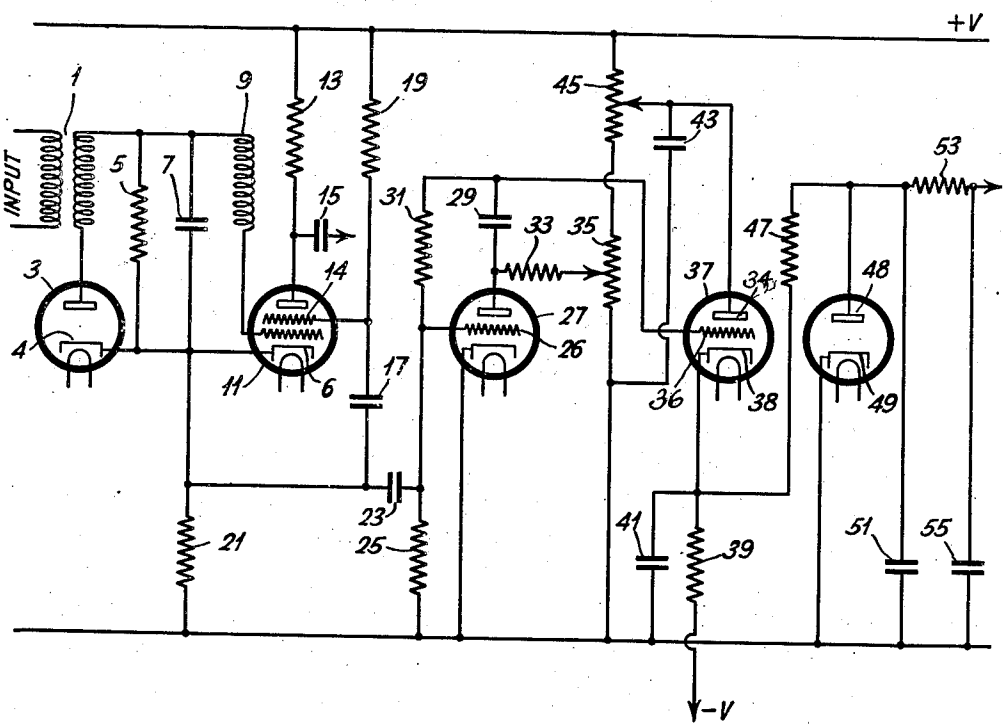
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TELEVISION SYSTEM

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Fig. 1



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TELEVISION SYSTEM

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This invention relates to television systems and is concerned with a method of obtaining automatic gain control in a television receiving amplifier for the purpose of reducing effects due to fading or other causes of attenuation of the received carrier wave.

It is common practice in wireless reception of sound signals to effect automatic gain control by using a rectified portion of the incoming signals to provide potentials which are applied to the grids of high or intermediate frequency amplifying valves to regulate the gain of these valves.

In certain systems of television transmission the vision carrier wave has not a mean value as in sound transmission and the method of effecting automatic gain control adopted in sound transmission cannot therefore be employed. It is the object of the present invention to provide a method of effecting automatic gain control in a television system receiving a carrier wave which is increased in amplitude to a maximum value representing maximum brightness in the picture and in which synchronizing signals are transmitted by reduction of the carrier amplitude to zero for short periods of time. Since this method of modulation permits transmission of the direct current component corresponding to average picture brightness it is referred to as stabilized carrier transmission. It will be seen that with this method of transmission the mean carrier amplitude depends upon the mean brightness of the picture and the method of automatic gain control usually adopted in sound transmission systems depending as it does on the observation of this mean carrier amplitude is not applicable. Thus some amplitude of the carrier other than the mean value must be used for this purpose. It would be possible to use the maximum carrier amplitude that can be radiated corresponding with maximum white in the picture, but this amplitude need not necessarily be present in any given transmission and even if present, is likely to occur with insufficient regularity for effective automatic gain control action.

According to the present invention a method of obtaining automatic gain control potentials in a television carrier wave receiver operating from a stabilised carrier transmission is provided comprising applying to the received signals impulses of an amplitude and sense as to reduce the amplitude of the synchronizing signals to such an extent that the peak level of the resultant signals corresponds to minimum vision modulation and in employing the minimum vision modulation signals to obtain gain control potentials.

In a television receiver operating according to the method of the invention, means are provided for deriving impulses of greater amplitude than the synchronizing signals and for applying said derived impulses in opposite sense to the received signals so as to render the synchronizing signals ineffective whereby the peak level of the resultant signals corresponds to minimum vision modulation and means for deriving from said minimum vision modulation signal potentials for effecting automatic gain control. The impulses of greater amplitude may be derived from the synchronizing signals which they are intended to render ineffective and since the derived impulses are of greater amplitude than the synchronizing signals, the synchronizing signals are reversed into the grey or white levels of the transmitted object thus leaving the peak level of the resultant signals corresponding to minimum or zero vision modulation. The received signals may be reversed in sense and such reversed signals may be arranged to generate impulses of anode current corresponding to the synchronizing signals, which impulses of anode current are applied to the reversed signals to oppose the synchronizing signals. In one circuit arrangement according to the invention the cathodes of a diode detector valve followed by an amplifying valve are connected together and potentials for providing automatic gain control are derived from signals taken from the cathode of the amplifying valve the anode of which supplies signals potentials to a receiving cathode ray tube. The signals taken from the cathode of the said valve are in a reverse sense and a following valve serves to provide the impulses of anode current which are in a negative sense, which are utilized to oppose the normal synchronizing signals in the complete wave form so that at a point in the circuit the maximum positive potential occurs at instants of minimum or zero vision modulation.

The amplitude of the carrier wave corresponding to zero vision modulation will be referred to as the black level and in order to ensure that the carrier wave modulation will reach this level at least once in every line period, an impulse corresponding to black in the subject being transmitted may be generated once in every line as, for example, by providing a black edge on the transmitted picture.

In order that the invention may be clearly understood and readily carried into effect, the same will now be more fully described with reference to the drawing wherein the figure shows

part of a circuit of a superheterodyne television receiver.

Referring to the drawing, a transformer 1, fed from the last intermediate frequency amplifying stage of the receiver, is coupled to a diode valve 3 having a load resistance 5 and condenser 7 connected across this load resistance. The rectified signals are passed to an amplifying valve 11 through an intermediate frequency filter consisting of a choke coil 9 and the internal capacity of the valve 11. The cathodes 4 and 6 of the diode 3 and valve 11 respectively, are connected directly together. A load resistance 13 is inserted in the anode lead of the valve 11 and the condenser 15 serves to couple the signal potentials to a valve operating to restore the direct current representing average picture brightness before the signals are applied to the control grid of a receiving cathode ray tube. The method of direct current restoration is that described in the specification of British Patent No. 422,906. The screen grid 14 of valve 11 is coupled through a by-pass condenser 17 to the cathode 6 and is supplied with a positive potential through resistance 19.

A further load resistance 21 is connected between the cathode 6 and earth and signal potentials, amplified in valve 11 but opposite in phase with respect to those fed to condenser 15, are set up across the resistance 21. Condenser 23 couples the end of the load resistance 21 to the upper end of a resistance 25 and the grid 26 of a valve 27. The grid cathode path of this valve functions as a diode to restore the direct current component lost at the coupling condenser 23 again in the manner described in the specification of British Patent No. 422,906.

The valve 27 operates to pass anode current on the occurrence of synchronizing signals and the resulting impulses of anode voltage are passed through a condenser 29 to a resistance 31 connected between the grid of valve 27 and the grid 36 of a following valve 37.

In order that the level of grid voltage at which the valve 27 commences to pass anode current may be controlled the anode load resistance 33 is connected to a tapping point on a potentiometer 35 connected across the source of a high tension supply. This form of connection permits ready adjustment of the anode voltage applied to the valve 27. By adjusting the tapping point on the potentiometer 35 it is possible to ensure that the impulses of anode current generated by the valve 27 are of such amplitude that the synchronizing signals which they are intended to oppose are reversed into the grey or white levels of the transmitted object. Since the synchronizing signals are reversed in this manner it is possible to ensure, despite variation in the amplitude of the synchronizing signals due to fading or other causes that the synchronizing signals are rendered ineffective so that the peak level of the resultant signals corresponds to zero or minimum vision modulation. If a tetrode or pentode valve is employed instead of the triode 27 a similar control may be effected by adjustment of the voltage applied to the screen grid of the former types of valves.

It will be seen that there is a direct connection from the coupling condenser 23 through the resistance 31 to the grid 36 of the valve 37 which therefore receives the rectified signal with the synchronizing signals extending in the positive direction together with impulses from the anode of valve 27 corresponding with the synchronizing impulses but in reverse sense. The synchronizing impulses are thus reversed into the grey or white levels of the transmitted subject and the maximum potential applied to grid 36 is that potential corresponding to minimum vision modulation, i. e., the black level. The cathode 38 of the valve 37 is coupled to earth through a condenser 41 and connected to a source of negative potential through a high resistance 39. The anode 34 is provided with a by-pass condenser 43 connected to earth and is supplied with high tension voltage from a potentiometer 45 connected across the source of high tension supply.

Whenever the grid 36 of valve 37 reaches a predetermined potential anode current will flow and charge the condenser 41, to such a potential that the anode current is almost cut off. The cathode 38 will therefore always reach a potential higher than the most positive potential of the grid 36, which is actually a negative voltage with respect to the earth line and corresponds with the black level, by an amount depending upon the grid bias of valve 37 which is dependent on the high tension voltage applied to the anode. This voltage is adjusted until for a given signal amplitude the cathode 38 will be at earth potential. A connection is taken from the cathode 38 through a resistance 47 to the anode 48 of a diode valve 49. This diode acts as an effective short circuit when the cathode 38 is at a positive potential and as an open circuit when that cathode is at a negative potential with respect to earth. Thus the diode 49 acts as a voltage delay because it will only pass potentials for gain control purposes when the amplitude of the signal is such that the cathode 38 falls below earth potential, under the conditions previously described. The gain control voltage which the diode 49 permits to pass is smoothed by a network including condensers 51 and 55 and a resistance 53 before application to the grids of high or intermediate frequency valves to be controlled.

It is to be understood that various modifications may be made in the invention and it is desired that any and all such modifications be considered within the purview of the invention except as limited by the art and the hereinafter appended claims.

We claim as our invention:

1. A system for obtaining automatic gain control potentials in a television receiver designed to receive a stabilized carrier transmission modulated by a series of picture and synchronizing signals comprising means for demodulating the received carrier to produce a series of detected picture and synchronizing signals with the synchronizing signals extending in the direction of and beyond black in the picture signals, means responsive to the synchronizing signals only to superimpose upon the demodulated signals impulses of such amplitude and phase as to reduce the amplitude of the synchronizing signals to such an extent that one extreme potential of the resultant signals corresponds to black or minimum picture signal level, and means to produce automatic gain control potentials from the minimum picture signal level of the resultant signals.

2. A television carrier wave receiver designed to receive a stabilized carrier transmission modulated by a series of picture and synchronizing signals and having an automatic gain control circuit including means for demodulating the received carrier to produce a composite series of picture and synchronizing signals with the synchronizing signals having an intensity greater

than black in the picture signals and extending in a direction opposite to white in the picture signals, means responsive to the synchronizing signals only for producing impulses of greater amplitude than the synchronizing signals of the composite series, means for applying said produced impulses to the composite series of signals in opposition to the synchronizing signals of the series so as to render the synchronizing signals substantially negative whereby the picture level of the resultant signal series will correspond to black or minimum picture signal level, and means for deriving from said resultant signals potentials for effecting automatic gain control.

3. A television carrier wave receiver adapted to receive a stabilized carrier transmission modulated by a series of picture and synchronizing signals, and having an automatic gain control circuit wherein means are provided for demodulating the received carrier to produce a composite series of picture and synchronizing signals with the intensity of the synchronizing signals exceeding the intensity of black in the picture signals and extending in a positive direction, means responsive to the received synchronizing signals for deriving impulses of greater amplitude than the received synchronizing signals in a composite series and in opposite polarity with respect thereto, means for applying the derived impulses to the demodulated composite picture and synchronizing signals to produce a resultant series of signals in which the maximum positive potential of the resultant signals corresponds to black or the minimum picture signal level, and means for producing from said resultant signals potentials for affording automatic gain control.

4. A television receiving system adapted to receive a stabilized carrier frequency modulated by a series of picture and synchronizing signals and having an automatic gain control circuit wherein means are provided for demodulating the received carrier, means responsive to the received synchronizing signals for generating impulses of synchronizing signal frequency, means for applying the generated impulses to the demodulated composite series in such amplitude and phase as to render the synchronizing signals thereof ineffective whereby the signal level of the resultant signals corresponds to black or minimum picture signal level, and means for deriving from the said resultant signals potentials for effecting automatic gain control.

5. The method of obtaining automatic gain control potentials in a television receiving system wherein a stabilized carrier modulated by a series of picture and synchronizing signals is adapted to be received which comprises the steps of detecting the received modulated carrier to produce a composite series of picture and synchronizing signals, the synchronizing signals extending in the direction of black picture signals and having a greater intensity than any picture signals, generating impulses of synchronizing signal frequency at the receiving system in response to the detected synchronizing signals, applying the generated impulses to the received and detected composite series of signals in such magnitude and phase as to reduce the amplitude of the synchronizing signals of the composite series to such an extent that the maximum potential level of the resultant signals corresponds to black picture signal level, and utilizing the resultant signals to obtain gain control potentials.

6. A system for obtaining automatic gain control potentials in a television receiver in which a radio frequency carrier modulated by a series of picture and synchronizing signals is received, comprising means for demodulating the received carrier to produce a series of detected picture and synchronizing signals with the synchronizing signals extending in the direction of and beyond black in the picture signals, means responsive to a portion of the produced series of signals to generate a voltage variation effective to reduce the amplitude of the synchronizing signals of the produced series of detected signals to such an extent that one extreme potential of the resultant signals corresponds to black or minimum picture signal level, and means to produce automatic gain control potentials from the minimum picture signal level of the resultant signals.

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