PATENT SPECIFICATION (11) 1220993

1220993

DRAWINGS ATTACHED

(21) Application No. 1067/68 (22) Filed 6 March 1968

(31) Convention Application No. 620728 (32) Filed 6 March 1967 in

(33) United States of America (US)

(45) Complete Specification published 27 Jan. 1971

(51) International Classification H 04 n 9/48

(52) Index at acceptance

H4F D19 D1B1 D1D1 D1K1 D30A D32

(72) Inventor DAVID HARRY CARPENTER

(54) COLOUR KILLER AND AUTOMATIC CHROMA CONTROL CIRCUITS

(71) We, RCA CORPORATION, formerly Radio Corporation of America, a corporation organised 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 improved circuits for providing automatic chroma control, color killing and burst blanking in the chrominance channel of a color television receiver.

Color television receivers often include automatic chroma control (A.C.C.) circuits for maintaining the chroma signals at a proper level, burst blanking circuits for preventing the periodic color synchronizing bursts from interfering with the operation of the color signal detection circuits, and color killer circuits for cutting off the chroma channel when monochrome transmissions are being received or when the received color transmission is to weak that a better picture is produced without color than with it.

It can be seen that the color killer circuit and the automatic chroma control circuit have substantially opposite functions. That is, the color killer circuit will cut off the chroma channel when the color burst synchronization signal level drops to a low level. The function of the automatic chroma control circuit is to increase or amplfy the chroma signals even though the received signals are becoming weaker.

It is generally more economical to derive both the color killer voltage and the ACC signal from the same point of the circuit in the color television receiver. Also, the same tube is sometimes used to achieve both functions. For example, if the chrominance amplifier is used, the gain of the chrominance amplifier is varied to maintain the reproduced color signal at a selected level. The color killer circuit may cut off the chrominance amplifier to produce the color killer function.

It is evident that great care must be taken to prevent the color killer circuit from interfering with the ACC circuit and vice versa.

It is an object of the invention to provide improved circuits for performing these functions especially in color television receivers having but a single chrominance amplifier to which the necessary control voltages may be applied.

In accordance with the present invention there is provided an automatic chroma control and color killer circuit for a color television receiver wherein the detected video signal includes periodic color synchronizing bursts, characterized by a point common to the automatic chroma control and the color killer circuit at which is derived both the automatic chroma control signal and the color killer signal, said point being connected to the gain control electrode of a chrominance amplifier, a source of a first control voltage varying in amplitude with changes in amplitude of said color synchronizing bursts, first coupling means coupling said source of said first control voltage to said common point for producing automatic chroma control signals at said common point and applying said automatic chroma control signals to said gain control electrode so as to increase the gain thereof for smaller amplitude burst and to decrease the gain thereof for larger amplitude bursts, color killer means having an input connected to said source of first control voltage and an output connected to said common point for producing color killer signals at said common point, said color killer means including a unilateral current conducting device which conducts and produces said color killer voltage at said common point only after the amplitude of said bursts falls below a selected level.

An embodiment of the invention will now be further described with reference to the accompanying drawings, of which:

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FIGURE 1 illustrates in block diagram and schematic form a color television receiver incorporating the circuit embodying this invention; and

FIGURE 2 includes curves illustrating certain operating characteristics of the color killer amplifier.

Reference is now made to FIGURE 1 for a description of one possible arrangement of the major components of a color television receiver. Transmitted signals are intercepted by an antenna 4 and applied to means 6 for selecting a given channel and producing corresponding intermediate frequency (I.F.) signals.

The sound channel includes a second detector 8, an amplifier 10 that is selectively responsive to the beat frequency between the frequency modulated sound I.F. carrier and the amplitude modulated video I.F. carrier. Detector 12 recovers the audio signal represented by the beat frequency, and after suitable amplification in an audio amplifier 14, the audio signal is applied so as to energize a loudspeaker 16.

The means for processing luminance signals is a luminance channel having a second detector 18 and a video amplifier 20, the output of the latter being applied so as to control the luminance of the images formed by the cathode ray tube 22.

Synchronization of the line and field deflection is obtained by connection of a driver amplifier 24 between the output of the video second detector 18 and a deflection system 26.

An automatic gain control voltage for the I.F. and/or radio frequency (R.F.) amplifiers included in the means 6 is derived by an automatic gain control (A.G.C.) system 28 that is keyed by pulses derived from the deflection system 26 (which, in the usual manner is controlled by the synchronizing impulses contained in the video signal fed to it from video amplifier 20) so as to be responsive only to the line synchronizing pulses contained within the video signals supplied to it from a source of video signals herein shown as the driver amplifier 24.

In the chrominance channel of the receiver, which is the means for processing chrominance signals, the output of the driver amplifier 24 is applied to the input of a chrominance amplifier *30* and also to the input of a burst separating means herein illustrated as a keyed amplifier *32* by a capacitor 44. The output of the chrominance amplifier *30* is coupled to a color signal detection system 34. The output of the burst amplifier *32* is coupled via a filter network *36* to a control electrode of a color reference oscillator *40* so as to synchronize its phase and frequency.

The output of the oscillator *40* is applied to the color signal detection system 34, and its output is applied to the cathode ray tube 22 so as to control the color in the picture produced thereby. The A.C.C. and color killer circuits embodying the principles of this invention are included within the dotted line *42*.

In particular, the video signals at an output of the driver amplifier 24 are coupled by the capacitor 44 to a series resonant circuit, which is comprised of an inductor 46, a Q spoiling resistor 48 and a capacitor 50. The series circuit selects the chrominance signals from the rest of the video signals and applies them via a connection 49 to a gain control grid *52* of a pentode chrominance amplifier 54. The cathode *56* of tube 54 is biased by a cathode resistor 58 and a parallel bypass capacitor 59. The anode 60 is connected via a primary winding 62, tuned by inherent capacitance, not shown, of an output transformer *64*, to a point of positive D.C. potential.

The amplifier chrominance signals produced in the primary winding 62 are coupled to the color signal detection system 34 by a secondary winding 66 that is tuned to resonance for the frequencies of the chrominance signals by a shunt capacitor 68. The primary and secondary windings 62 and 66 constitute a bandpass transformer for the chrominance signals. Positive burst blanking pulses 70 that occur during the intervals when the color synchronizing bursts are present, may be derived by an auxiliary winding 72 on the line deflection transformer, not shown, in the deflection system 26 and applied to the cathode *56* so as to reduce or cut off conduction in the tube *54* and prevent the color synchronizing bursts from being applied to the color signal detection system 34.

The burst amplifier *32*, filter *36* and oscillator *40* operate to provide a continuous reference wave to the color detection system 34 that is synchronized in phase and frequency with the several cycles of the color subcarrier that are contained within the burst blanking pulses 70. Video signals, including the bursts, are coupled from the driver amplifier 24 via the capacitor 44 and a capacitor 74 to a control grid 76 of a pentode amplifier 77 and to the ungrounded terminal of a grid leak resistor 78. Positive operating potential is supplied via a diode 80 to the screen grid 81, and via a primary winding 82 of an output transformer *84* to the anode 86 of tube 77. Chrominance signal frequencies are bypassed to ground by a capacitor 88.

In order that the tube 77 may pass only the color synchronizing bursts, positive keying pulses 90 are provided, which are derived from an auxiliary winding 92 on the line deflection transformer, not shown, in the deflection system 26. These pulses are applied with reduced amplitude via a voltage divider, formed by a resistor 94 and the grid leak resistor 78, to the control grid 76. Increased gain may be obtained by also applying the keying pulses 90 to the screen grid 81 via a capacitor

96 and a resistor 98 and to the anode 86 via the primary winding 82.

During the intervals between the keying pulses 90, the grid 76 is at ground potential, and the cathode 100 is maintained at a sufficiently positive potential to cut off the tube 77 by selecting a sufficiently large value for the cathode resistor 102 and suitably long RC time constant for the cathode resistor 102 and the shunt capacitor 104.

The amplifier bursts appearing across the primary winding 82 of the output transformer *84* are coupled by a secondary winding 108 to a series circuit comprised of a D.C. blocking capacitor 112, a crystal 114 and a variable capacitor 116. The series circuit is resonant only at the fundamental frequency of the bursts so that a continuous wave of the fundamental frequency, which is the same as the frequency of the cycles of color subcarrier included in the burst, appears across the variable capacitor 116.

The ratio of the turns of the primary winding 82 and the secondary winding 108 are such as to match the impedance at the anode 86 to the impedance of the series circuit 112, 114, 116. A resistor 117 having a resistance equal to the magnitude of the series circuit impedance is connected in shunt with the secondary winding 108. Neutralization of sideband components of the bursts that might pass through the capacitance of the holders of the crystal 114 is effected by a capacitor 118.

The continuous wave of the color subcarrier frequency thus produced across the capacitor 116 is applied to a control grid 120 of an amplifier 122 of the oscillator *40* so as to pull the oscillator *40* into phase and frequency synchronism. In the particular oscillator circuit shown, the cathode 124, the control grid 120, and the screen grid 126 are connected in a circuit configuration similar to that of a tuned plate tuned grid oscillator. Positive D.C. operating potential is applied to the screen grid 126 via a resistor 128, and an inductor 130.

A capacitor 132 provides a low impedance path for the frequency of the reference wave between ground and the junction of the inductance 130 and the resistor 128, and thus the inductor 130 is effectively in parallel with a capacitor 134. Their values are selected so as to produce parallel resonance at a frequency just a little above the frequency of the reference wave.

The crystal 14 and the variable capacitor 116 comprise the significant elements of a parallel circuit connected between the grid 120 and ground that is resonant at the frequency of the reference wave. A capacitor 136 is connected between the screen grid 126 and the control grid 120 so as to provide more feedback than is produced by the interelectrode capacitance between them. The anode 138 of the amplifier 122 is electron coupled to the screen grid 216 and is connected to a point of positive voltage via a primary winding 140 of an output transformer 142 that is in series with a voltage dropping resistor 146. A bypass capacitor 148 is connected between ground and the junction of the primary winding 140 and the resistor 146. The reference wave output of the oscillator produced across the primary winding 140 is coupled via a secondary winding 144 to the color signal detection system 34.

The following description relates to a source of or a means for deriving a voltage that varies in magnitude with the amplitude of the bursts and hence with the level of the chrominance signals. When no bursts are present in the video signal, no continuous wave is applied to the grid 120, and the oscillator *40* operates at a frequency that is approximately equal to that of the color subcarrier.

Positive half cycles of the oscillations produced at the control grid 120 by oscillator action are rectified by the grid 120 and cathode 124 so as to produce at the grid 120 a negative direct voltage component of a given value. When bursts are present in the video signal, and the oscillator *40* is synchronized, the continuous wave from the capacitor 116 adds in phase to the oscillations produced at the control grid 120 by the oscillator so that the rectified direct voltage produced at the grid increases. Since the change in the direct voltage at the grid 120 is proportional to the amplitude of the bursts and hence, during normal operation, to the amplitude of the chrominance signals at the output of the driver amplifier 24, it can be used for automatic chroma control (A.C.C.) purposes.

A direct voltage equal to that produced at the grid 120 can be produced by rectifying the negative half cycles of the oscillations at the grid 120. This is done by connecting a diode 150, a parallel capacitor 152 and resistor 154 in series between the grid 120 and ground. The voltage at the ungrounded side of the capacitor 152 produced by the rectifying action of the diode 150 adds in like polarity to that produced at the grid 120 by the rectifying action of the grid 120 and cathode 124 after the manner of a conventional voltage doubler, so that the voltage available across the capacitor 152 for A.C.C. purposes and for control of the color killer circuit is nearly twice the voltage obtained by half-wave rectification.

Reference is now made to the portion of the A.C.C. circuit of FIGURE 1 which is contained within the dotted line 42. The purpose of the A.C.C. circuit is to control the gain of the chrominance amplifier *30* in such manner that the intended variations in the amplitude of the chrominance signal it supplies to the color signal detector system 34 remains within a given range or at a given level even though the level of the chrominance

signal coupled to it from the driver amplifier 24 fluctuates.

As the level of the signals from the driver amplifier 24 decreases, the A.C.C. circuit operates to increase the gain of the chrominance amplifier *30*. Direct application of the voltage across the capacitor 152 to the grid 52 of the chrominance amplifier 54 would cause it to operate at a lower gain, even when the bursts are not present, because the rectification of the oscillations produced by the oscillator *40* makes the voltage too negative. Accordingly, means are provided for applying the voltage to the control grid 52 so that the voltage variation across the capacitor 152 is combined with a positive offset voltage by applying it to one terminal of a voltage divider. The voltage divider is comprised of series resistors 156 and 158. The other terminal of the voltage divider 156, 158 is connected to a point of positive potential, in this case the cathode 100 of the burst gate amplifier tube 77.

The voltage at the junction 159, between the resistors 156, 158, which has been translated in this manner, is the A.C.C. voltage, and it is applied to the grid 52 of the chrominance amplifier 54 via lead *161*, The Q spoiling resistor 48 and a portion of the inductor 46. As the amplitude of the bursts increases, the A.C.C. voltage applied to the grid 52 becomes more negative, thus reducing the gain of the chrominance amplifier 54 as desired.

The color killer circuit embodying the principles of this invention will now be described. In order to cut off the chrominance amplifier tube 54 when the amplitude of the color synchronizing burst falls below a selected level, means responsive to the amplitude of the bursts are provided for developing a negative color killer voltage at the anode or output electrode 160 of a color killer amplifier tube 162. The negative color killer voltage is applied via a smoothing filter, comprised of a series resistor 164 and shunt capacitor 166, and a unilateral current conducting device, herein shown as a diode 168, to the lead *161* and thence to the grid 52 of the chrominance amplifier 54 via the Q spoiling resistor 48 and a portion of the inductor 46.

The color killer voltage at the anode 160 is developed by providing means for controlling the conductivity of the color killer amplifier 162 with the voltage across the capacitor 152. Because the voltage across the capacitor 152 may be so negative under all conditions as to cut off the color killer amplifier 162, the voltage is combined with a positive offset voltage. This is effected by connecting resistors 172 and 174 in series between the capacitor 152 and a tap 176 of a potentiometer 178. One terminal of the potentiometer 178 is at ground potential and the other is connected to a point of positive potential such as the cathode 100 of the burst gate amplifier 77.

The control grid 170 of the color killer amplifier 162 is connected to the junction 180 between the resistors 172, 174, and the cathode control electrode 182 is connected to ground.

Reduction of the ripple in the voltage applied to the grid 170 is brought about by connection of a capacitor 184 between the grid 170 and ground. Varying the position of the tap 176 permits the color killer amplifier 162 to conduct at a desired voltage, and hence at a desired amplitude of the bursts.

Development of a color killer voltage at the anode 160 of the color killer amplifier 162 that changes in a negative direction as the amplitude of the bursts decreases is accomplished by two actions. First, the anode 160 is connected to a point of positive operating potential by an impedance shown as a large resistor 186. As the voltage applied to the grid 170 becomes less negative, due to a decrease in the amplitude of the burst, a point is reached, depending on the setting of the tap 176, when the color killer amplifier 162 begins to conduct.

Referring now to FIGURE 2, the horizontal axis represents variation in grid voltage applied to the control grid 170 of tube 162 from a cut-off value represented by the dotted vertical line 190. The vertical axis represent variation in voltage, V_A, at the anode 160.

In FIGURE 2, curve 188 illustrates the gradual reduction in the positive voltage of the anode 160 produced by increased current through the resistor 186 as the voltage at the grid 170 decreases to zero from its cut-off value. This action by and of itself cannot cause the anode 160 to become negative with respect to ground, as is required to make diode 168 conductive and thereby apply a color-killer voltage to point 159.

The second action involves the rectification of positive pulses supplied between the anode 160 and the cathode 182. In this particular circuit, the pulses are derived from the keying pulses 90 by a series circuit to ground comprised of an integrating resistor 192 and voltage dividing capacitors 194 and 196, the anode 160 being connected to the junction of the capacitors.

The purpose of this series circuit, or coupling means, is to reduce the amplitude of the keying pulses and attenuate some of the high frequency components so as to lessen coupling between the anode 160 and electrodes of the oscillator amplifier 122 when tubes 122 and 162 are contained within a single evacuated envelope. In order that the voltage at the anode 160 shall become negative to ground, the peak amplitude of the pulses applied to the anode 160 must exceed the positive potential applied to the anode by way of the resistor

186. When the grid 170 is sufficiently negative to cut off the color killer amplifier tube 162, no rectification takes place in tube 162. However, as the grid 170 becomes less negative, the efficiency of the rectification increases so as to produce at the anode 160 a potential increasingly negative to ground as indicated by the curve 204 of FIGURE 2.

The combined effect of the two actions on the color killer potential at the anode 160 is represented by the curve 200. Whenever the anode 160 becomes negative with respect to the control grid 52 of the chrominance amplifier 54, the diode 168 conducts and the voltat the anode 160 is applied to the control grid 52. The tap 176 is generally set so that the color killer amplifier 162 does not start to conduct until the voltage applied to the grid 52 of the chrominance amplifier 54 from the junction 159 is such that the latter is operating at maximum gain.

Under this condition, the voltage at the junction 159 is slightly positive, as indicated by the horizontal dotted line 202. Therefore, as soon as the color killer voltage, curve 200, at the anode 160 drops below the line 202, the diode 168 conducts and the color killer voltage is applied to the control grid 52. Further drop in the color killer voltage actually reduces the gain of the chrominance amplifier 54 until the voltage reaches a value negative to ground, such as indicated by the horizontal dotted line 198, this is sufficient to cut off the chrominance amplifier 54.

Thus, the change in voltage at the grid 170 of the color killer amplifier 162 necessary to change the chrominance amplifier 54 from a condition of maximum gain to cut off is equal to the difference between the grid voltage at point B, where the curve 200 crosses the dotted line 202, and the voltage at the point C, where the curve 200 crosses the dotted line 198. On the other hand, the rectification action alone, as indicated by the curve 200, would require as much larger change in voltage at the grid 170 from the point A to the point C in order to change the chrominance amplifier 54 from a condition of maximum gain to cut off.

Furthermore, the action of the resistor 186 prevents the color killer voltage at the anode 160 from being applied to the grid 52 of the chrominance amplifier 54 until the voltage produced by the rectification action is changing more rapidly as indicated by the increased slope of the curve 204 between the points B and C. Application of a color killer voltage that does not cut off the chrominance amplifier 54 is undesirable as it causes the amplifier to operate at reduced gain thus increasing the noise in the picture. This noisy condition is more likely to occur when the rectifying action alone is used than when it is combined with the action of the anode resistor 186 because there is a much larger chance of a signal being received having burst amplitudes that produce voltage at the color killer grid 170 that lie between the points A and C than between the points B and C.

It will be noted that the chrominance amplifier 54 can be cut off by burst blanking pulses 70 without having any effect on the operation of the color killer circuit, as the latter develops the color killer voltage independently.

FIGURE 1 illustrates an application of the invention to a particular receiver designed to operate in response to the type of color transmission presently approved for use by the Federal Communications Commission of the United States of America. However, it can be used in other receivers designed for use in this system, as well as in receivers designed for use in other color transmission systems. In the receiver illustrated in FIGURE 1, the control voltage developed across the capacitor 152 is derived indirectly from the color synchronizing bursts, but it could have been derised directly from them by rectification.

Furthermore, the invention has been described in a circuit using vacuum tubes, and it is apparent that the particular voltage values and polarities might be different if transistors were utilized. In other television systems bursts may be included for other purposes or no burst may be present, but in either case, means can be provided to derive a control signal that varies in a given direction as the level of the color signal goes to zero, as in the case of a monochrome transmission, or decays to a level where it is advisable to disable the color channel that supplies signals to the picture producing device.

The following table indicates the values of certain parameters and voltages which have been found to yield satisfactory performance.

Tube 54	Pentode section of a 5GH8A
Tube 77	Pentode section of a 5GH8A
Tube 162	Triode section of a 5GH8A
Tube 122	Pentode section of a 5GH8A
Diode 150	1N60
Diode 168	FD333
Resistor 154	82 K ohms
Resistor 172	3.7 M ohms
Resistor 174	10.0 M ohms
Resistor 178	1.0 M ohms
Resistor 156	2.2 M ohms
Resistor 158	12.0 M ohms
Resistor 164	159 K ohms
Resistor 186	3.9 M ohms
Resistor 48	82 ohms
Resistor 192	47 K ohms
Capacitor 152	10 PF
Capacitor 184	.01 μf.
Capacitor 166	.01 μf.
Capacitor 194	.01 μf.
Capacitor 196	390 PF
V at cathode 100	65 V
V at anode 160 of valve 162 when cut off	−140 V
V across Capacitor 152 with no burst present	−10 V
Peak to peak voltage of Pulse 90	250 V

It is contemplated that the circuit constructed in accordance wih the principles of this invention may be used in other types of receivers which are adapted to produce control voltage that varies in relation to the level of the chrominance signals in other ways or wherein the bursts, although being in the frequency range of the chrominance signals, are used in a different manner.

WHAT WE CLAIM IS:—

1. An automatic chroma control and color killer circuit for a color television receiver wherein the detected video signal includes periodic color synchronizing bursts, characized by a point common to the automatic chroma control and the color killer circuit at which is derived both the automatic chroma control signal and the color killer signal, said point being connected to the gain control electrode of a chrominance amplifier, a source of a first control voltage varying in amplitude with changes in amplitude of said color synchronizing bursts, first coupling means coupling said source of said first control voltage to said common point for producing automatic chroma control signals at said common point and applying said automatic chroma control signals to said gain control electrode so as to increase the gain thereof for smaller amplitude burst and to decrease the gain thereof for larger amplitude bursts, color killer means having an input connected to said source of first control voltage and an output connected to said common point for producing color killer signals at said common point, said color killer means including a unilateral current conducting device which conducts and produces said color killer voltage at said common point only after the amplitude of said bursts falls below a selected level.

2. A circuit in accordance with Claim 1, characterized in that said color killer means includes an impedance connected between a point of operating potential and said unilateral current conducting device, the polarity of said potential tending to increase current flow in said impedance, a source of periodic pulses coupled to said impedance to produce, at said output of said color killer means, a rectified voltage that is opposite in polarity to that of said operating potential, the polarity of said unilateral current conducting device being such that it only conducts when the voltage at said output of said color killer means is at a predetermined value lying between the value of said operating potential and the value of said rectified voltage.

3. A circuit in accordance with Claim 1 or 2, wherein in that said color killer means includes a color killer amplifier having an input electrode connected to said source of said first signals and having an output electrode connected to said unilateral current conducting device.

4. A circuit in accordance with any one of Claims 1, 2 or 3, wherein the color killer voltage developed at said common point when said unilateral current conducting device conducts being of sufficient value to disable said chrominance amplifier.

5. A circuit in accordance with any one of the preceding claims, wherein the automatic chroma control voltage produced at said common point when said unilateral current conducting device is non-conductive is of sufficient magnitude to vary the gain of said

Tube 54	Pentode section of a 5GH8A
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Tube 162	Triode section of a 5GH8A
Tube 122	Pentode section of a 5GH8A
Diode 150	1N60
Diode 168	FD333
Resistor 154	82 K ohms
Resistor 172	3.7 M ohms
Resistor 174	10.0 M ohms
Resistor 178	1.0 M ohms
Resistor 156	2.2 M ohms
Resistor 158	12.0 M ohms
Resistor 164	159 K ohms
Resistor 186	3.9 M ohms
Resistor 48	82 ohms
Resistor 192	47 K ohms
Capacitor 152	10 PF
Capacitor 184	.01 μf.
Capacitor 166	.01 μf.
Capacitor 194	.01 μf.
Capacitor 196	390 PF
V at cathode 100	65 V
V at anode 160 of valve 162 when cut off	−140 V
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It is contemplated that the circuit constructed in accordance wih the principles of this invention may be used in other types of receivers which are adapted to produce control voltage that varies in relation to the level of the chrominance signals in other ways or wherein the bursts, although being in the frequency range of the chrominance signals, are used in a different manner.

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2. A circuit in accordance with Claim 1, characterized in that said color killer means includes an impedance connected between a point of operating potential and said unilateral current conducting device, the polarity of said potential tending to increase current flow in said impedance, a source of periodic pulses coupled to said impedance to produce, at said output of said color killer means, a rectified voltage that is opposite in polarity to that of said operating potential, the polarity of said unilateral current conducting device being such that it only conducts when the voltage at said output of said color killer means is at a predetermined value lying between the value of said operating potential and the value of said rectified voltage.

3. A circuit in accordance with Claim 1 or 2, wherein in that said color killer means includes a color killer amplifier having an input electrode connected to said source of said first signals and having an output electrode connected to said unilateral current conducting device.

4. A circuit in accordance with any one of Claims 1, 2 or 3, wherein the color killer voltage developed at said common point when said unilateral current conducting device conducts being of sufficient value to disable said chrominance amplifier.

5. A circuit in accordance with any one of the preceding claims, wherein the automatic chroma control voltage produced at said common point when said unilateral current conducting device is non-conductive is of sufficient magnitude to vary the gain of said

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chrominance amplifier as the amplitude of said first control voltage is varied.

6. A circuit in accordance with any one of Claims 1, 3, 4 or 5, wherein said color killer circuit is a color killer amplifier having first and second control electrodes and an output electrode, said first control electrode being connected to a reference potential, a resistor connected between said output electrode and a point of potential of such polarity as to tend to increase the flow of current between said first control electrode and said output electrode and through said resistor, a source of pulses having two output terminals across which said pulses appear, means including a capacitor for coupling said output electrode of said color killer amplifier to one of the terminals of said source of pulses and means connecting said first control electrode to the other terminal of said source of pulses whereby said pulses are rectified so as to produce at said output electrode a voltage that has a polarity opposite to the polarity of said point of operating potential, the polarity of said unilateral current conducting device being such that it conducts when the voltage at said output electrode produced by the rectification of said pulses reaches a predetermined value.

7. A circuit in accordance with any one of the preceding claims, wherein said first coupling means includes a second unilateral current conducting device connected in circuit between said source of said first control voltage and said common point.

8. A circuit in accordance with any one of the preceding claims, wherein the input to the color killer means is connected to said source of said first signals by control voltage means of a voltage divider network.

9. A circuit in accordance with Claim 8, wherein said voltage divider network includes a variable voltage divider.

10. An automatic chroma control and color killer circuit substantially as described herein with reference to Figure 1 of the accompanying drawings.

A. A. THORNTON & CO.,
Chartered Patent Agents,
Northumberland House,
303/306, High Holborn,
London, W.C.1.

Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1971.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

