



PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Blanking Circuits for Television Receivers

We, R.C.A. CORPORATION, formerly Radio Corporation of America, a Corporation organized under the laws of the State of Delaware, United States of America, of 30 Rockefeller Plaza, City and State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to retrace blanking circuits for television receivers.

In television receivers, if the electron beam is not turned off during the horizontal and vertical retrace intervals, the image reproduced by the picture tube may be adversely affected. For example, if the electron beam is not suppressed during the vertical retrace interval, diagonal lines may be superimposed on the image reproduced by the picture tube. This problem is of particular concern in color television receivers wherein spurious colors may be produced during vertical and horizontal blanking intervals unless the electron beam is suppressed.

Retrace blanking circuits have been devised which apply a blanking pulse derived from the receiver deflection circuits to a suitable point in the television receiver to suppress the electron beam during the retrace interval. Under certain conditions it is desirable to apply the blanking pulse to a point in the receiver which may have a low impedance to reference potential or ground at the blanking pulse frequency. For example, in color television receivers, a low impedance point, where the blanking pulses may be applied, is at the control electrode circuit of a video amplifier stage which is driven by a low impedance delay line. In order to develop blanking pulses of sufficient amplitude across such a low impedance circuit, either the deflection circuits must be designed to provide the power required, or an additional amplifier stage for the blanking pulse is

required. In either case, it is possible that the blanking pulse may adversely affect the operation of circuits preceding the circuit to which the blanking pulses are applied.

It is an object of the present invention to provide a new and improved retrace blanking circuit for television receivers.

According to the present invention there is provided a retrace blanking circuit for a television receiver including a source of video signals, deflection waveform generating circuits, and a video amplifier stage coupled to a kinescope, said retrace blanking circuit including a rectifier connected between said source of video signals and said video amplifier stage, the rectifier being biased in such a way as to be conductive to said video signals; and a circuit for applying a pulse signal from said deflection waveform generating circuits to said rectifier for rendering said rectifier non-conductive to decouple said video signal source from said video amplifier stage during the retrace interval of the deflection waveform and simultaneously causing said video amplifier stage to develop a signal for blanking said kinescope during said retrace interval.

In the accompanying drawings:

Figure 1 is a schematic circuit diagram partly in block form, of a color television receiver embodying the blanking circuit of the present invention;

Figure 2 is a waveform diagram useful in illustrating the operation of the blanking circuit shown in Figure 1; and

Figure 3 is a schematic circuit diagram illustrating another embodiment of the present invention as applied to the receiver shown in Figure 1.

The blanking circuit of the invention will be described in the context of a color television receiver. It is to be understood, however, that the circuit of the invention is equally adaptable for use in black and white or monochrome receivers as well as color receivers.

Referring now to the drawings, wherein like parts are indicated by like reference numerals in all figures, and referring in particular to Figure 1, a color television receiver includes an antenna 10, which is coupled to a tuner—I.F. amplifier 12. The tuner may include, as is known, a radio frequency (R.F.) amplifier, mixer and oscillator stages for amplifying and converting received radio frequency signals to corresponding intermediate frequency (I.F.) signals, and an intermediate frequency amplifier for amplifying the I.F. signals. An intercarrier sound signal is derived at an output of the intermediate frequency amplifier and supplied to the sound I.F. amplifier and audio channel 14 so as to reproduce the sound accompanying the picture signal in a loudspeaker 16. The amplifier I.F. signal is coupled by means of a transformer 18 through a video detector circuit 20 to a video amplifier stage 22.

The output of the video amplifier stage 22 is coupled through a delay line and blanking circuit 24 (shown enclosed in the dashed rectangle and to be described hereinafter) to a second video amplifier or video output stage 26 and then to the cathode electrodes (not shown) of a color picture tube 28. It will be noted that in the detector circuit 20, the diode is poled to detect the negative envelope of the composite video signal so that the signal output of the video amplifier stage 22 has its synchronizing pulse excursions in the negative direction. The output of the video amplifier stage 22 is also applied through a sync, AGC, and chroma amplifier 29 to a chrominance circuit 30, and sync separator circuit 32 for processing of the component parts of the video signal to produce a visual display in the color picture tube 28 in accordance with known techniques. An automatic gain control (AGC) amplifier 34 is also coupled to the output of the amplifier 29 to develop and supply gain control signals to the tuner and I.F. amplifier 12.

For example, the sync separator circuit 32 serves to separate the deflection synchronizing components from the composite video signal in accordance with well-known amplitude selective techniques. These synchronizing components are applied to vertical deflection circuit 36 and horizontal deflection and high voltage power supply circuit 38 to synchronize the development therein of suitable vertical and horizontal deflection waveforms. Each of the waveforms has a relatively long scanning portion and relatively short retrace portion for application to the appropriate deflection yoke elements 40 which surround the neck of the picture tube 28. As is known, the scanning and retrace portions of the horizontal deflection waveform are of considerably shorter time duration than the respective scanning and

retrace portions of the vertical deflection waveform. The vertical deflection circuit 36 includes a vertical output transformer having a winding 96. A negative pulse is developed across winding 96 during the vertical retrace interval. In addition, the horizontal deflection and high voltage power supply circuit 38 supplies the necessary high voltage required by the anode 42 of the color picture tube 28.

The chrominance circuit 30 includes a pulse amplifier, color demodulators, and other circuitry known in the art to synchronize and detect the color information of the composite video signal and then apply such color information to appropriate grids of the picture tube 28.

The foregoing circuitry may for example correspond to that used in the CTC-19 color television receiver chassis manufactured by the Radio Corporation of America and shown in the RCA Service Data Pamphlet 1965, No. T 13, published by RCA Sales Corporation, 600 North Sherman Drive, Indianapolis, Indiana, United States of America.

Referring now to circuits 24 and 26 of Figure 1, the video signal output of amplifier stage 22 is coupled through a resistor 44 and delay line 46, by means later to be described, to the input circuit of the video amplifier stage 26. The delay line 46 has a relatively low impedance, as for example 600 ohms and is designed to have a reasonably uniform amplitude response over the frequency range of the luminance information portion of the video signal. The delay line 46 is terminated at its end remote from resistor 44 by a resistor 48 in series to ground with an inductor 50 so as to minimize reflections that might tend to destroy fidelity of translation of the luminance information through the line. The electrical length of the line 46 is chosen so as to impart a time delay to the luminance information passing therethrough which substantially equals the normal time delay imparted to signals processed through the chrominance circuit 30 of the color television receiver.

The video amplifier stage 26 includes a pentode tube 52 having cathode, control grid, screen suppressor, and plate electrodes 54, 56, 58, 60 and 62, respectively. The luminance signals are applied to the control grid 56 through a D.C. blocking capacitor 64 in series with a video peaking network 66. Screen electrode 58 is connected through a resistor 68 to a source of screen operating potential V_1 . Resistor 68 is bypassed at signal frequencies by a capacitor 70. The suppressor electrode 60 is grounded, and the plate electrode 62 is connected through a plate load resistor 72 to a source of operating potential V_2 .

The cathode electrode 54 of tube 52 is coupled through a potentiometer 74 to

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ground. Potentiometer 74 may also serve as a contrast control in the TV receiver. Connection is also made from the cathode 54 through a video peaking network 76 to ground. A brightness control circuit for the receiver comprises a pair of series resistors 82 and 84 connected from the cathode of the video amplifier stage 22 to a source of negative potential—V (not illustrated) with an adjustable contact 80 on the resistor 82 connected through resistor 78 and network 66 to the control grid 56.

In accordance with the illustrated embodiment of the invention, a rectifier 86 is serially connected in the video signal path coupling the video amplifiers 22 and 26. The cathode 90 of the rectifier 86 is connected to the delay line 46 and the rectifier anode 88 is connected through a resistor 92 to a source of positive potential V_3 . Also connected to the rectifier anode 88 is one terminal of a resistor 94, the other terminal of which is connected to winding 96.

In operation, during the vertical scanning interval, the rectifier 86 is forward biased by the supply V_3 , with forward biasing current predominately flowing from ground through inductor 50, resistor 48, rectifier 86, and resistor 92 to the supply V_3 . In the forward biased condition, the rectifier presents a very low series impedance in the video signal path between the delay line 46 and the video amplifier 26. Since the resistor 94 is large relative to the impedance looking back through the diode toward the video amplifier 22, the scanning wave from the vertical deflection circuit 36 is effectively isolated from the video signal path, and very little of the scanning wave is superimposed on the video signal.

During the vertical retrace interval, a large negative pulse (retrace pulse) is produced by the vertical deflection circuit across the winding 96 of the vertical output transformer. This pulse is applied through the resistor 94 to the anode 88 of the rectifier 86. The resistors 92 and 94 are proportioned so that the negative pulse overcomes the forward bias on the rectifier 86. This causes rectifier 86 to become non-conductive and present a high impedance in the video signal path between the delay line 46 and the video amplifier 26.

Thus, during the vertical retrace interval, due to the high impedance of the rectifier, the transformer winding 96 is effectively decoupled from the video signal path. This substantially prevents loading of the negative pulse by the low impedance of the delay line and output circuit of the video amplifier stage 22. The negative pulse developed at the junction of resistors 92 and 94 is coupled to the video amplifier stage 26 through capacitor 64 and peaking network 66. From there, it drives the grid electrode 56 sufficiently negative with respect to the

cathode 54 so as to cut off the amplifier tube 52 and cause the voltage on the plate electrode 62 to rise in the positive direction toward the potential of V_2 .

The rising voltage of plate 62 is coupled to the cathodes (not shown) of the color picture tube 28 to suppress or cut off the electron beams therein and thereby blank said picture tube during the vertical retrace interval. This prevents the appearance of vertical retrace lines in the displayed image. The time interval during which the tube 52 is cut off to cause blanking is determined by the resistors 92 and 94, the forward bias on the rectifier 86, the amplifier tube 52 characteristics and operating bias, and the magnitude and rate of decay of the retrace pulse.

When the retrace pulse has decayed to a point where the rectifier 86 is again forward biased, the video signal can again be transmitted to the video amplifier stage 26.

In Figure 2, there is illustrated a voltage waveform derived from the vertical deflection circuit 36 and appearing across the winding 96 of the vertical output transformer. At some point A, determined by the bias potential V_3 , resistors 92 and 94 and the magnitude of the pulse, the rectifier 86 is rendered non-conductive, leaving a negative pulse portion P which is applied to the video amplifier stage 26 to cutoff tube 52 during vertical retrace.

A particular set of values of the circuit portion 24 of Figure 1 which has provided satisfactory operation is set forth below. It will be appreciated that these values are given by way of example only.

Resistor 48	680 ohms	
Resistor 92	560K ohms	
Resistor 94	15K ohms	105
Inductor 50	27 μ h.	
Capacitor 64	0.1 μ f.	
Rectifier 86	Fairchild Semiconductor Type FD222	
Bias Voltage V_3	+405 Volts D.C.	110

The remaining component values and circuit details of Figure 1 may conform to the details of the corresponding components of the aforementioned CTC19 color television receiver chassis.

Referring now to Figure 3 of the drawings, there is shown a modification of the vertical blanking circuit portion of Figure 1, including both a vertical and a horizontal blanking circuit constructed in accordance with the principles of the present invention. Reference numerals identical to those in Figure 1 indicate corresponding components.

Vertical blanking is accomplished during the vertical retrace interval by coupling a negative pulse from the vertical deflection circuit 36 through resistor 94 to the anode 88 of the forward biased rectifier 86, whereby the rectifier is rendered non-conductive to the

video signal and the tube 52 is driven into cutoff condition. The circuit operates in a manner similar to that described for the circuit of Figure 1.

5 For blanking during the retrace interval of the horizontal deflection waveform, a negative going pulse obtained from the horizontal deflection circuit 38 during the horizontal retrace interval, is coupled to the anode 88 of the rectifier 86. In the illustrated embodiment the negative going pulse is applied to a pulse amplifier 100 and is coupled through a capacitor 102 in series with a resistor 104 to the anode 88 of the rectifier 86. The pulse amplifier 100 is coupled to a horizontal output transformer in the horizontal deflection circuit 38. The pulse amplifier 100 and horizontal deflection circuit 38 may be similar to that described in the
10 the aforementioned CTC19 color television receiver chassis, with the pulse amplifier comprising the "Blanker" stage shown therein.

25 Accordingly, with the above arrangement, the principles of the present invention can be used to produce blanking during both the horizontal and vertical retrace intervals.

WHAT WE CLAIM IS:—

30 1. A retrace blanking circuit for a television receiver including a source of video signals, deflection waveform generating circuits, and a video amplifier stage coupled to a kinescope, said retrace blanking circuit including a rectifier connected between said
35 source of video signals and said video amplifier stage, the rectifier being biased in such a way as to be conductive to said video signals; and a circuit for applying a pulse signal from said deflection waveform generating circuits to said rectifier for rendering said rectifier non-conductive to decouple said video signal source from said video amplifier stage during the retrace interval of the deflection waveform and simultaneously causing said video amplifier stage to develop
40 a signal for blanking said kinescope during said retrace interval.

45 2. A retrace blanking circuit in accordance

with claim 1, wherein said circuit for applying said pulse signal to said rectifier is of a high impedance relative to the impedance seen looking back through said rectifier toward said source of video signals whereby said deflection waveform generating circuits are effectively isolated from said source of video signals and said video amplifier stage during the scanning interval of said deflection waveform.

3. A retrace blanking circuit in accordance with claim 1 or claim 2, wherein said rectifier is biased by a circuit which includes a resistor connected between a source of direct potential and the junction of said rectifier and said video amplifier stage, said source of direct potential, said source of video signals, said rectifier and said resistor providing a direct current circuit for biasing said rectifier to present a low impedance to the transfer of video signals during the scanning interval of said deflection waveform, the ratio of said resistor to said high impedance being of a value such that the pulse voltage developed during the retrace interval is sufficient to reverse bias said rectifier.

4. A retrace blanking circuit in accordance with any one of the preceding claims wherein said source of video signals contains vertical and horizontal deflection synchronizing components and wherein said deflection waveform includes a vertical deflection portion, characterized by a circuit producing a first pulse signal during the horizontal retrace interval and a second pulse signal during the vertical retrace interval, said rectifier being coupled to both said first and second pulse signals, and being rendered non-conductive upon the application of either of said signals.

5. A retrace blanking circuit for a television receiver substantially as described with reference to the accompanying drawings.

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Accordingly, with the above arrangement, the principles of the present invention can be used to produce blanking during both the horizontal and vertical retrace intervals.

WHAT WE CLAIM IS:—

1. A retrace blanking circuit for a television receiver including a source of video signals, deflection waveform generating circuits, and a video amplifier stage coupled to a kinescope, said retrace blanking circuit including a rectifier connected between said source of video signals and said video amplifier stage, the rectifier being biased in such a way as to be conductive to said video signals; and a circuit for applying a pulse signal from said deflection waveform generating circuits to said rectifier for rendering said rectifier non-conductive to decouple said video signal source from said video amplifier stage during the retrace interval of the deflection waveform and simultaneously causing said video amplifier stage to develop a signal for blanking said kinescope during said retrace interval.

2. A retrace blanking circuit in accordance

with claim 1, wherein said circuit for applying said pulse signal to said rectifier is of a high impedance relative to the impedance seen looking back through said rectifier toward said source of video signals whereby said deflection waveform generating circuits are effectively isolated from said source of video signals and said video amplifier stage during the scanning interval of said deflection waveform.

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