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(54) **Muting circuits**

(57) A muting circuit for disabling the sound chain of a television receiver when this latter is not receiving a television program, detects in the video signal received the line sync pulses and measures the height and width of the sync pulses as well as their phase relative to signals derived from line scan circuit so as to separate them from the parasite signals produced by the line-scan circuit of the television receiver. A differentiating and thresholding circuit C_1, R_3, R_4, T_2 and a threshold circuit C_3, T_4 provides discrimination of the pulses V_1 received in respect of height, width. The threshold voltage across C_3 determining the application of a muting control voltage when no sync pulses or parasitic signals are present at V_1 is also influenced by the relative phase of the signal at the base, electrode of T_3 and the fly-back pulse VL at the emitter.

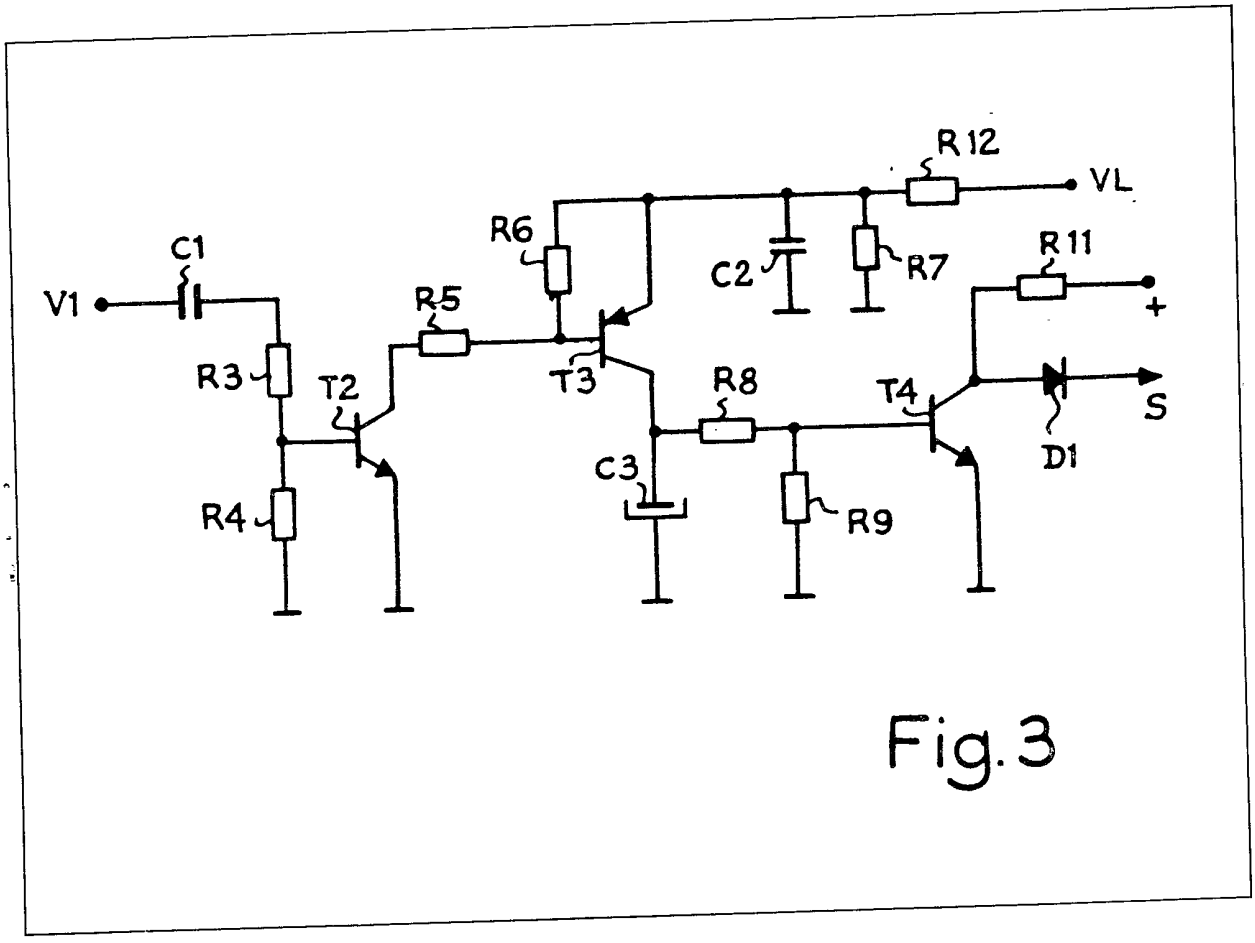

Fig.3

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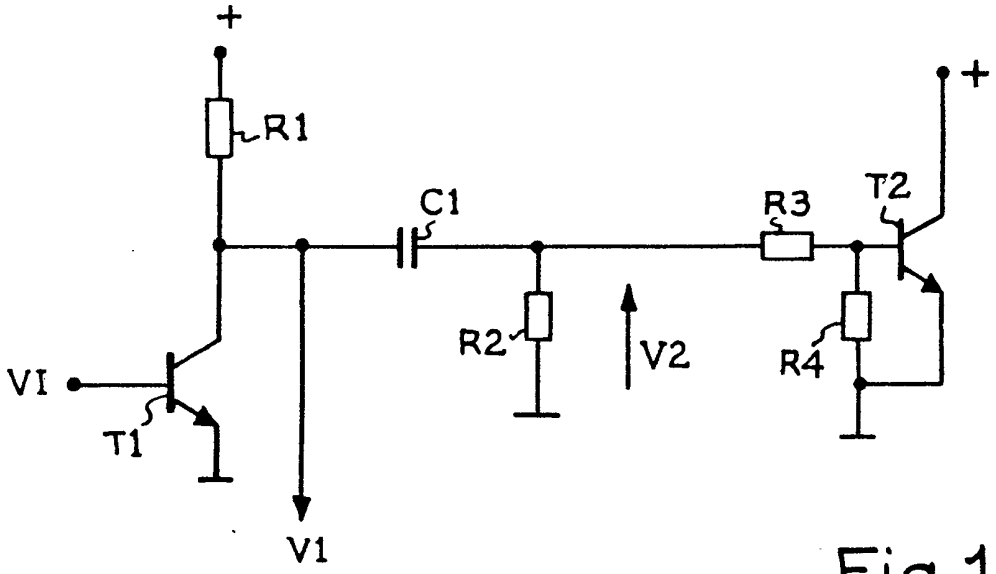

Fig.1

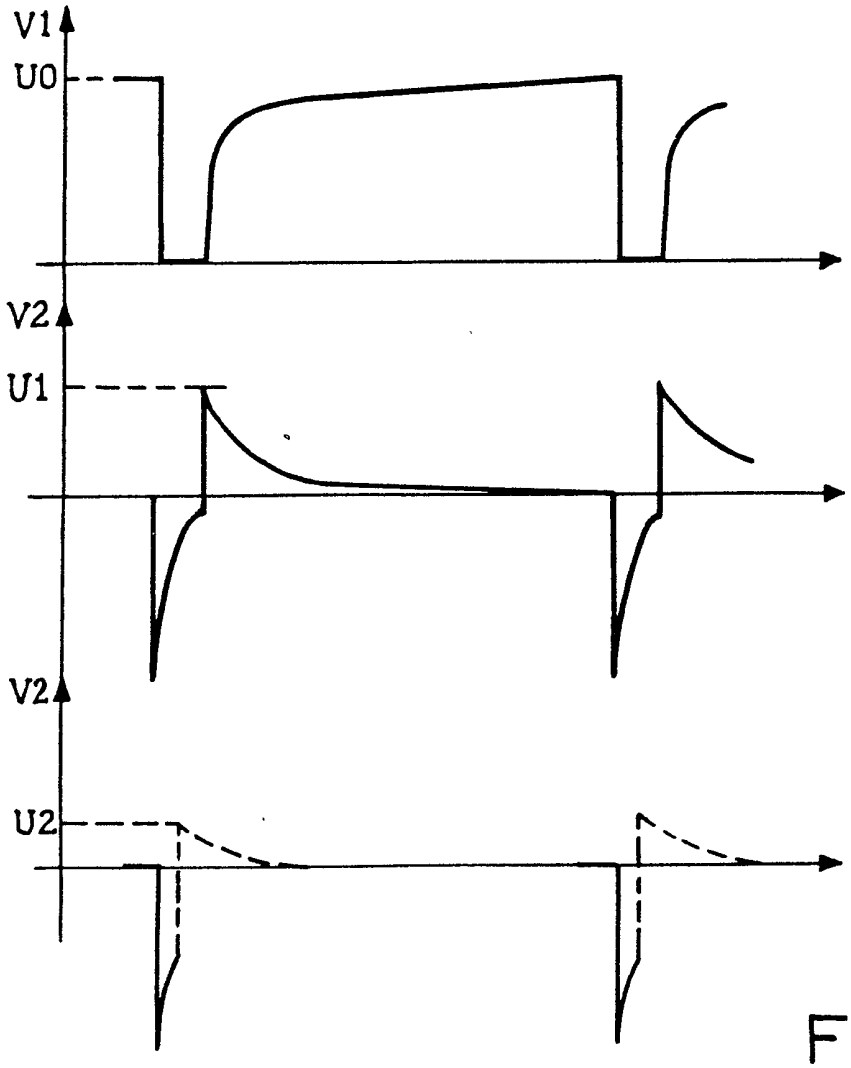

Fig.2

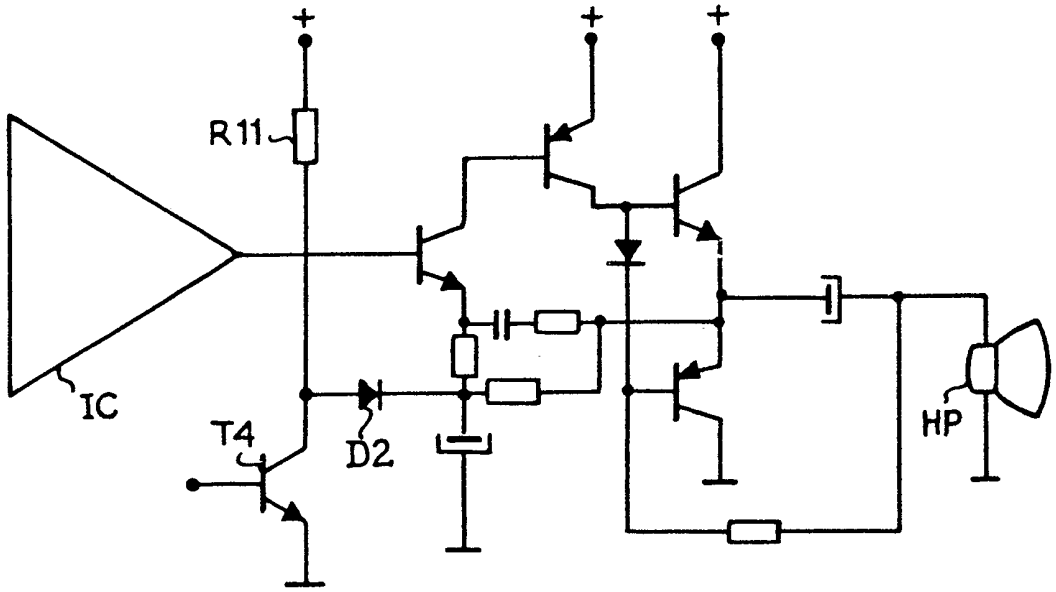
+
+
+
R11
IC
T4
D2
HP

Fig.4

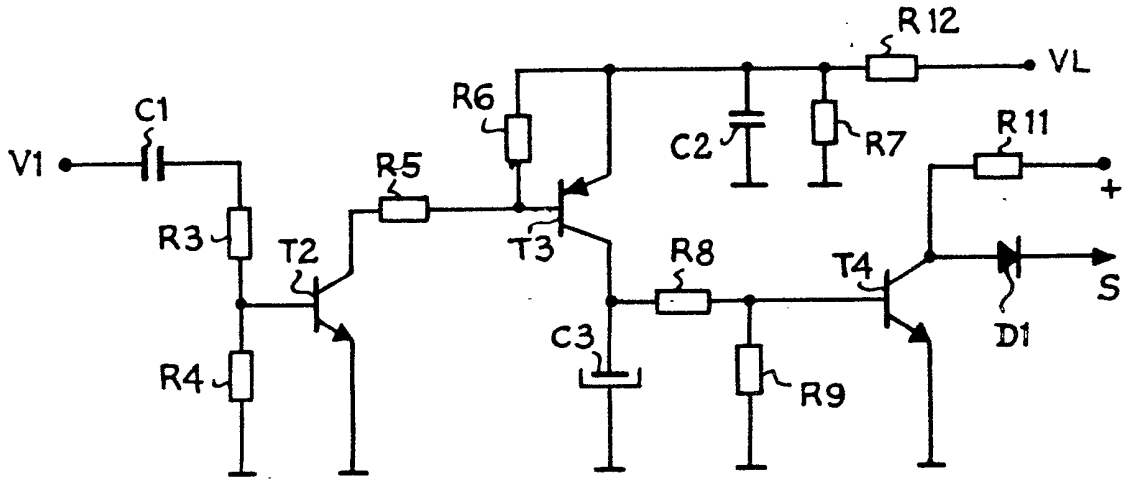
R12
VL
C1
V1
R6
C2
R7
R11
+
R5
R3
T2
T3
R8
T4
S
D1
C3
R4
R9

Fig.3

SPECIFICATION

Device for cutting off the sound in a television receiver and a television receiver comprising such a device

The present invention relates to devices for cutting off the sound in a television receiver, which cut off automatically the sound in a television receiver when this latter is not receiving a television program.

It is in fact not desirable to be able to receive in the sound part of a television receiver sound signals other than those from television programs. Furthermore, certain legislations, particularly the German legislation, make compulsory in television receivers the presence of a device for cutting off the sound when the television receiver is not receiving a television program.

Because of manufacturing and adjustment tolerances, and because of the aging of the circuits, it is impossible to manufacture tuning circuits for television receivers whose passband is included and remains included within the limits of the effective bands for television transmitters.

Even in the case where the sound of the television channel is frequency-modulated, and demodulated in accordance with the system known under the name intercarrier, parasite modulations have been noted which allow the television receiver to receive erratically purely audio transmitters situated in bands other than those of the television, or possibly in these bands following illegal operations or abnormal propagation.

A known system consists in detecting, during the line return, the presence of the sync pulses of the video signal received. If these pulses are not present, a device cuts off the sound of the television receiver somewhere in the sound chain.

However the line-scan circuit of a television receiver operates with high energy and with abrupt leading edges. For this reason, it emits parasite signals which it is extremely difficult not to receive in the most sensitive stages of the receiver. These stages are more especially sensitive the lower the level of the signal received, because of the action of the automatic gain-control circuit. When there is no transmission at all the sensitivity is maximum. The parasite signals emitted by the line-scan stage may then be received by the high-frequency or intermediate-frequency stages of the receiver and be interpreted as sync pulses of a video signal. The sound cut-off device is then at fault and audio transmitters may thus be received which one should not be able to hear.

Summary of the Invention

To avoid such reception, the invention proposes a sound cut-off device for a television receiver of the type comprising means for detecting in the signal received by the television receiver line-sync pulses, and means for cutting off the audio chain when these pulses disappear, principally characterized in that it further comprises identification means for measuring the amplitude and the width of the sync pulses, as well as their phase with respect to the signals of the line-scan circuit of the television receiver, so as to distinguish these pulses from the parasite signals emitted by this line-scan circuit.

Description of the Drawings

Other features and advantages of the invention will become clear from the following description given by way of nonlimiting example, particularly insofar as the numerical values given are concerned, and made with reference to the accompanying figures in which:

Figure 1 is a circuit for identifying the sync pulses;

Figure 2 shows waveforms in the circuit of Figure 1;

Figure 3 shows a variation of the identification circuit having a control circuit; and

Figure 4 shows a sound output stage controlled by the circuit of Figure 3.

Description of the Preferred Embodiments

In the diagram of Figure 1, the video signal of negative polarity VI is applied to the base of an NPN transistor T1 whose emitter is connected to ground and whose collector is connected to a positive supply voltage + through a resistor R1. This stage, which is used in all television receivers, allows not only the line but also the frame sync signals to be separated. There is obtained at the collector thereof a signal V1 which is, on the one hand, used by the line oscillator circuit and the frame separator circuit and, on the other hand, applied to an identification circuit for controlling the sound chain. This signal V1 is shown in Figure 2. It has the shape of a series of negative pulses of a duration of about 5 microseconds, separated by level portions having an abrupt edge at the beginning of the blip and a somewhat gentler edge at the end of the blip.

So as to identify the line sync pulses, this signal is applied to a differentiator circuit formed by a capacitor C1 in series with a resistor R2 connected to ground. The signal V2 present at the common connection between C1 and R2 is formed by alternatively negative and positive sawteeth whose leading edges correspond with the edges of the pulses of signal V1. It is shown in Figure 2 where it can be seen that, with true pulses of a width of 5 microseconds, the sawtooth corresponding to the leading edge of the pulse has substantially time to return to 0 before the beginning of the sawtooth corresponding to the trailing edge of the pulse. Thus, the amplitude of the positive sawtooth is substantially equal to the amplitude of the negative sawtooth since the DC component of the signal V2 is necessarily zero. This amplitude of the positive sawtooth is then equal to a value U1.

In the case where the sync pulses are pseudo-pulses due to the reception of the parasite signals emitted by the line deflection stage, these pseudo-pulses are much narrower than true pulses because the parasite signals which effectively reach the stages of the receiver are essentially due to very rapid transitory phenomena such as diode switching. Considering the time constant of the differentiator network C1R2, the negative sawtooth corres-

ponding to the leading edge of this pseudo-pulse does not have time to return to 0 before the positive sawtooth corresponding to the trailing edge of the pseudo-pulse begins. This positive sawtooth is then much smaller in height and only reaches a level U2 much lower than U1. Thus, by comparing the levels, the true pulses can be differentiated from the pseudo-pulses.

This comparison of the levels is further facilitated because the level U0 of the pseudo-pulses is much smaller than that of the true pulses, despite the action of the automatic gain-control circuit, which further reduces U2.

Since the width of the true pulses is very substantially equal to 5 microseconds, an optimal value of the time constant of the differentiator network is substantially 2 microseconds.

To carry out a discrimination according to the value of V2, this voltage is applied to the base of an NPN transistor T2, through a potentiometric divider formed from two resistors R3 and R4 connected in series to ground. The emitter of T2 is also connected to ground and its collector to a positive supply source. Since the base of T2 is moreover not biased, and since the signal V2 does not have a DC component, the transistor is permanently disabled except when the signal applied to its base exceeds its threshold voltage. The ratio of the values of resistors R3 and R4 determines the level of signal V2 at which the transistor ceases to conduct. By setting this level at a value between 70 and 80% of the level U1 corresponding to no noise reception at which the automatic-gain control operates, which defines a relatively constant level U1, good discrimination between the true sync pulses and the pseudo-pulses is obtained.

In an embodiment shown in Figure 3, the information V1 is applied to a capacitor C1 of 100 picofarads.

The potentiometric divider also forms the integrating resistor and is formed from a resistor R3 of 18 kiloohms in series with a resistor R4 of 3.9 kiloohms connected to ground. The transistor T2 is of the 2400 type.

So as to obtain simultaneously a gain sufficient for switching the means cutting off the sound chain, a transistor T3 of 2401 type is used which is connected as current amplifier.

The emitter of the PNP transistor is connected to its base through a resistor R6 of 22 kiloohms. This base is also connected to the collector of T2 through a resistor R5 of 10 kiloohms. The collector of T3 is connected to ground through two series-connected resistors R8 and R9 whose values are respectively 18 kiloohms and 12 kiloohms. These resistors are shunted by a capacitor C3 of 1 microfarad.

For supplying the emitter of T3, a positive pulse of 200 volts is used corresponding to the line return and which may be taken directly from the collector of the horizontal scanning transistor. This pulse VL is applied through a resistor R12 of 47 kiloohms to the emitter of T3. This emitter is decoupled to ground by a resistor R7 of 4.7 kiloohms shunted by a capacitor C2 of 1 nanofarad.

The cell formed by R12, R7 and C2 allows the line pulse VL to be shaped so as to obtain a more pointed top whose position corresponds to the moment when T2 starts conducting.

Capacitor C3 integrates the voltage variations at the collector of T3 so as to suppress the fluctuations due to the regular disabling of T2 by the sync pulses and so that this voltage has two separate values according as to whether a television program is received or not.

When a normal image is received, T2 becomes saturated during the second half of the line pulse. T3 then becomes saturated at the moment when C2 has a maximum charge from pulse VL. T3 then lets a charging current pass from C2 to C3.

If T2 starts conducting too soon with respect to VL, because the pseudo-pulse is narrower than the true one, the charge on C2 is smaller at the moment when T3 starts conducting, and consequently the charge on C3, as well as the voltage at its terminals, are reduced. A part of the charging current on C3 also comes from the resistive divider R6, R7 which itself delivers a smaller current when T2 becomes saturated too early.

Thus then, when the image is correctly synchronized, the voltage at the terminals of C3 is maximum.

As the level of the signal on the antenna of the receiver gradually diminishes, the image becomes noisy and a certain gigging of the line oscillator may be observed with respect to the sync pulses. This causes a considerable reduction of the voltage at the terminals of C3.

The common point between R8 and R9 is connected to the base of an NPN transistor T4 of type 2400 whose emitter is itself connected to ground. This base is not biased moreover and so T4 only conducts when the voltage applied by the divider R8, R9 reaches a minimum value. The ratio between R8 and R9 allows the switching of T4 to be adjusted so that this switching takes place at a noise level in the image considered as intolerable.

Thus then control of the cutting off of the sound circuit may come from one of the three following phenomena : insufficient width of the sync blip, insufficient amplitude of same, and a phase shift thereof which is too great with respect to the line-return pulse of the local time base.

The collector of T4 is supplied from a positive voltage source + of 10 volts through a resistor R11 of 4.7 kiloohms. The signal for switching the sound chain S is taken from the collector of T4 through an IN914 type diode D1 whose anode is connected to this collector.

It will be noted that T2 and T3 are used within their saturation characteristics, which allows the influence of the dispersion of the components used in the circuit to be best reduced.

This switching signal S cuts off the sound chain at any point thereof, for example at the level of the modulators, at the level of the output circuit or at the level of the circuit for remote control of the volume.

The embodiment of Figure 5 corresponds to cut-off by interrupting the audio output circuit.

The audio chain comprises in this case an integrated circuit IC of TBA 120S type which demodulates the signals of the intermediate-frequency amplifier and delivers a low-level audio signal to a

power circuit the diagram of which is well-known and which feeds a loudspeaker HP. This integrated circuit IC comprises an isolated transistor whose electrodes are connected to the separate outputs of the integrated circuit. It is convenient to use this transistor for fulfilling the functions of transistor T4. In this case, the cathode of diode D2 wil be connected to a correct point of the power circuit such that, when T4 is saturated, D2 is disabled and the amplifier operates, and when T4 is disabled, D2 is saturated and causes the amplifier to be disabled.

CLAIMS

1. In a device for cutting off the sound in a television receiver, of the type comprising means for detecting in the signal received by the television receiver line sync pulses, means for disabling the audio chain when these pulses disappear, and means for detecting the phase of the sync pulses with respect to the signals of the line-scan circuit of the television receiver, said device further comprises identification means for measuring the amplitude and the width of the sync pulses, so as to distinguish these pulses from the parasite signals supplied by this line-scan circuit.

2. The device as claimed in claim 1, wherein said identification means comprise a differentiator circuit receiving the sync pulses and delivering to a threshold circuit a signal formed of pairs of differentiated pulses of different polarities in each pair; the height of the second pulses of each pair depending on the width of the sync pulses, and the threshold circuit only reacting with the second differentiated pulses whose height shows that they come from the sync pulses.

3. The device as claimed in claim 2, wherein said threshold circuit is supplied by the line-return pulses from the line-scan circuit so as to react moreover only to the second differentiated pulses which are in phase with said line-return pulses.

4. The device as claimed in claim 3, wherein there is further provided a current amplification stage controlled by said threshold circuit and supplying an integration circuit so as to obtain a DC signal for controlling said audio chain.

5. The device as claimed in claim 4, wherein there are further provided means for supplying said amplification stage with current by means of said line-return pulses so that the DC control signal is maximum when the second differentiated pulses are in phase with the second half of said line-return pulse.

6. The device as claimed in any one of claims 1 to 5, wherein said means for disabling said audio chain allow the sound output amplifier to be disabled.

7. The device according to claim 6, wherein said means for disabling said audio chain comprise an isolated transistor forming part of an intergrated demodulation and pre-amplification circuit for said audio chain.

8. A device for cutting off the sound in a television receiver substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawings.

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