detector 1 and transformed by means of a local oscillator 3 into modulated intermediate frequency oscillations. The modulated intermediate frequency oscillations are amplified in an intermediate frequency amplifier 5, detected in a second detector 7 and the picture currents and synchronizing impulses thus obtained are supplied through a low frequency amplifier 9 to the control electrode 11 of a cathode ray tube 13. The picture currents received control the intensity of the cathode ray beam generated in the tube 13 while the synchronizing impulses set up at the control electrode 11 serve to block the cathode ray beam during the duration of time between the scanning of two successive picture lines or pictures.

The cathode ray tube comprises two devices which control the scanning movement of the cathode ray beam. In these devices, which are denoted by 15 and 17 respectively, is set up a saw-tooth current or voltage. The device 15 controls the movement of the cathode ray beam in the direction of the picture lines (hereinafter referred to as "horizontal scanning movement"); the device 17 controls the movement of the cathode ray beam in a direction perpendicular to the picture lines (referred to hereinafter as "vertical scanning movement").

In order to ensure that the scanning movement of the cathode ray beam at the receiver is in synchronism with the scanning movement at the transmitter, the synchronizing impulses received are supplied to the devices 15 and 17 via a device 19 by which the picture currents are separated from the synchronizing impulses. In the connection of the device 19 with the vertical scanning device 17 is provided a filter 21 which only trans-

mits those synchronizing impulses (picture impulses) whose frequency is equal to the frequency of the vertical scanning movement. If desired, there may be provided in the connection of the device 19 with the horizontal scanning device 15 a filter 23 which transmits only these synchronizing impulses (control impulses) whose frequency is equal to the frequency of the horizontal scanning movement.

In the embodiment shown in Fig. 2 the device 19, which serves to separate picture currents and synchronizing impulses from one another, comprises an intermediate-frequency amplifying tube 2 to the input circuit 4 of which are supplied modulated intermediate frequency oscillations which are taken from the output circuit of the first detector 1 (Fig. 1). The output circuit 6 of the tube 2 is inductively coupled with a circuit 3 which is connected in series with a diode 10 and an impedance constituted by the parallel connection of a resistance 12 and a condenser 14. The voltage across the impedance 12, 14 is supplied, if desired via a low-frequency amplifier which is not shown in the drawings, to the devices 15 and 17. The voltage across the impedance 12, 14 is supplied furthermore to the grid of the tube 2 owing to the fact that that point of the impedance 12, 14 which is located on the anode side of the diode 10 is connected via a filter 16 by which only intermediate frequency oscillations are returned to the grid of the tube 2. It is thus achieved that the grid bias of the intermediate frequency amplifying tube 2, which bias is determined by the voltage drop in the impedance 18 which consists of the parallel connection of a resistance and a condenser, also depends on the instantaneous value of the voltage across the impedance 12, 14, in such manner that with an increasing carrier wave amplitude the grid bias becomes more negative and that with a decreasing amplitude the negative bias of the tube decreases.

Figure 3 shows the characteristic curve which represents the anode current i_a of the tube 2 as a function of the grid bias V_g . The grid bias of the tube 2 is determined on the one hand by the voltage drop across the impedance 18, which is represented in the drawing by V_1 , and on the other hand by the voltage across the impedance 12, 14, which is denoted by V_2 . The instantaneous value of V_2 varies in dependence on the modulation of the intermediate frequency oscillations supplied to the grid of the tube 2, that is to say the instantaneous value of the voltage V_2 increases with the reception of the picture currents which are denoted by 20 whereas the instantaneous value of the voltage V_2 is only small with the reception of the synchronizing impulses, which are denoted by 22. The voltage across the impedance 12, 14 with the reception of a non-modulated carrier oscillation is determined by a dotted line 24. For the purpose of separating the picture currents from the synchronizing impulses, the bias voltage V_1 of the tube 2 is so chosen that with a non-modulated carrier oscillation the tube 2 operates at a point of the characteristic curve which is located at the boundary between a highly curved portion *a* and a substantially straight portion *b* of the i_a - V_g characteristic curve. With this adjustment the amplification of the tube 2 decreases, during the reception of the picture currents with an increasing amplitude of the modulated oscillations received whereas during the reception of the synchronizing impulses the amplification of the tube 2 is substantially equal to

that with the reception of the non-modulated carrier wave. In the output circuit of the intermediate frequency amplifier 2 there are consequently set up intermediary frequency oscillations whose amplitude is substantially constant during the occurrence of the picture currents whereas the synchronizing impulses bring about a strong decrease of the carrier wave amplitude. During the occurrence of the picture currents the rectified output voltage of the tube 2 is therefore substantially constant owing to which the synchronizing impulses alone are supplied to the devices 15 and 17.

A different embodiment is shown in Figure 5 wherein similar elements are denoted by the same references. The difference with the preceding system consists in that a second diode 26 is provided to which the intermediate frequency oscillations are supplied via a coupling condenser 28. The voltage across the output impedance of the diode 26, which impedance consists of a resistance 30 and a condenser 32, is supplied to the grid of the tube 2 via a filter 16 which preferably consists of a resistance 34 and a condenser 36 and by which only intermediate frequency oscillations are retained. The diode 26 has a negative bias (referred to as "threshold value") which is equal to the non-modulated carrier wave amplitude. Across the output impedance 30, 32 of the diode 26 there will consequently be set up a voltage which only depends on the instantaneous value of the picture currents. This voltage is supplied to the grid of the tube 2.

Figure 6 shows the anode current grid voltage characteristic curve of the tube 2 which may be utilized in the system according to Fig. 5. The bias voltage of the tube 2 is determined on the one hand by the voltage drop across the impedance 18, which is denoted by V_1 , and on the other hand by the voltage V_2 across the impedance 30, 32, which voltage depends on the instantaneous value of the picture currents received. During the occurrence of the picture currents the negative grid bias of the tube 2 increases with an increasing amplitude of the oscillations to be amplified which are supplied to the grid whereas during the occurrence of the synchronizing impulses the negative bias has the same value as with the reception of the non-modulated carrier oscillation. Again with this system it is consequently ensured that during the occurrence of the picture currents the amplitude of the intermediate frequency oscillations set up in the output circuit of the amplifier 2 is substantially constant and that the synchronizing impulses bring about a strong decrease of the amplitude.

Figure 4 shows a characteristic curve which represents the low-frequency output voltage of the device 19 (Fig. 1) as a function of the intermediate frequency input voltage of said device, the enveloping curve of the intermediate frequency oscillations to be amplified being represented by the line 20, 22. The non-modulated carrier wave amplitude is determined by the dotted line 36. It appears from this curve that the low frequency output voltage increases with an increasing amplitude of the intermediate frequency voltage to be amplified as long as the amplitude of the voltage to be amplified is smaller than, the carrier wave amplitude. When, however, the amplitude of the voltage to be amplified surpasses said value, the amplification of the device 19 decreases in dependence on the instantaneous value of the modulation and the

low frequency output voltage remains substantially constant. In the output circuit of the device 19 there will consequently be set up a substantially constant voltage which depends chiefly on the synchronizing impulses.

What I claim is:

1. Television receiving apparatus for receiving video signals and synchronizing signals, the latter modulating the carrier wave in the opposite sense to that which the video signals modulate said carrier wave, comprising cathode ray means for reproducing the televised image from said video signals, means for deflecting said cathode ray, means for energizing said deflecting means, and means for controlling the action of said deflecting energizing means comprising a thermionic valve operated on a curved portion of its grid voltage-plate current curve, means for developing a control voltage representative of the instantaneous modulation value of said carrier, means for impressing the received signals onto a control element of the first-mentioned valve, and means for feeding a portion of the signal indicative of the instantaneous modulation value of the carrier to a control element of the first-mentioned valve, whereby for video signals the amplification of said valve decreases with an increasing amplitude of the modulated carrier, and whereby the synchronizing impulses affect the

operation of said valve so that the valve is operated on a portion of its grid voltage-plate current curve, equal to the amplification obtained when the unmodulated carrier oscillation is impressed on said circuit, said feedback means comprising a filter adapted to feed only high and intermediate frequency oscillations.

2. Apparatus in accordance with claim 1 wherein said means for developing a control voltage representative of the instantaneous modulation value of said carrier comprises a time constant circuit including a condenser and a resistance, and a uni-directional conductor connected serially with said time constant circuit, and means for impressing the output of said thermionic valve on to said uni-directional conductor.

3. Apparatus in accordance with claim 1 wherein said means for developing a control voltage representative of the instantaneous modulation value of said carrier comprises a time constant circuit including a condenser and a resistance, and a uni-directional conductor connected serially with said time constant circuit, and means for impressing the output of said thermionic valve on to said uni-directional conductor, and in which said uni-directional conductor comprises a diode.

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