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(19)

(54) COLOUR TELEVISION RECEIVERS

(71) We, SONY CORPORATION, a corporation organised and existing under the laws of Japan, of 7—35 Kitashinagawa-6, Shinagawa-ku, Tokyo, Japan, 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 colour television receivers and more particularly is concerned with automatic chrominance control (ACC) and automatic colour killer (ACK) control.

In the chrominance channel of a conventional colour television receiver, there are provided an automatic chrominance control (ACC) circuit and an automatic colour killer (ACK) circuit. The ACC and ACK circuits are operated in response to the level of the colour burst signal transmitted with a composite television signal, such that the ACC circuit operates to render the level of a chrominance signal in the composite signal constant, and the ACK circuit operates to render the chrominance channel inactive on receiving a monochrome television transmission or when the level of the colour burst signal becomes lower than a reference level and hence colour killing is necessary to avoid appearance of a so-called colour noise on a reproduced picture.

Circuitry has been proposed in which burst level detectors are provided separately for ACC and ACK circuits. However, this is complicated and requires separate time constant circuits so as to produce respective control voltages for the ACC and ACK operations. This in turn results in an inconvenient number of external terminals when the circuitry is formed as an integrated circuit.

In another proposal a common burst level detector is provided for the ACC and ACK circuits. In this case, the output signal from the common burst level detector is used to control the gain of the chrominance amplifier and to render the chrominance channel inactive when receiving a monochrome television transmission or when the colour burst level goes below a reference level. This is simple in circuit construction and requires only one time constant circuit for deriving a control voltage from the burst level detector, so the circuitry can easily be made as an integrated circuit. However, there is the problem that in order to make the characteristics of the ACC circuit good, the time constant of the time constant circuit must be made relatively long. This will mean that the ACK circuit is not made operative immediately a colour signal transmission changes to a monochrome signal transmission. As a result, colour noise appears on the reproduced monochrome picture.

According to the present invention there is provided a colour television receiver including:

a gain controllable chrominance amplifier for amplifying the chrominance signals and the colour burst signals transmitted with said composite signal during a colour television transmission;

a burst level detector connected to said chrominance amplifier for detecting the level of said burst signals;

a control circuit including a time constant circuit connected to said burst level detector for deriving a control signal in response to said detected burst signals;

first means for supplying said control signal to said chrominance amplifier for controlling the gain thereof;

second means responsive to said control signal for activating said chrominance amplifier when the level of said control signal goes over a predetermined level and inactivating said chrominance amplifier when the level of said control signal goes below said predetermined level; and

third means connected between said burst level detector and said time constant circuit for shortening the time constant of said time constant circuit when the level of the output signal of said burst level detector goes below a reference level.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a block diagram of part of a colour television receiver to which the invention is applicable; and

Figure 2 is a circuit diagram of an embodiment of the invention.

In the colour television receiver of Figure

1 an input terminal 1 is supplied with a chrominance signal separated from a composite colour television signal and containing a colour burst signal. The chrominance signal is supplied from the input terminal 1 to a chrominance amplifier, namely, an ACC amplifier 2 the gain of which is varied, for example, decreased as the level of a control voltage proportional to the level of the colour burst signal increases. The output signal of the ACC amplifier 2 is supplied to a colour killer circuit 3 which renders the chrominance channel inactive when the control voltage goes below a predetermined value. The output signal of the colour killer circuit 3 is supplied through a colour level adjusting circuit 4 and a band-pass amplier 5 to a colour demodulator circuit 6 which produces colour difference signals R—Y, G—Y and B—Y. The output signal of the ACC amplifier 2 is also supplied to a burst gate circuit 7 which is also supplied with a burst gate pulse from a terminal 8, so that the colour burst signal is gated by the burst gate pulse through the burst gate circuit 7 and hence only the colour burst signal is supplied to a colour burst detector 9.

Thus, the burst detector circuit 9 produces a voltage which varies in accordance with the level of the colour burst signal. The detected voltage from the burst detector circuit 9 is supplied via an input terminal 13 to a control circuit 10 which includes a time constant circuit. The control circuit 10 produces at an output terminal 21 a *dc* control voltage proportional to the level of the colour burst signal. The control voltage from the control circuit 10 is supplied through the output terminal 21 to the ACC amplifier 2 and to the colour killer circuit 3 to control them. By way of example, if the level of the colour burst signal is high, the level of the control voltage becomes high and hence the ACC operation carried out is such that the gain of the ACC amplifier 2 is decreased further, and when there exists no colour burst signal, as in the case of a monochrome television transmission, the level of the control voltage becomes very low and the colour killer circuit 3 acts automatically to cut off the chrominance channel.

In the circuit of Figure 1, the control voltage produced by the control circuit 10 is used to control both the ACC amplifier 2 and the colour killer circuit 3, so the control circuit 10 is simplified in circuit construction, and in particular there is no need to provide separate time constant circuits. Particularly, when the chrominance channel is formed as an integrated circuit, it is not desirable for a capacitor for the time constant circuit to be connected to the integrated circuit, as this increases the number of external terminals of the integrated circuit.

Since the control voltage for the ACC amplifier 2 is produced by detecting the colour burst signal, it is necessary that the output of the colour burst detector circuit 9 is held during the time interval in a vertical blanking period within which no colour burst signal is present. In fact, it is required that the colour killer circuit 3 cuts off the chrominance channel immediately the colour burst signal is not received or is not present. For example, in the case where colour television transmission channels and monochrome television transmission channels are both present, when the reception is changed from a colour channel to a monochrome channel, if the colour killer operation is delayed, a so-called colour noise appears in a monochrome picture, which is disturbing to a viewer.

An embodiment of the invention, in which a control voltage is used commonly for both the ACC amplifier and the colour killer circuit, but the above-mentioned problem is avoided, will now be described with reference to Figure 2 which shows an example of the control circuit 10 of Figure 1.

Transistors 11 and 12 form a differential amplifier. The base of one of the transistors, transistor 11 in this case, is supplied through the input termial 13 with the detected ouput (which is a pulsating positive voltage in the presence of the colour burst signal) from the burst signal detector circuit 9, while the base of the other transistor 12 is supplied with a fixed *dc* voltage or reference voltage which is derived by resistors 14 and 15 from a power supply terminal B+. The output voltage derived from the collector of the transistor 11 is supplied to the base of a PNP transistor 16 (the other transistors are all of NPN-type). The emitter of the transistor 16 is connected through a resistor 17 to the power supply terminal B+ and the collector is connected to the base of the transistor 18 and connected through a resistor 19 to the base of a transistor 20. The collector of the transistor 18 is connected through the resistor 17 to the power supply terminal B+ and the emitter is connected to the output terminal 21. The emitter of the transistor 18 is also connected to a time constant circuit formed by a capacitor 22 and a resistor 23 which are connected in parallel. The emitter of the transistor 20 is grounded, and the collector is connected through a resistor 24 to the base of a transistor 25. The emitter of the transistor 25 is grounded and the collector is connected to the emitter of the transistor 18 through a resistor 26 of small (or even zero) value. The collector of the transistor 20 is also connected through a resistor 27 to the power supply terminal B+ and is grounded through a capacitor 28. Terminals t_1 and t_2 are provided to which the capacitors 22 and 28 are connected externally, and from which the output terminal 21 is led out when the differential amplifier and associated circuitry are made as an integrated circuit.

In the control circuit 10 of Figure 2 when the colour burst signal is present and the detected output signal of the burst signal detector circuit 9, which is supplied to the input terminal 13, is higher than the reference voltage (the base voltage of the transistor 12), a current corresponding to the level of the detected output signal flows through the differential amplifier and the transistors 16 and 18 to the capacitor 22. As a result, a control voltage produced at the output terminal 21 is in proportion to the level of the colour burst signal. Since the gain of the ACC amplifier 2 is controlled by the control voltage produced at the output terminal 21 as shown in Figure 1, the level of the chrominance signal is made constant. When the ACC operation is carried out, the transistor 20 is ON. Thus, the transistor 25 is made OFF. As a result, the discharge time constant of the time constant circuit is determined by the values of the capacitor 22 and resistor 23.

When the detected output signal supplied to the input terminal 13 becomes lower than the reference voltage, due to the fact that the colour burst-signal is not present or the level thereof is very low, the transistor 11 becomes OFF. As a result, the transistors 16, 18 and 20 become OFF and hence the transistor 25 becomes ON. Thus, the charge stored in the capacitor 22 is discharged rapidly through the resistor 26 of small value, the transistor 25 and the resistor 23. As a result, the level of the control voltage at the output terminal 21 becomes substantially zero in a short period of time, and the chrominance channel is cut off by the colour killer circuit 3, which is supplied with the control voltage as shown in Figure 1.

Since the resistor 27 and the capacitor 28 are used, when the transistor 20 becomes OFF, the base voltage of the transistor 25 becomes high with a time constant determined by the resistor 27 and capacitor 28 (which time constant is shorter than that determined by the capacitor 22 and the resistor 23). The reason for this is to avoid the transistors 11, 12, 16, 18, 20 and 25 switching repeatedly in a short period of time and making the chrominance channel unstable in the case where the detected output signal, which is a pulsated signal, is small because of a feeble electric field.

Thus, with the present circuit, when the ACC operation is carried out, the discharge time constant of the time constant circuit (comprising the capacitor 22 and the resistor 23) is relatively long and the level of the control voltage can be held to some extent during the period in the vertical blanking period where no colour burst signal exists, while the colour killer operation can be started immediately after the level of the colour burst signal becomes lower than the reference voltage. Thus, when the reception is changed from a colour television transmission channel to a monochrome television transmission channel, a so-called colour noise on a reproduced picture can be avoided.

WHAT WE CLAIM IS:—

1. A colour television receiver including:

a gain controllable chrominance amplifier for amplifying the chrominance signals and the colour burst signals transmitted with said composite signal during a colour television transmission;

a burst level detector connected to said chrominance amplifier for detecting the level of said burst signals;

a control circuit including a time constant circuit connected to said burst level detector for deriving a control signal in response to said detected burst signals;

first means for supplying said control signal to said chrominance amplifier for controlling the gain thereof;

second means responsive to said control signal for activating said chrominance amplifier when the level of said control signal goes over a predetermined level and inactivating said chrominance amplifier when the level of said control signal goes below said predetermined level; and

third means connected between said burst level detector and said time constant circuit for shortening the time constant of said time constant circuit when the level of the output signal of said burst level detector goes below a reference level.

2. A receiver according to claim 1 wherein said time constant circuit includes a capacitor and said third means including a switching device connected in parallel with said capacitor, and said switching device is made conductive when the level of said output signal from said burst level detector goes below the reference level.

3. A colour television receiver substantially as hereinbefore described with reference to the accompanying drawings.

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1 SHEET This drawing is a reproduction of the Original on a reduced scale

Fig. 1

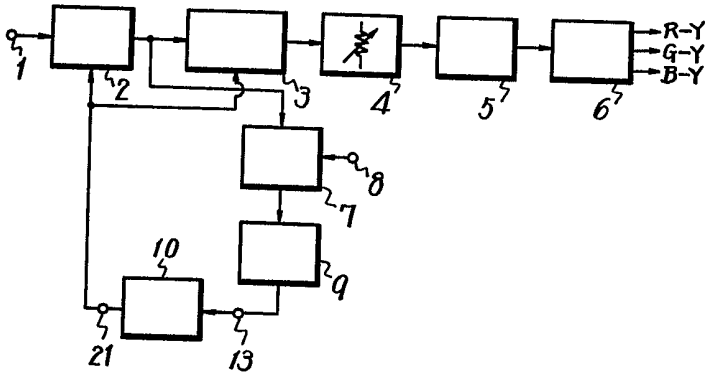

Fig. 2