

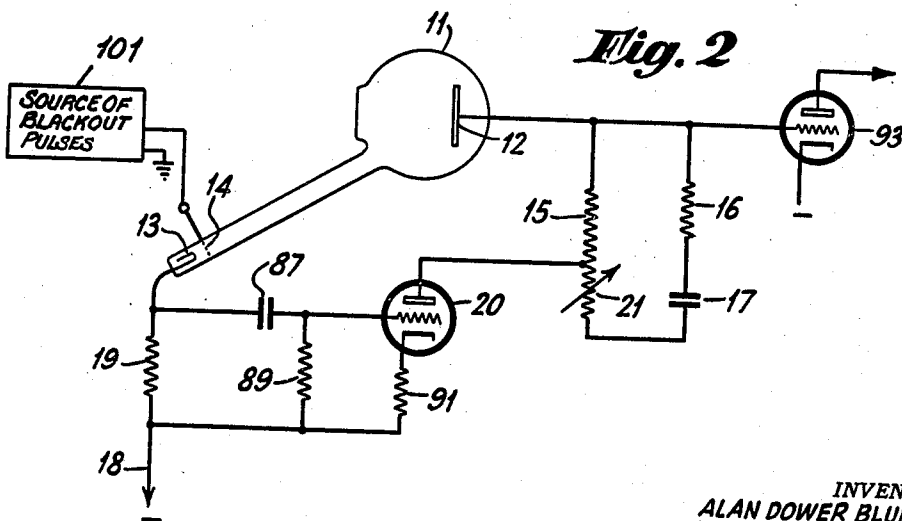
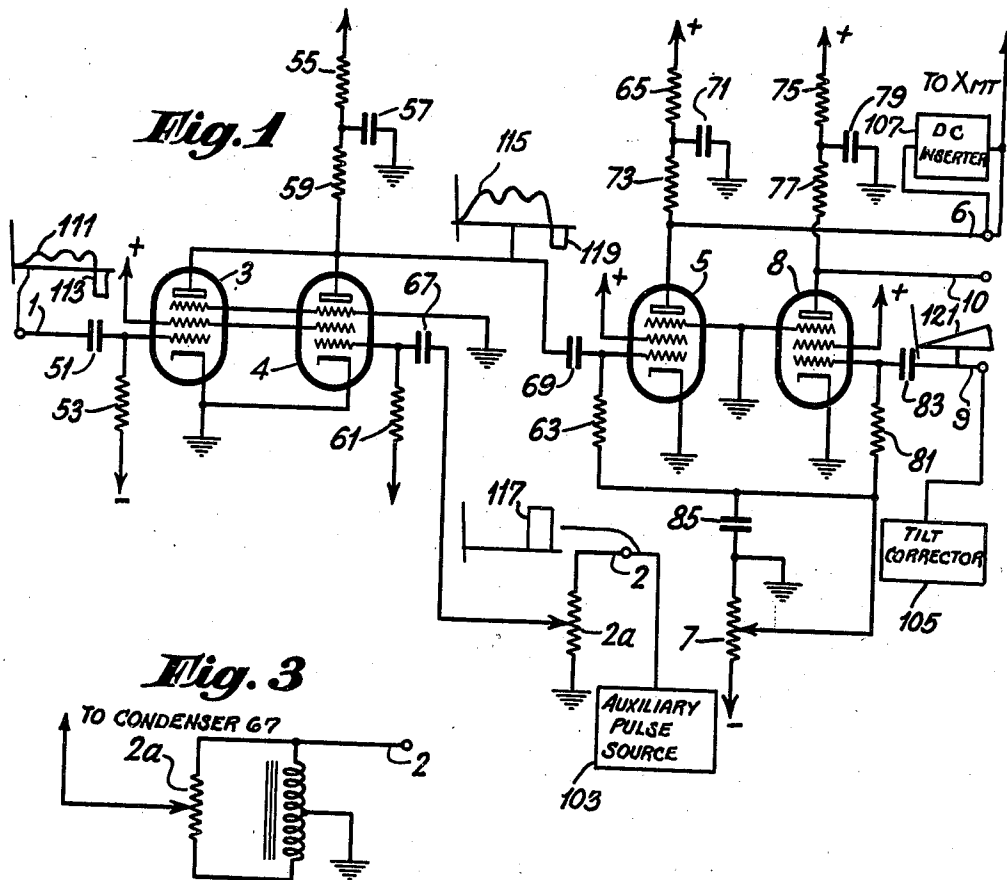
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TELEVISION OR OTHER SIGNAL TRANSMISSION SYSTEM

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TELEVISION OR OTHER SIGNAL TRANSMISSION SYSTEM

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This invention relates to electric signal transmission systems and in particular to television systems in which it is desired to insert the D. C. or low frequency components into the television signals.

It is well known in the television art to use an "Iconoscope" transmitting tube for generating picture signals and to interrupt the scanning beam during the period when the synchronising pulses are transmitted. It has been found that the interruption of the scanning beam produces a signal, which when the beam is switched off is related to, but not equal to, the "average" black of the picture to be transmitted, and this relationship is sensibly independent of the picture brightness. These signals produced during the period when the beam is switched off will be called the "blackened out" signals. They are related to "average" black because the "tilt" which is usually present prevents there being an absolute black level. By "tilt" is meant the spurious component of approximately saw-tooth wave form produced by the transmitting tube. The subject of "tilt" is discussed in more detail in the specification of United States Patent No. 2,143,398. It has also been found that a television transmission tube of the type described in the specification of U. S. application Serial No. 19,752 gives a "blackened out" signal which is related to black. Now although the "blackened out" signal is related to "average" black it is not equal to it, the departure depending on the type of tube, the beam current, etc. This difference of level between the "blackened out" signal and "average" black will be called the "shift." In some tubes with a weakly illuminated scene the shift may greatly exceed the picture amplitude.

In the specification of U. S. application Serial No. 40,532, now issued as Patent No. 2,190,753 as of Feb. 20, 1940, there is described, more particularly from page 6 line 99 to page 8 line 90, a method of D. C. reinsertion wherein use is made of the "blackened out" signal to provide a recurrent reference amplitude in the transmission of television signals. Consider a scanning tube of one of the types mentioned followed by an amplifier of adjustable gain followed by a stage for D. C. reinsertion with reference to the "blackened out" signals. For a given amplifier gain the shift can be allowed for by a bias potential at the point of D. C. re-establishment, as for example the potential applied to the cathode of valve 24 in Figure 2 of the specification of U. S. application Serial No. 40,532 now issued as Patent No. 2,190,753 as of Feb. 20, 1940. If now

the scanning tube is excited by a scene which is not so well illuminated, it is necessary to alter the gain control and to increase the gain in order to obtain a good picture. The increase in gain then increases the shift at the D. C. re-establishing point and this necessitates a re-adjustment of the bias mentioned above, if the D. C. is to be re-inserted properly. If a shift is large compared with the picture amplitude the effect of changing the gain (prior to a re-adjustment of the bias) is to change the picture brightness by an amount altogether disproportionate to the change in gain effect. Of course, the gain and bias controls can be ganged, but the ganging depends on the particular amount of shift produced by the scanning tube.

It is an object of the present invention substantially to overcome the above difficulty.

According to the present invention there is provided an apparatus for stabilising a recurrent datum level in television or like signals having a recurrent reference amplitude which is related to but not equal to said datum level, comprising means for adding to said signals prior to the point in the signal channel at which said datum level is stabilised, an auxiliary signal which substantially annuls the difference between said reference amplitude and said datum level, whereby the stabilisation of said datum level can be rendered substantially independent of changes in the gain of the signal channel prior to said point of stabilisation.

According to a feature of this invention, said television or the like signal is generated by a cathode ray scanning tube, said reference amplitudes are the signals produced during periods when the beam is cut off, and said auxiliary signals are similar to and generated simultaneously with signals used to cut off said beam.

According to a further feature said reference amplitudes are produced during the intervals between lines when the beam is cut off, and said auxiliary signals are derived from the signals which cut off the beam.

According to a further feature said auxiliary signals are derived from the beam current of the scanning tube.

The amplitude and/or sense of said auxiliary signals are preferably controlled so as to adjust the final level of the datum (or black) level of the signal after D. C. re-establishment.

For the purpose of describing the invention more in detail reference will now be made to the accompanying drawing in which Figures 1 and 2 illustrate particular embodiments according to

the invention and Figure 3 is a preferred form of phase reversing circuit.

It has already been shown that if the gain control prior to the D. C. re-establishment is varied, then the D. C. level is seriously upset. According to the invention therefore an auxiliary signal, consisting of pulses similar in duration and timing to the black out pulses, that is, the pulses which are used to cut off the electron beam, is added to the signals prior to D. C. re-establishment, and these auxiliary pulses, if of sufficient amplitude and of correct sense, change the "blackened out" signal amplitude so that it is coincident with black. Alteration of the signal amplitude, as by gain control, then no longer affects the D. C. level of black.

Figure 1 shows a circuit for effecting such a mixture. The arrow heads pointing upwardly or downwardly indicate that the leads to which the arrow heads are attached are connected respectively to suitable positive or negative potential supplies. The signals from the scanning tube are applied to terminal 1 and through a suitable coupling condenser and grid leak resistance to the grid of valve 3. The auxiliary signals are applied to the terminal 2 to the grid of valve 4 via a suitable coupling condenser and grid leak resistance. The cathodes and suppressor grids of valves 3 and 4 are earthed. The anodes of valves 3 and 4 are joined in parallel to a common anode load resistance, which is suitably decoupled by a resistance and condenser. The auxiliary signals may be line black out pulses, for example. They are phased so as to be synchronised with the "blackened out" signals arriving at terminal 1. The amplitude of the auxiliary signals introduced is controlled by the potentiometer 2a. With the arrangement of Figure 1 only one sense of auxiliary pulse is provided. Figure 3 shows an alternative arrangement of the potentiometer which gives signals of either sense. In this figure a transformer winding is connected in parallel with the potentiometer 2a and the centre tap of the transformer is connected to earth, the auxiliary signals being applied at terminal 2. It can be seen that the signal produced across one half of the transformer is equal in magnitude, but of opposite sign, to that produced across the other half of the transformer. Therefore, by altering the position of the tapping on the potentiometer it is possible to change the magnitude and to reverse the phase of the auxiliary signal applied to valve 4. The auxiliary pulses and the picture signals are mixed in the common anode circuit of valves 3 and 4 and pass through a suitable coupling condenser and grid leak resistance to the gain control stage 5, which comprises a variable-mu valve with bias controlled by potentiometer 7, which is suitably decoupled by a condenser. The valve 5 is provided with an anode resistance and decoupling resistance and condenser and the output is taken from terminal 6 for further amplification and D. C. re-establishment. The potentiometer 2a may be adjusted to give the correct black level out, it being assumed that the D. C. re-establishment device is adjusted to give the correct level when the modified "blackened out" signal is equal to the average black level.

When D. C. re-establishing on the "blackened out" signal it is preferable to mix any tilt correction signals required after D. C. re-establishment. Alteration of the gain control alters the amplitude of tilt correction required. An additional gain control valve 8, with similar gain character-

istics to 5 is therefore shown. The tilt correction signals are applied to terminal 9 and through a coupling condenser and resistance to the grid of valve 8 and pass out at 10 for subsequent mixing with the signal. Valve 8 is provided with the necessary anode load resistance and decoupling arrangement. As the picture signals are altered in amplitude in valve 5, so are the tilt correction signals altered in valve 8.

In order to aid in appreciating the invention, there is shown in the drawing the wave forms of the various signals to input terminals. The signal input to the terminal 1 comprises the picture signal 111 and the average black signal 113 upon which is superimposed the spurious signal generated as above described by the blacking out of the beam. It will be appreciated that the exact wave form of the spurious signal and the auxiliary signal need not be identical, since there is the area under the two wave form curves that is of importance in determining the setting of the black level. The auxiliary pulse signal supplied from the source 103 is shown at 117 and comprises a rectangular pulse similar to the assumed spurious signal whose polarity is opposite to that of the signal 113 and whose amplitude is greater than that of 113. The output of the two tubes 3 and 4, therefore, shows the amplified picture signal 115 which is merely a magnified replica of 111, together with the corrected black-out pulse 119 which represents the difference between 113 and 119. This signal is fed through the condenser 69 to the amplifier tube 5 which, from the terminal 6, feeds the D. C. inserter 167 substantially the same wave form shown at 115-119 with, however, greater amplitude due to the amplification of the tube 5. The tilt corrector 165 feeds into the terminal 9 a wave shape 121 which is substantially triangular for the assumed condition of the black spot increasing linearly with deflection. The output of the tube 8 fed from terminal 10 has the identical wave shape of 121, except, of course, it is of greater amplitude and the output from tube 8 is combined with the output of the D. C. inserter as described above.

Figure 2 shows an arrangement by which the auxiliary signals may be mixed in at the scanning tube, the arrangement being such that the auxiliary signals are automatically varied in accordance with the strength of scanning beam 11 represents a scanning tube of which only the signal plate connection 12, the cathode 13 of the gun, and the control grid 14 of the gun are shown. The signal plate is connected to a composite load consisting of a very high resistance 15 shunted by a lower resistance 16 in series with a condenser 17. This composite arrangement gives a very large signal (as compared with 16 alone) at low frequencies, thus reducing the effective "flicker" noise of the amplifier. The frequency distortion produced by this arrangement is corrected later. The cathode 13 is connected to the negative supply lead 18 through a resistance 19. The cathode 13 is also coupled through a condenser and leak to the grid of a valve 20 whose anode load is a variable resistance 21. Valve 20 is provided with a suitable cathode biasing resistance. When the black out pulses arrive at 14 to switch off the beam during the return strokes of lines and frames, the cathode current ceases, causing the potential drop across 19 due to the cathode current to vanish. This negative signal reduces the current in 20 thus producing a positive pulse across 21. The resistance 21 is

adjusted in a similar manner to the potentiometer in Figure 1 to give auxiliary signals which neutralise the shift. If the phase is incorrect for correction a further phase reversing valve can be inserted between 13 and 21. With certain types of scanning tubes, the shift is proportional to the beam current. With the arrangement described, if the beam current is increased (as by altering the bias on 14) the drop across 19 increases and so the signals produced when the beam is cut off increase on the grid of 20, so increasing the auxiliary signals appearing across 21.

In practice it has been found that the "blackened out" signal from the scanning tubes are more constant if the tube is illuminated in a suitable manner by light from a small lamp in a manner such as that described in co-pending U. S. application Serial No. 185,480.

I claim:

1. The method of television transmission which comprises supplying picture signals having direct current and alternating current components, which signals are recurrently interrupted by a spurious signal related to the black level of the picture, adding auxiliary signals in substantially time coincidence to the spurious signals, the auxiliary signals being of such amplitude and polarity to give a resultant representative of the black level of the picture, manually controlling the amplification of the unsuppressed components of the picture signals in accordance with the picture signals and reinserting direct current components representative of the suppressed direct current components subsequent to the controlling of the amplification of the unsuppressed picture signals.

2. The method of television transmission which comprises supplying picture signals having direct current and alternating current components, which signals are recurrently interrupted by a spurious signal related to the black level of the picture, adding auxiliary signals in substantially time coincidence to the spurious signals, the auxiliary signals being of such amplitude and polarity to give a resultant representative of the black level of the picture, manually controlling the amplification of the unsuppressed components of the picture signals in accordance with the picture signals, reinserting direct current components representative of the suppressed direct current components subsequent to the controlling of the amplification of the unsuppressed picture signals, supplying a second auxiliary signal, manually controlling the amplification of the second auxiliary signal in accordance with the picture signals, and subsequently combining the amplified auxiliary signal with the picture signal and the reinserted direct current components.

3. A television transmission system comprising means for supplying picture signals having direct current and alternating current components, which signals are recurrently interrupted by a spurious signal related to the black level of the picture, means for adding auxiliary signals in substantially time coincidence to the spurious signals, the auxiliary signals being of such amplitude and polarity to give a resultant representative of the black level of the picture, means for manually controlling the amplification of the unsuppressed components of the picture signals in accordance with the picture signals, and means for reinserting direct current components representative of the suppressed direct current components subsequent to the controlling of the amplification of the unsuppressed picture signals.

4. A television transmission system comprising means for supplying picture signals having direct current and alternating current components, which signals are recurrently interrupted by a spurious signal related to the black level of the picture, means for adding auxiliary signals in substantially time coincidence to the spurious signals, the auxiliary signals being of such amplitude and polarity to give a resultant representative of the black level of the picture, means for manually controlling the amplification of the unsuppressed components of the picture signals in accordance with the picture signals, means for reinserting direct current components representative of the suppressed direct current components subsequent to the controlling of the amplification of the unsuppressed picture signals, means for supplying a second auxiliary signal, means for manually controlling the amplification of the second auxiliary signal in accordance with the picture signals, and means for subsequently combining the amplified auxiliary signal with the picture signal and the reinserted direct current components.

5. A television transmitter comprising a cathode ray tube having a cathode, control electrode, anode and target electrode, a power supply, a resistor connected between the power supply and said cathode, a first thermionic amplifier having a cathode, grid and plate, means to supply potential variations occurring across said resistor connected between the cathode and power supply to the grid and cathode of said thermionic amplifier, a resistor connected between said power supply and said target electrode, a connection from said resistor to the plate of said thermionic amplifier, a serially connected resistor and condenser connected in parallel with said resistor connected to said target electrode, a second thermionic amplifier having a cathode, grid and plate, and a connection from said target electrode to the grid of said second thermionic amplifier.

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