

(19)



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(11)

EP 0 392 552 B9

(12)

CORRECTED EUROPEAN PATENT SPECIFICATION

Note: Bibliography reflects the latest situation

(15) Correction information:
Corrected version no 2 (W2 B1)
Corrections, see page(s) 4

(51) Int Cl.7: **H04N 5/44**, H04N 5/60

(48) Corrigendum issued on:
30.11.2005 Bulletin 2005/48

(45) Date of publication and mention
of the grant of the patent:
12.04.2000 Bulletin 2000/15

(21) Application number: **90107083.9**

(22) Date of filing: **12.04.1990**

(54) **Audio switching for an audio/video system having S-video capability**

Tonumschaltung für ein Ton/Videosystem mit S-Videofähigkeit

Commutation audio pour un système audio/vidéo à capacité S-vidéo

(84) Designated Contracting States:
AT DE DK ES FR GB IT SE

(30) Priority: **14.04.1989 US 340147**

(43) Date of publication of application:
17.10.1990 Bulletin 1990/42

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ELECTRONICS, "1988 INTERNATIONAL
CONFERENCE ON CONSUMER ELECTRONICS,
Part 1", vol. 34, no. 3, August 1988, pages
443-450, New York, NY, US; Y. YAMAMOTO et al.:
"A new video processor for color TV"**

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Description

FIELD OF THE INVENTION

[0001] This invention relates to the field of signal switching arrangements in audio-video systems.

BACKGROUND OF THE INVENTION

[0002] The term "television receiver" as used herein includes television receivers having a display device (commonly known as television sets), and television receivers without a display device, such as videocassette recorders (VCR's) and remote controlled audio-video switchers.

[0003] The term "television receiver" as used herein also includes television monitor/receivers having an RF tuner and baseband signal input circuitry.

[0004] Modern television receivers allow selection of external baseband audio and video signals from audio and video sources such as VCR's and videodisc players, as well as selection of broadcast television programs tuned and demodulated by built-in tuner and intermediate frequency (IF) circuitry.

[0005] The external audio and video signals are coupled to individual input terminals (jacks) of a connection panel usually located on the rear portion of the television receiver. These input terminals, and the output terminals of the internal tuner/IF circuitry, are coupled to the signal processing circuits of the television receiver via a signal switch assembly. Such a switch assembly is desirably electronically controlled to select the proper audio signal which corresponds to a selected video signal.

[0006] In the "IEEE Transactions on Consumer Electronics", 1988 International Conference on Consumer Electronics, Part 1, 34 (1988), August, No. 3, pages 443 to 450, Yamamoto et al describe in an article "A New Video Processor For Color TV" the structure of a new TV chassis having video and audio processor circuits controlled by an audio/video switch for receiving selectively demodulated video and audio signals received by the tuner, video and audio signals applied to auxiliary inputs, and RGB signals applied to further inputs. This will mean, that the user may select between broadcast signals received by antenna or cable, auxiliary signals from a video recorder, in each of which cases composite video signals and audio signals will be provided from the signal sources whereby the composite video signals are guided through a comb filter prior to being applied to the video processor circuit. Finally, the user may select RGB signals which are directly applied to the video processor and might be generated by e.g. a computer as usual at the time of that publication.

[0007] Further, various TV devices can be coupled together while using SCART connectors which have a plurality of terminals among which there are three terminals for R, G and B color signals (terminals 7, 11 and 15), two terminals for right and left audio signals (terminals

2 and 6) and one terminal for a composite video signal (terminal 20) which is also used for synchronizing signals when the R, G and B signals are being used.

[0008] A television receiver having multiple electronically selectable auxiliary baseband signal inputs is known from the RCA CTC-149 manufactured by Thomson Consumer Electronics, Inc. Indianapolis, Indiana. This television receiver employs digital switching logic to automatically provide proper audio when each of the video source selections is made (i.e., tuner, AUX1 or AUX 2). However, this receiver does not have S-VIDEO (i.e., Super Video, a wideband video format) capability.

[0009] An S-VIDEO signal source, such as a VCR or a Camcorder, provides wideband luminance and chrominance signals on separate terminals of an S-VIDEO connector. The S-VIDEO connector is different than the coaxial baseband connectors normally used in industry. Audio signals in an S-VIDEO system are provided via standard coaxial connectors, because these signals do not differ from the normal audio signals provided by standard television signal sources.

[0010] S-VIDEO signals cannot be selected by the video switching circuitry described above with reference to the RCA CTC-149 television receiver, because the S-VIDEO wideband luminance (Y) signal and chrominance (C) signal are applied to the different areas the television receiver than are the standard baseband video signals.

SUMMARY OF THE INVENTION

[0011] It is herein recognized that it is not necessary or economically desirable to provide separate audio input terminals on an S-VIDEO capable television receiver for the audio signals produced by an S-VIDEO signal source device, if the television receiver already includes standard baseband audio signal input terminals. Specifically, a television receiver includes a multiple input video switch, a baseband video/S-VIDEO selector switch, and a multiple input audio switch, collectively forming an audio/video switching arrangement. An audio input terminal is connected to the audio/video switching arrangement such that it is automatically selectable in either a standard NTSC mode, for coupling audio signals associated with standard baseband video signals or in an S-VIDEO mode for coupling audio signals associated with S-VIDEO signals.

BRIEF DESCRIPTION OF THE DRAWING

[0012]

FIGURE 1 illustrates, in block diagram form, a switching system of the prior art.

FIGURES 2 and 2a illustrate partially in block diagram form and partially in schematic form, embodiments of the invention.

FIGURE 3 illustrates, in tabular form, the signal

sources selected by the circuitry of FIGURE 2 in response to various control codes.

FIGURE 4 illustrates, in pictorial form, a connector panel suitable for use in a television receiver employing the invention.

DETAILED DESCRIPTION OF THE EMBODIMENT

[0013] Referring to prior art FIGURE 1, a controller 100 receives user-entered control signals from a local keyboard 105 and from an infrared (IR) receiver 110. IR receiver 110 receives and decodes remote control signals transmitted by a remote control unit 115. Controller 100, which may be a microprocessor or microcomputer, causes a television tuner 120 to select a particular RF signal to be tuned in response to data entered by a user. Tuner 120 produces a signal at an intermediate frequency (IF) and applies it to a processing unit 125 comprising a first section 125a including a picture (PIX) amplifying stage and video detector, and a second section 125b including, a sound amplifying stage, an audio detector and a stereo decoder. Processing unit 125 produces a baseband video signal (TV), and baseband left and right audio signals.

[0014] The baseband video signal (TV) is coupled via line 126 to one input of a four input video switch 130. The baseband left and right audio signals are applied to one pair of inputs of an audio switch 140 capable of selecting a pair of inputs from four pairs of audio inputs. Video switch 130 and audio switch 140 each have three other inputs labelled AUX1, AUX2 and AUX3, for receiving respective baseband video and audio signals from external sources. Each of the inputs of video switch 130 and audio switch 140 is selectable in response to binary signals generated by controller 100 and applied to control inputs C_1 and C_0 via conductors 131 and 132, respectively. For example, if C_1 and C_0 are both caused to be at a low signal level (i.e. binary 00), then the TV input is selected. If C_1 is low and C_0 high (binary 01), then AUX1 is selected. If C_1 is high and C_0 low (binary 10), then AUX2 is selected. If both C_1 and C_0 are high (binary 11), then AUX3 is selected. The selection of corresponding video and audio signals is ensured because the control lines 231 and 232 are coupled to respective control inputs C_1 and C_0 of both video switch 130 and audio switch 140.

[0015] The selected video signal is applied to a comb filter unit 150 which separates luminance (Y) signals and chrominance (C) signals for application to a video processor unit 160 for ultimate display on a display screen of a display device 170. The selected audio signals are applied to an audio processor unit 180 and ultimately reproduced via speakers 190, 195. The above-described circuitry is essentially known from the RCA CTC-149 television receiver manufactured by Thomson Consumer Electronics, Inc., Indianapolis, Indiana.

[0016] A preferred embodiment of the subject invention will now be described with respect to FIGURES 2,

3, and 4. Similarly numbered elements in FIGURE 2 accomplish the same functions as their counterparts in FIGURE 1, and therefore these functions need not be described again.

[0017] Referring to FIGURE 2, a video signal switch unit 255 is shown inserted between comb filter 250 and video processor 260.

[0018] The structure of FIGURE 2 provides for selection of the proper audio signal in response to control signals applied to parallel-connected control inputs C_1 and C_0 of video signal switch 230 and audio signal switch 240, and also in response to a signal indicative of whether S-VIDEO signals are selected.

[0019] Specifically, this is accomplished by the addition of resistors R255, and diodes D231, and D232. Respective control inputs C_1 and C_0 of audio switch 240 are directly connected to the control inputs C_1 and C_0 of video switch 250, as shown in FIGURE 2. The cathode of diode D231 is coupled to the junction of control inputs C_1 of both audio switch 240 and video switch 250. The cathode of diode D232 is coupled to the junction of control inputs C_0 of both audio switch 240 and video switch 250. The anodes of diodes D231 and D232 are connected together, to a control input C on video switch unit 255, and to one end of resistor R255, the other end of which is connected to a source of positive supply voltage.

[0020] The operation of the circuitry of FIGURE 2 will be explained with respect to FIGURES 3 and 4.

[0021] Referring to FIGURE 4, a connector panel 400 includes an RF input connector 410 for receiving broadcast or cable radio frequency (RF) signals. Panel 400 also includes two groups of connectors AUX1 and AUX2 for receiving baseband audio and baseband video signals, and a connector 450 labelled S-VIDEO IN for receiving wideband video signals from an S-VIDEO source such as, for example, an S-VHS (super-VHS) videocassette recorder.

[0022] S-VIDEO IN connector 450 does not include a terminal for receiving audio signals, and consequently separate accommodations must be made for receiving audio signals from an S-VIDEO source. It is herein recognized that separate dedicated audio input terminals need not be provided to receive audio signals from an S-VIDEO source, if the input terminals are grouped as shown in FIGURE 4, or otherwise labelled to indicate that a single pair of audio input terminals may be "shared" between an auxiliary NTSC video signal source and an S-VIDEO signal source. Specifically, a "box" 420 is drawn or printed to enclose connectors having a relationship to one another. That is, if a standard NTSC video source is to be connected to panel 400, then the audio signals are connected to left and right AUDIO IN jacks 430 and 435, and the video signal is connected to VIDEO IN jack 440. If, however, an S-VIDEO source is to be connected to panel 400, then the video signal is connected to S-VIDEO jack 450, and the audio signals are connected to left and right AUDIO IN

jacks 430 and 435. This results in an easy-to-use and easy-to-understand connection system for the user, and saves the manufacturing cost of adding two additional audio jacks. The table of FIGURE 3 shows the audio source and video source selections corresponding to the four possible states of the binary signals on control lines C1 and C0. The X's in the table indicate the selections for each control code. Audio source AUX1 (corresponding to left and right AUDIO IN jacks 430 and 435) is selected in response to control codes 01 and 11 (i.e., AUX1 and S-VIDEO selections). Note that at least one "0" appears in each of the control codes except for the control code (i.e., 11) corresponding to the selection of the S-VIDEO source. Accordingly, in the circuitry of FIGURE 2, a zero on either of control lines C1 or C0 will cause diode D231 or diode D232 to conduct through pull-up resistor R244 thereby forcing a low level signal to be developed at control input C of video switch 255 for all control codes except 11 (select S-VIDEO). Video switch unit 255 selects input signals from comb filter unit 250 whenever a low level signal is applied to control input C, and selects external S-VIDEO signals whenever a high level signal is applied to control input C.

[0023] Audio switch 240 selects a pair of input terminals (TV) in response to control code 00, a pair of input terminals (S-VIDEO/AUX1) in response to control code 01, a pair of input terminals (AUX2) in response to control code 10 and, the S-VIDEO/AUX1 input terminals once again in response to control code 11. This is accomplished by interconnecting wires 241 and 242 between respective terminals of the audio switch inputs selected by control codes 01 and 11 as shown in FIGURE 2.

[0024] It is recognized that diodes D231 and D232 form an AND gate and may be replaced by a digital AND circuit 253 to accomplish that function as shown in FIGURE 2a.

Claims

1. An audio and video switching apparatus, comprising:

video switch means (230,255) having first (TV) and second (AUX1) video signal inputs for receiving first and second composite color video signals, respectively, having a pair of inputs (Y, C) for receiving luminance and chrominance component signals of a third video signal respectively, having a control signal input (C₁,C₀, C) for receiving a video signal selection control signal, and having an output for developing an output signal comprising a pair of luminance and color components selected from luminance and color components derived from said first composite color video signal, luminance and color components derived from said second

composite color video signal, and said luminance and chrominance component signals at said pair of inputs, in response to said video signal selection control signal;

audio switch means (240) having first (TV) and second (AUX1;S-video) audio signal inputs for receiving first and second audio signals, respectively, having a control signal input (C₁,C₀) for receiving an audio selection control signal, and having an output for developing an output audio signal selected from said first and second audio input signals in response to said audio selection control signal;

data entry means (205) for providing user selection of one of three operating modes; and control means (200) for providing the control signals for causing said video and audio switch means (230, 255,240) to operate in the three operating modes comprising

- a first mode in which said luminance and color components derived from said first composite color video signal (TV) and said first audio signal (TV) are selected, **[deletion(s)]**
- a second mode in which said luminance and color components derived from said second composite color video signal (AUX1) and said second audio signal are selected;
- and a third mode in which said luminance and chrominance component signals (Y,C) at said pair of inputs and said second audio signal (S-video) are selected.

2. The audio and video switching arrangement of claim 1, **characterized in that**

said audio switch means (240) includes a third audio signal input (241,242), said second and third audio signal inputs being connected together.

3. The audio and video switching arrangement of claim 1, **characterized in that:**

said video switch means (230, 255) includes first (230) and second (255) video switch means, said first video switch means (230) having said first (TV) and second (AUX1) video signal inputs for receiving said first and second video signals, respectively, having a control input for receiving said video selection control signal, and an output at which is developed an output video a signal comprising a pair of luminance and colour components which are de-

rived from a selected one of said first and second video signal inputs in response to said video selection control signal;

said second video switch means (255) having a first input coupled to said output of said first video switch means, a second input for receiving said third video signal (Y), a control input (C) for receiving a further control signal, and an output at which is developed a video signal selected from signals at said first and second inputs of said second video switch means in response to said third control signal; and logic means (D231, D232; 253) having an input for receiving said video selection control signal, and an output for developing said further control signal in response to said video selection control signal.

4. The switching arrangement of claim 3 **characterized in that** said logic means (D231,D232;253) comprises an AND gate.
5. The switching arrangement of claim 4 **characterized in that** said AND gate comprises diode means (D231,D232) having similar electrodes coupled together and coupled via a resistor means (R255) to a point of reference potential, the junction of said similar electrodes of said diode means and said resistor means forming the output of said AND gate.
6. The switching arrangement of claim 1 **characterized in that** said third video signal is an S-VIDEO signal.

Patentansprüche

1. Audio- und Videoschaltvorrichtung mit: einer Videoschalteranordnung (230,255), die erste (TV) und zweite (AUX1) Videosignaleingänge zur Zuführung erster bzw. zweiter Farbvideosignalgemische, ein Paar Eingänge (Y,C) zur Zuführung von Leuchtdichte- bzw. Farbkomponentensignalen eines dritten Videosignals, einen Steuersignaleingang (C_1, C_0, C) zur Zuführung eines Videosignalwähl-Steuersignals und einen Ausgang zur Lieferung eines Ausgangssignals hat, das ein Paar Leuchtdichte- und Farbkomponenten aufweist, die in Abhängigkeit von dem Videosignalwähl-Steuersignal aus den von dem ersten Farbvideosignalgemisch abgeleiteten Leuchtdichte- und

Farbkomponenten, den von dem zweiten Farbvideosignalgemisch abgeleiteten Leuchtdichte- und Farbkomponenten bzw. den an dem Paar Eingängen liegenden Leuchtdichte- und Farbkomponentensignalen ausgewählt sind; einer Tonschalteranordnung (240), die erste

(TV) und zweite (AUX;S-video) Tonsignaleingänge zur Zuführung erster bzw. zweiter Tonsignale, und einen Steuersignaleingang (C_1, C_0) zur Zuführung eines Tonwählsteuersignals und einen Ausgang zur Lieferung eines Ausgangstonsignals hat, welches in Abhängigkeit von dem Tonwählsteuersignal aus den ersten und zweiten Audioeingangssignalen ausgewählt ist; eine Dateneingabeeinrichtung (205) zur Wahl eines von drei Betriebszuständen durch einen Benutzer; und eine Steuereinrichtung (200) zur Lieferung der Steuersignale zur Veranlassung der Video- und Audioschalteranordnungen (230,255,240) in den drei Betriebsarten zu arbeiten:

- einem ersten Modus, in dem Leuchtdichte- und Farbkomponenten ausgewählt werden, die aus dem ersten Farbvideosignalgemisch (TV) und dem ersten Audiosignal (TV) abgeleitet sind;
- einem zweiten Modus, in dem die Leuchtdichte- und Farbkomponenten, die von dem zweiten Farbvideosignalgemisch (AUX1) und dem zweiten Audiosignal abgeleitet sind, ausgewählt werden;
- und einem dritten Modus, in dem die an dem Paar Eingängen liegenden Leuchtdichte- und Farbkomponentensignale (Y, C) und das zweite Audiosignal (S-video) ausgewählt werden.

2. Audio- und Videoschaltvorrichtung nach Anspruch 1, **dadurch gekennzeichnet, daß** die Audioschalteranordnung (240) einen dritten Audiosignaleingang (241,242) aufweist und der zweite und dritte Audiosignaleingang zusammengeschaltet sind.

3. Audio- und Videoschaltvorrichtung nach Anspruch 1, **dadurch gekennzeichnet,**

daß die Videoschalteranordnung (230,255) erste (230) und zweite (255) Videoschaltereinrichtungen enthalten, von denen die erste Videoschaltereinrichtung (230) die ersten (TV) und die zweiten (AUX) Videosignaleingänge zur Zuführung der ersten bzw. zweiten Videosignale sowie einen Steuereingang zur Zuführung des Videowählsteuersignals und einen Ausgang hat, an dem ein Ausgangsvideosignal entsteht, welches ein Paar Leuchtdichte- und Farbkomponenten enthält, die in Abhängigkeit von dem Videowählsteuersignal aus einem ausgewählten der ersten und zweiten Videoeingangssignale ausgewählt sind,

und von denen die zweite Videoschalteranordnung (255) einen ersten Eingang hat, der an den Ausgang der ersten Videoschalteranordnung angeschlossen ist, sowie einen zweiten Eingang zur Zuführung des dritten Videosignals (Y) und einen Steuereingang (C) zur Zuführung eines weiteren Steuersignals und einen Ausgang, an dem ein Videosignal entsteht, welches in Abhängigkeit von dem dritten Steuersignal aus Signalen an den ersten und zweiten Eingängen der zweiten Videoschalteranordnung ausgewählt ist und
und **daß** eine Logikschaltung (D231,D232;253) vorgesehen ist, die einen Eingang zur Zuführung des Videowählsteuersignals und einen Ausgang zur Erzeugung des weiteren Steuersignals in Abhängigkeit von dem Videowählsteuersignal hat.

4. Schalteranordnung nach Anspruch 3, **dadurch gekennzeichnet, daß** die Logikschaltung (D231,D232;253) ein UND-Tor aufweist. 20
5. Schalteranordnung nach Anspruch 4, **dadurch gekennzeichnet, daß** das UND-Tor Dioden (D231,D232) enthält, die mit gleichen Elektroden zusammengeschaltet und über einen Widerstand (R255) an einen Bezugspotentialpunkt geschaltet sind, wobei der Verbindungspunkt der gleichen Elektroden der Dioden mit dem Widerstand den Ausgang des UND-Tores bilden. 25 30
6. Schalteranordnung nach Anspruch 1, **dadurch gekennzeichnet, daß** das dritte Videosignal ein S-Videosignal ist. 35

Revendications

1. Dispositif de commutation de signaux audio et vidéo, comprenant : 40

des moyens de commutation de signal vidéo (230, 255) comportant des première (TV) et seconde (AUX1) entrées de signal vidéo pour recevoir, respectivement, des premier et second signaux vidéo complets en couleur possédant une paire d'entrées (Y, C) pour recevoir des signaux des composantes de luminance et de chrominance d'un troisième signal vidéo, respectivement, possédant une entrée de signal de commande (C1, C0, C) pour recevoir un signal de commande de sélection du signal vidéo, et comportant une sortie pour développer un signal de sortie comprenant une paire de composantes de chrominance et de luminance sélectionnée à partir des composantes de chrominance et de luminance dérivées dudit pre-

mier signal vidéo complet en couleur, des composantes de luminance et de chrominance dérivées dudit second signal vidéo complet en couleur, et lesdits signaux des composantes de luminance et de chrominance au niveau de ladite paire d'entrées, en réponse audit signal de commande de sélection de signal vidéo ;
des moyens de commutation de signal audio (240) comportant des première (TV) et seconde (AUX1 ; S-vidéo) entrées de signal audio pour recevoir des premier et second signaux audio, respectivement, comportant une entrée de signal de commande (C1, C0) pour recevoir un signal de commande de sélection audio, et comportant une sortie pour développer un signal audio de sortie sélectionné à partir desdits premier et second signaux d'entrée audio en réponse audit signal de commande de sélection audio ;

des moyens d'entrée de données (205) pour fournir à l'utilisateur une sélection de l'un des trois modes de fonctionnement ; et des moyens de commande (200) pour fournir les signaux de commande afin d'entraîner lesdits moyens de commutation des signaux audio et vidéo (230, 255, 240) à fonctionner dans les trois modes de fonctionnement comprenant :

- un premier mode dans lequel lesdites composantes de luminance et de chrominance dérivées dudit premier signal vidéo complet en couleur (TV) et ledit premier signal audio (TV) sont sélectionnés ,
- un second mode dans lequel lesdites composantes de chrominance et de luminance déduites dudit second signal vidéo complet en couleur (AUX1) et ledit second signal audio sont sélectionnés ;
- et un troisième mode dans lequel lesdits signaux des composantes de luminance et de chrominance (Y, C) au niveau de ladite paire d'entrées et ledit second signal audio (S-vidéo) sont sélectionnés.

2. Dispositif de commutation de signaux audio et vidéo selon la revendication 1, **caractérisé en ce que**

lesdits moyens de commutation audio (240) comprennent une troisième entrée de signal audio (241, 242), lesdites seconde et troisième entrées de signal audio étant connectées ensemble.

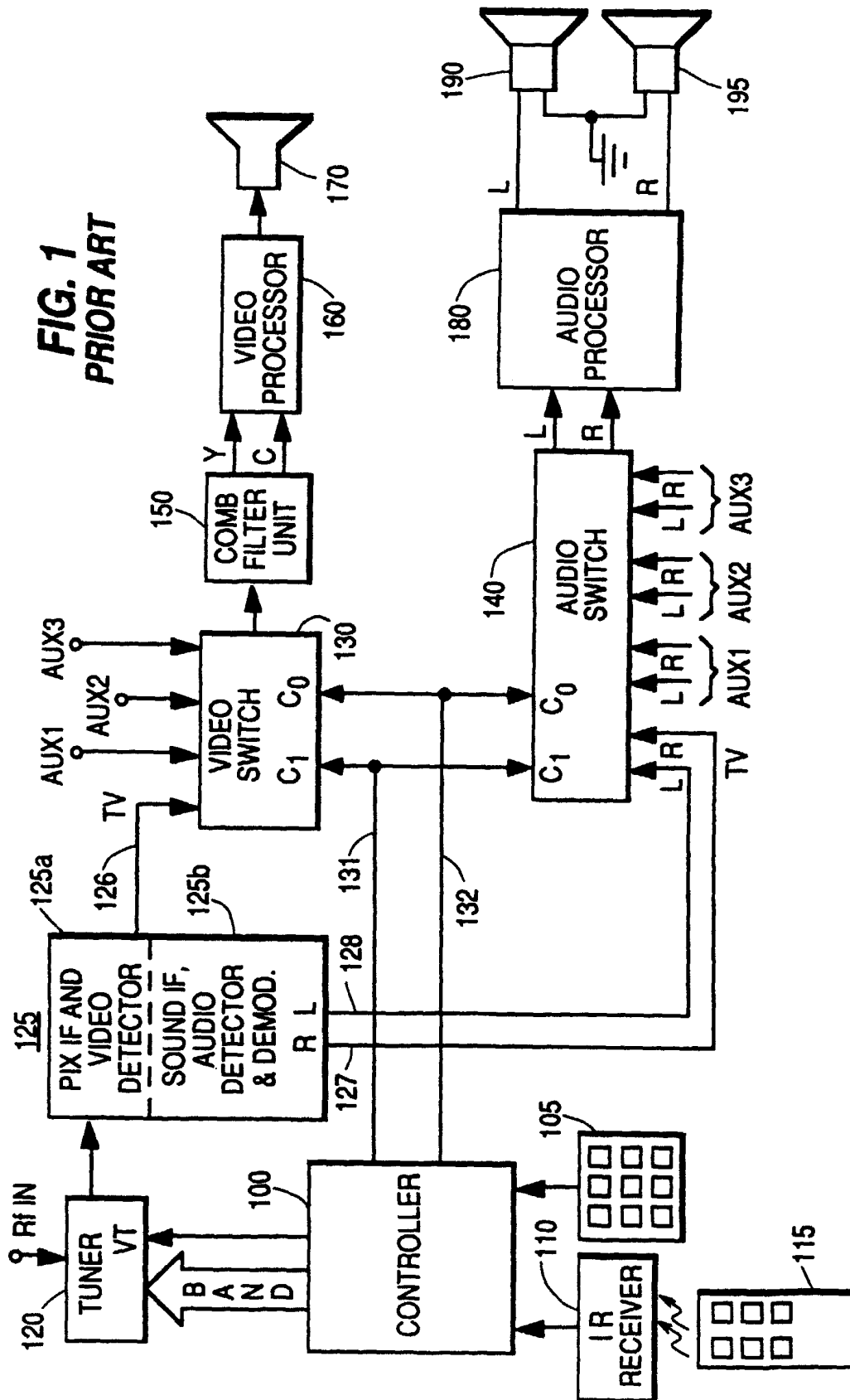
3. Dispositif de commutation des signaux audio et vidéo selon la revendication 1, **caractérisé en ce que :**

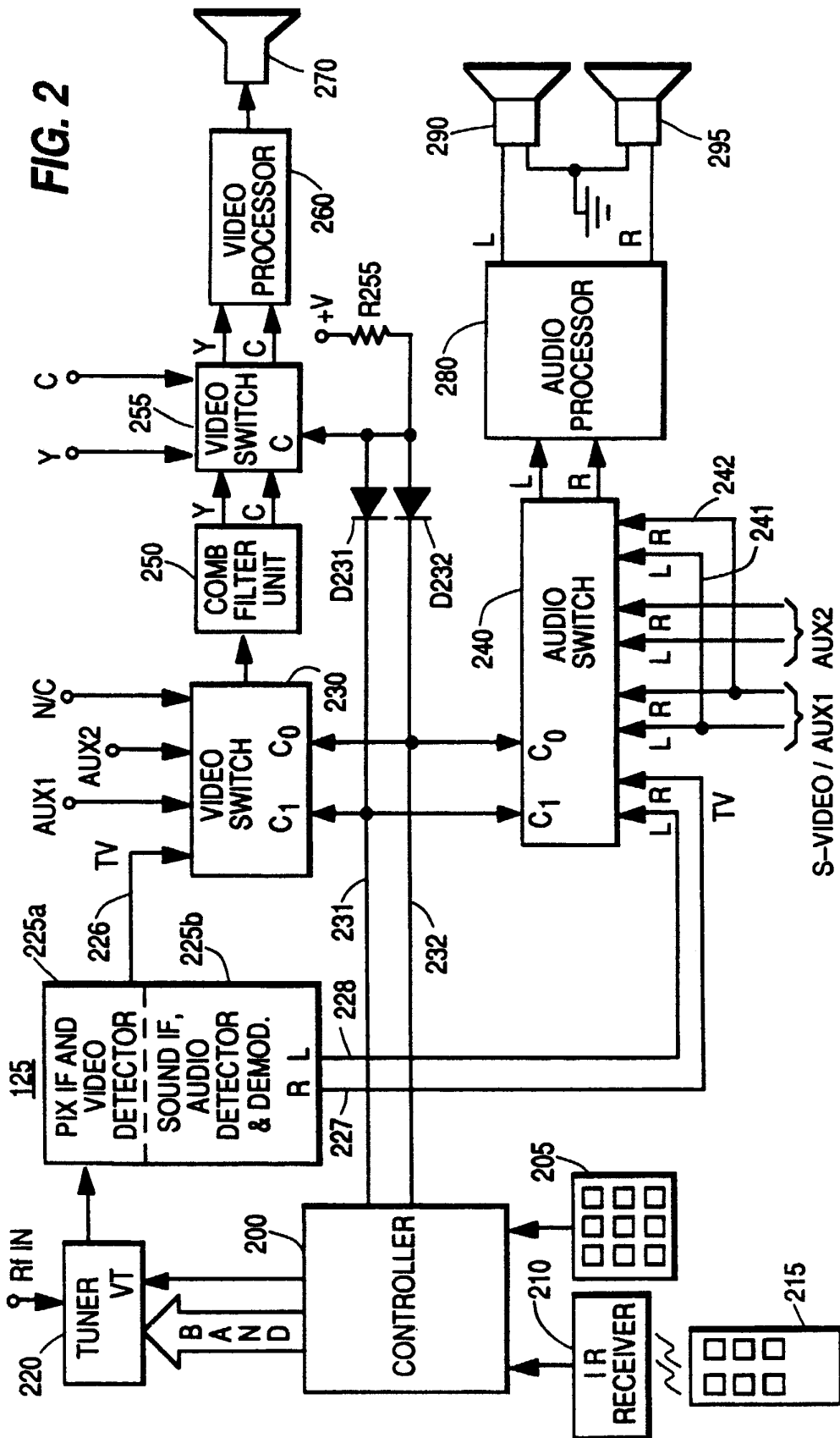
lesdits moyens de commutation vidéo (230, 255) comprennent des premier (230) et second (255) moyens de commutation vidéo, lesdits premiers moyens de commutation vidéo (230) comportant lesdites première (TV) et seconde (AUX1) entrées de signal vidéo pour recevoir, respectivement, lesdits premier et second signaux vidéo comportant une entrée de commande pour recevoir ledit signal de commande de sélection vidéo et une sortie au niveau de laquelle est développé un signal vidéo de sortie comprenant une paire de composantes de luminance et de chrominance qui sont dérivées de l'une sélectionnée desdites première et seconde entrées de signal vidéo en réponse audit signal de commande de sélection vidéo ; lesdits seconds moyens de commutation de signal vidéo (255) possédant une première entrée couplée à ladite sortie desdits premiers moyens de commutation vidéo, une seconde entrée pour recevoir ledit troisième signal vidéo (Y), une entrée de commande (C) pour recevoir un signal de commande supplémentaire, et une sortie au niveau de laquelle se développe un signal vidéo sélectionné à partir des signaux présents au niveau desdites première et seconde entrées desdits seconds moyens de commutation vidéo en réponse audit troisième signal de commande ; et des moyens logiques (D231, D232; 253) comportant une entrée pour recevoir ledit signal de commande de sélection vidéo, et une sortie pour développer ledit signal de commande supplémentaire en réponse audit signal de commande de sélection vidéo.

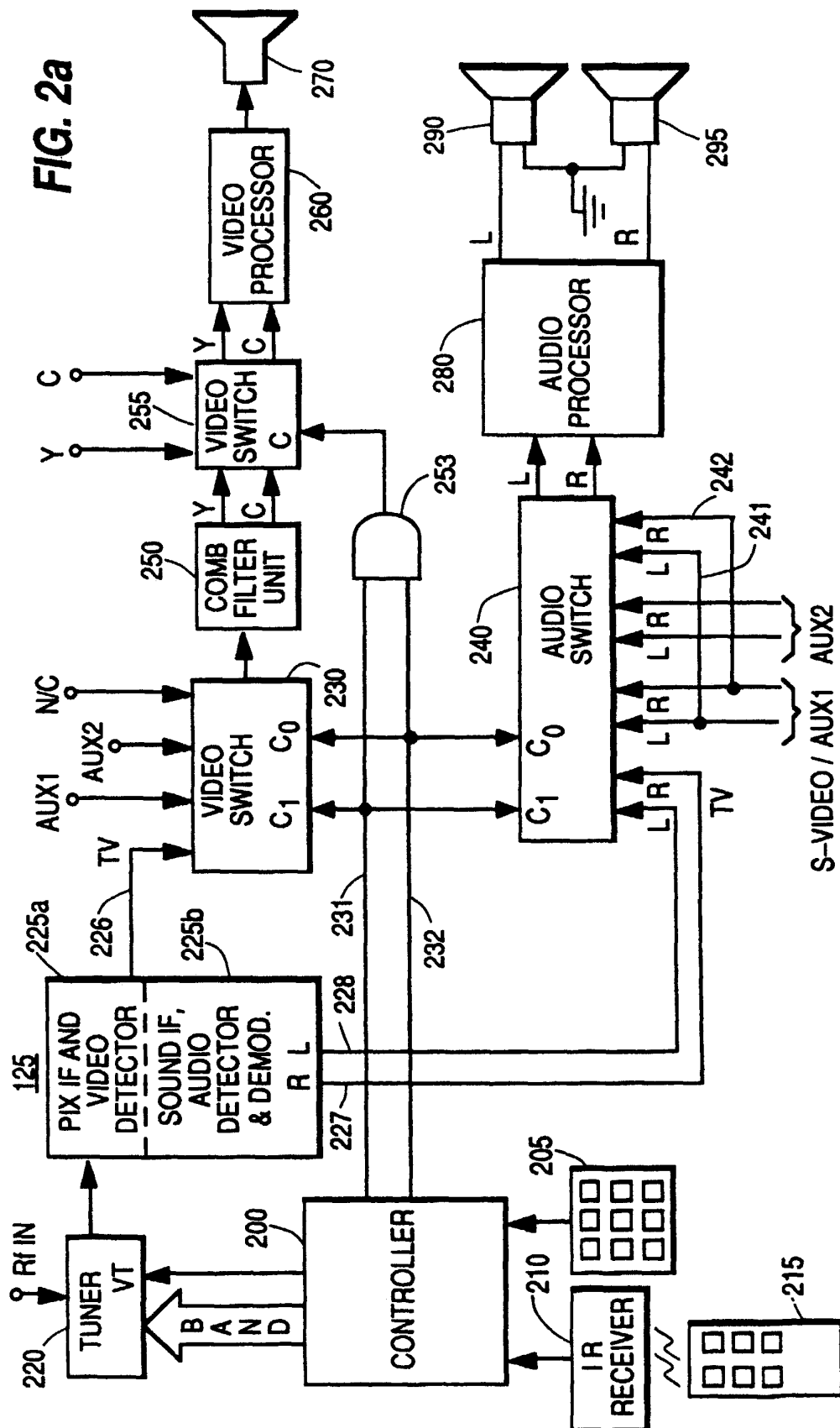
4. Dispositif de commutation selon la revendication 3, **caractérisé en ce que** lesdits moyens logiques (D231, D232, 253) comprennent une porte ET.

5. Dispositif de commutation selon la revendication 4 **caractérisé en ce que** ladite porte ET comprend des moyens de diode (D231, D232) comportant des électrodes similaires couplées ensemble et couplées par l'intermédiaire de moyens de résistance (R255) à un point de potentiel de référence, la jonction desdites électrodes similaires desdits moyens de diode et desdits moyens de résistance formant la sortie de ladite porte ET.

6. Dispositif de commutation selon la revendication 1, **caractérisé en ce que** ledit troisième signal vidéo est un signal S-VIDEO.







CONTROL CODES		VIDEO SOURCES				AUDIO SOURCES		
		TV	AUX1	AUX2	S-VIDEO	TV	AUX1	AUX2
0	0	X				X		
0	1		X				X	
1	0			X				X
1	1				X		X	

FIG. 3

FIG. 4

