

Color television receiver

The present invention relates to a color television receiver and is concerned in one aspect with a receiver for operation with the SECAM (Registered Trade Mark) system and in another aspect with a dual standard SECAM/PAL receiver.

There is provided in a known color television receiver for the reception of composite color television signals inclusive of a chrominance component encoded in SECAM format; said SECAM-encoded chrominance component comprising, during image portions of alternate line intervals, a first subcarrier frequency modulated in accordance with a first color-difference signal, and during image portions of the intervening line intervals, a second subcarrier frequency modulated in accordance with a second color-difference signal, with a lead-in burst of oscillations at the center frequency of said first subcarrier preceding the image portion of each of said alternate line intervals, and with a lead-in burst of oscillations at the center frequency of said second subcarrier preceding the image portion of each of said intervening line intervals; apparatus comprising:

an FM detector, responsive to the received signals, and subject to operation in either a first mode with center frequency tuning corresponding to the center frequency of said first subcarrier, or a second mode with center frequency tuning corresponding to the center frequency of said second subcarrier;

a triggered flip-flop circuit for providing, when enabled, a pair of half line rate wave outputs of mutually opposite phase;

a source of line rate pulses timed to substantially coincide with the periods of appearance of said lead-in bursts; and

means for controlling the operating mode of said FM detector in response to one of said pair of half line rate wave outputs such that said FM detector operates in respective different ones of said modes during the image portions of successive line intervals.

An example of such a known SECAM receiver is described in British Patent Specification 1,358,551.

In the SECAM color television system described in that patent specification R—Y and B—Y color-difference signals frequency modulate respective subcarriers (4.40625 MHz and 4.250 MHz) which are provided alternately on a line-by-line basis in the transmitted signal. An economical approach to processing such signals in a SECAM receiver, which is also attractive for use in dual-standard (SECAM/PAL) receivers, is to convert the SECAM signal into a signal similar to a PAL signal (i.e., a "quasi-PAL" signal) for further processing by standard PAL signal decoding techniques. The respective SECAM subcarriers are demodulated sequentially by a frequency discriminator,

and in appropriate sequence, respective phases of a subcarrier derived from the PAL crystal oscillator of the PAL decoder apparatus.

It is important that the FM detector, as controlled by the flip-flop (and thus the flip-flop itself), operates in the mode appropriate to the color difference signal received at any one time, i.e., the line-by-line switching of the center frequency of the detector is correctly timed relative to the line-by-line alternation of the color difference signals.

Thus the receiver in one aspect of the present invention is characterised by said controlling means being additionally responsive to said line rate pulses so that it operates in only said first mode during each period of lead in burst appearance so that the output of the FM detector exhibits a first output due to it operating in the first mode during periods of lead in burst at the center frequency of the second subcarrier and a second output, different to the first output, due to it operating in the first mode during periods of lead in burst at the center frequency of the first subcarrier;

first sampling means, coupled to receive an output of said FM detector and responsive to said line rate pulses and to said one of said pair of half line rate wave outputs, for sampling the output of said FM detector only during alternate ones of said periods of appearance of lead-in-bursts;

second sampling means coupled to receive said output of said FM detector and responsive to said line rate pulses and to the other of said pair of half line rate wave outputs, for sampling the output of said FM detector only during intervening ones of said periods of appearance of said lead-in-bursts;

the arrangement being such that if the phase of said one of the half line rate wave outputs relative to the received SECAM signal is such that the FM detector operates in the first mode during said alternate line intervals and in said second mode during said intervening line intervals, a predetermined one of the sampling means samples the said first output and the other samples the said second output;

means for comparing the output levels of said first and second sampling means; and

means responsive to an output of said comparing means for disabling said flip-flop circuit only when the output levels of the sampling means are indicative of said predetermined one of said sampling means sampling said second output and said other one of said sampling means sampling said first output.

Thus this aspect allows the identification and correction of an incorrect mode of line-by-line switching of the center frequency of the FM detector.

In an embodiment of this one aspect of the present invention, the flip-flop circuit develops

half line rate control waves for use in switching the center frequency tuning of the frequency discriminator employed for demodulating received SECAM signals. When the phasing of the flip-flop output is correct, the discriminator is provided with center frequency tuning appropriate to demodulation of the R—Y SECAM subcarrier (4.40625 MHz) during the image portion of an R—Y line interval of the SECAM signal, and tuning appropriate for demodulation of the B—Y modulated subcarrier (4.250 MHz) during the image portion of a B—Y line interval of the SECAM. Through the supplemental association of line rate, burst interval control wave, however, the timing of the changes in discriminator center frequency tuning is so controlled that during the lead-in burst preceding the image portions of both of such R—Y and B—Y line intervals, the discriminator center frequency tuning is the same (e.g. tuned for a center frequency corresponding to the R—Y subcarrier). As a consequence of holding the same (R—Y subcarrier) center frequency tuning for all burst intervals, there appears, in the filtered output of the discriminator, pulses during alternate line interval blanking portions which identify the successive occurrence of a particular (B—Y) line interval.

The filtered output of a discriminator subject to center frequency tuning control of the above-described type is applied to a pair of sample-and-hold circuits. Using respective half line rate control waves of mutually opposite phase derived from the flip-flop, and common line rate, burst interval gating pulses, for control of the sampling times of the respective sample-and-hold circuits, one sample-and-hold circuit effects sampling of the filtered discriminator output during the lead-in burst occurrence of alternate line intervals, while the other sample-and-hold circuit effects a sampling of the filtered discriminator output during the lead-in burst occurrence of the intervening line intervals. Comparison of the outputs of the two sample-and-hold circuits in a voltage comparator yields an output indicative of the correctness or incorrectness of the phasing of the flip-flop circuit. When the output is indicative of incorrect flip-flop phasing, the flip-flop is shut down, and then allowed to restart, whereupon a new comparison is effected, with such a process repeated until correct flip-flop phasing is achieved.

In accordance with a further aspect of the present invention, there is provided a receiver in accordance with said one aspect

for the reception also of composite colour television signals inclusive of a chrominance component encoded in a PAL format, and which includes:

a PAL chrominance component decoder; and means responsive to an output of said FM detector for forming a quasi-PAL chrominance component; the receiver being further characterised in that it further includes a path for

received signals bypassing said FM detector and said quasi-PAL chrominance component forming means;

switching means for supplying the output of said quasi-PAL chrominance component forming means to said decoder when in a first switching state, and for supplying the output of said bypassing path to said decoder when in a second switching state; and

means responsive to an output of said comparing means for causing said switching means to assume said first switching state only when the output levels of the first and second sampling means are indicative of the predetermined one of the sampling means sampling the said first output and the other of the sampling means sampling the said second output.

Thus there is provided a dual-standard SECAM/PAL receiver in which the output of the comparing means is utilized to effect automatic control of PAL/SECAM reception.

In an illustrative implementation of both aspects in a dual-standard receiver, response to signal conditions simultaneously establishing a high output from a first one of said sample-and-hold circuits and a low output from the second of said sample-and-hold circuits results in a disabling of the flip-flop and operation of the receiver in a PAL-reception operating mode, while response to signal conditions establishing substantially equal outputs from both sample-and-hold circuits results in an enabling of the flip-flop and operation of the receiver in a PAL-reception operating mode, whereas response to signal conditions simultaneously establishing a high output from the second sample-and-hold circuits and a low output from the first sample-and-hold circuit results in enabling of the flip-flop and operation of the receiver in a SECAM-reception operating mode.

In the accompanying drawings:

FIGURE 1 illustrates, by block diagram representation, dual-standard SECAM/PAL color television receiver apparatus incorporating an identification system pursuant to the principles of the present invention;

FIGURE 2 illustrates schematically circuit arrangements which may be advantageously employed in implementing the functions of elements of the identification system of FIGURE 1; and

FIGURES 3 and 4 illustrate graphically waveforms of aid in explaining the operation of the identification system of FIGURES 1 and 2.

In the dual-standard receiver arrangement of FIGURE 1, a composite video input signal (derived from the receiver's video detector, not illustrated) appears at input terminal 1, and is supplied to a pair of bandpass filters 11 and 13, as well as to the receiver's luminance channel (not illustrated). Bandpass filter 13 encompasses the chrominance signal bandwidth associated with a PAL transmission. Bandpass filter 11 encompasses the chrominance signal bandwidth of a SECAM transmission, and is

provided with a bandpass characteristic of a "cloche" or bell-shaped form, appropriately complementary to the characteristic employed for high frequency pre-emphasis of subcarrier sidebands in SECAM signal formation.

The output of bandpass filter 11 is supplied to a SECAM/PAL transcoder 14 embodying the present invention. The transcoder 14 includes a limiter 15, which accepts the output of bandpass filter 11 and delivers a limited version thereof to an FM detector 17, illustratively of the quadrature detector type, such as described, for example, in EP 0 003 393 A1.

A tuning control circuit 18 is associated with the FM detector 17 so as to alter the effective center frequency of its frequency discriminator characteristic in a controlled manner to be described in detail subsequently. The tuning control is such that, during a SECAM signal reception, the output of the single FM detector sequentially comprises, during the image portions of successive line intervals, R—Y and B—Y color-difference signals. This color-difference signal output of detector 17 is supplied to a de-emphasis circuit 19, provided with a characteristic complementary to the modulating signal pre-emphasis employed in SECAM signal formation. The output of the de-emphasis circuit 19 is supplied to a burst pedestal insertion circuit 21, which serves to augment the color-difference signal output of the detector with burst gating pedestals occupying an appropriate segment of the blanking portion of each line interval.

The augmented color-difference signal output of circuit 21 is supplied as a modulating signal to a PAL modulator 23, which modulates the amplitude of subcarrier waves of PAL subcarrier frequency in accordance with the modulated signal. The subcarrier wave input terminal S of modulator 23 receives subcarrier frequency waves in a particular phase sequence appropriate to the formation of a quasi-PAL signal by modulator 23.

The desired phase sequencing of the subcarrier wave input to modulator 23 is carried out by a subcarrier phase switching circuit 33, which receives PAL reference oscillations from a PAL decoder (not shown), both directly and via a 90° phase shifter 31, and which receives line rate control waves from a burst gating pulse source 27 and half line rate control waves from a flip-flop circuit 29. The flip-flop circuit 29, which is subject to triggering by an output of the burst gating pulse source 27, is controlled in its phasing by an identification system, embodying the invention and to be subsequently described.

The operation of the subcarrier phase switching circuit 33 is carried out in such a way during SECAM signal reception that the following results are obtained:

A) During the image portion of a line interval when a B—Y color difference signal is supplied to the modulating signal input terminal of

modulator 23, the PAL subcarrier waves delivered to the subcarrier wave input terminal S of modulator 23 are of a first phase;

B) During the image portion of a line interval when R—Y color difference signals are supplied to the modulating signal input terminal of modulator 23, the subcarrier waves delivered to terminal S are of a second phase leading the first phase by 90°;

C) During delivery of the burst gating pedestal immediately preceding R—Y color difference signal delivery to modulator 23, the subcarrier waves delivered to terminal S of the aforementioned second phase;

D) During delivery of the burst gate pedestal immediately preceding delivery of B—Y color difference signals to modulator 23, the subcarrier waves delivered to terminal S are of a phase differing from the second phase by 180° and lagging the first phase by 90°.

Reference may be made to EP 0 003 169 A1 for a description of an illustrative circuit arrangement for implementing the switching functions of apparatus 33, and an explanation of the advantages of the above-described phasing sequence.

The output of modulator 23 is supplied to the input terminal of a switch section (S2) of electronic switching apparatus 35, which also includes an additional switching section, S1, ganged with switch section S2. The switching apparatus 35 serves to alter the mode of receiver operation between a SECAM-encoded signal reception mode and a PAL-encoded signal reception mode. In the illustrated (SECAM reception) switching condition of switching apparatus 35, switch section S2 enables the coupling of the output of modulator 23 to the chrominance signal input of the PAL decoder via switch output terminal O.

The output of the previously mentioned PAL bandpass filter 13 is coupled to the input of switch section S1. In the illustrated (SECAM reception) switching condition of switching apparatus 35, switch section S1 disrupts the coupling of the output of filter 13 to the switch output terminal O. However, when switching apparatus 35 is altered to the alternative (PAL reception) switching condition, this coupling is enabled, whereas the modulator output coupling is disabled.

Desirably, switching apparatus 35 may also include a third switching section (not illustrated), serving to effect a disabling of the coupling of a phase control signal to the reference oscillator of the PAL decoder when the receiver is operating in the SECAM reception mode, while enabling such coupling when the receiver is operating in the PAL reception mode (as described in the aforementioned EP 0 003 169 A1). The switching apparatus 35 is controlled automatically, in accordance with recognition of the PAL or SECAM nature of the received signals, by an output of the receiver's identification circuit, now to be explained.

The identification system of the receiver apparatus of FIGURE 1 includes a pair of sample-and-hold circuits, 41 and 43, coupled to receive the FM detector's output after processing by de-emphasis circuit 19. Control of the sampling interval for sample-and-hold circuit 41 is effected, in response to line rate pulses of burst interval timing from output terminal BG of burst gating pulse source 27 and to half line rate control waves from output terminal FF of flip-flop 29, in such manner that sample-and-hold circuit 41 effects sampling of the detector output during the lead-in burst occurrence of alternate line intervals. Control of the sampling interval for sample-and-hold circuit 43 is effected, in response to the line rate pulses from terminal BG and to half line rate control waves from the flip-flop's output terminal FF (the latter control waves being 180° out of phase with the control waves from terminal FF), in such manner that sample-and-hold circuit 43 effects sampling of the detector output during the lead-in burst occurrence of the intervening line intervals.

The respective outputs of the sample-and-hold circuits 41 and 43 are subject to comparison in a voltage comparator 45. A first level detector 47, responsive to a first output of voltage comparator 45, provides an output effecting control of the disabling or enabling of flip-flop 29 in dependence upon the level of said first output. A second level detector 49, responsive to a second output of voltage comparator 45, provides an output effecting control of the switching state of electronic switching apparatus 35 in dependence upon the level of said second output.

For an understanding of the manner in which the above-described identification system operates, it is appropriate to first consider the manner in which tuning control circuit 18 operates. For the single FM detector 17 to sequentially develop R—Y color-difference signals at its output, it is desired that its center frequency tuning be appropriate for demodulation of the R—Y SECAM subcarrier (4.40625 MHz) during the image portion of an R—Y line interval, and appropriate for demodulation of the B—Y SECAM subcarrier (4.250 MHz) during the image portion of a B—Y line interval of the SECAM signal. Accordingly, tuning control circuit 18 effects a line-to-line switching of the center frequency tuning in response to half-line rate control waves from the flip-flop terminal FF. If the flip-flop phasing is correct, this will result in tuning appropriate for R—Y subcarrier demodulation during image portions of R—Y line intervals, and tuning appropriate for B—Y subcarrier demodulation during image portions of B—Y line intervals; however, if the flip-flop phasing is incorrect, the result will be inappropriate center frequency tuning for the respective line interval image portions.

To aid in identification of such incorrect phasing when it occurs, line rate pulses of burst

interval timing from terminal BG are utilized in combination with the half line rate control waves from terminal FF to effect a composite control of the center frequency tuning, whereby the timing of the changes in center frequency tuning is such that, during the lead-in bursts preceding the image portions of both R—Y and B—Y line intervals, the center frequency tuning is the same (e.g., tuned for a center frequency corresponding to the R—Y subcarrier).

As a consequence of holding the same (R—Y) center frequency tuning for all burst intervals, there appears in the output of detector 17 pulses during those alternate line interval blanking portions when the lead-in burst frequency deviates from the R—Y center frequency (i.e., during each lead-in burst occurrence preceding a B—Y line interval). Such pulses are not developed during the intervening line interval blanking portions when the lead-in burst frequency is equal to the R—Y center frequency (i.e., during each lead-in burst occurrence preceding an R—Y line interval).

Illustratively, the relationship between the poling of the respective half line rate waves controlling the sampling times of the respective sample-and-hold circuits 41, 43 and the poling of the half line rate waves controlling the tuning changes of detector 17 is such that the sampling interval for sample-and-hold circuit 41 occurs during each of the alternate lead-in burst appearances which immediately precede the switching (by control circuit 18) of the detector tuning to the B—Y center frequency, whereas the sampling interval for sample-and-hold circuit 43 occurs during each of the intervening lead-in burst appearances. With such a relationship, the B—Y line indicating pulses developed during alternate line interval blanking portions by detector 17 will be sampled by sample-and-hold circuit 41 when the flip-flop phasing is correct, whereas such B—Y line indicating pulses will be sampled by sample-and-hold circuit 43 when the flip-flop phasing is incorrect.

Illustratively, comparator 45, which compares the output voltage levels of the respective sample-and-hold circuits, develops a first output (which is delivered to level detector 47) which (a) goes high when the output of sample-and-hold circuit 41 is at a pulse presence indicating level while the output of sample-and-hold circuit 43 is at a pulse absence indicating level (which condition occurs, during SECAM signal reception, when the flip-flop phasing is correct); and (b) goes low when the output of sample-and-hold circuit 43 is at a pulse presence indicating level while the output of sample-and-hold circuit 41 is at a pulse absence indicating level (which condition occurs, during SECAM signal reception, when the flip-flop phasing is incorrect). Level detector 47 discriminates between the high level of said first output under condition (a) and the low level of said first output under condition (b) to develop an output which effects disabling of

flip-flop 29 only when condition (b) is sensed. When the high level of said first output of comparator 45 is present, indicating correctness of flip-flop phasing, the output of level detector 47 is such as to permit normal triggered operation of flip-flop 29.

Under circumstances where the outputs of the respective sample-and-hold circuits are substantially equal, said first output of comparator will be at an intermediate level. One example of a condition that produces such a result is the sampling action that occurs during a SECAM signal reception period when flip-flop 29 is disabled. In the absence of the sampling control effects of the half line rate control waves from flip-flop 29, both of the sample-and-hold circuits 41 and 43 will sample each successive lead-in burst, and their outputs will approach equality, causing the first output of the comparator to rise toward the intermediate level. Level detector 47 responds to such intermediate level conditions by terminating the flip-flop disabling action. That is, the output of level detector under intermediate level conditions is such as to permit normal triggered operation of flip-flop 29.

Another example of a condition that results in an intermediate level for said first output of comparator 45 is reception of a PAL encoded signal. During the line interval blanking portions of a PAL signal color synchronizing bursts of the PAL subcarrier frequency appear. Since the PAL subcarrier frequency (4.43361875 MHz) differs from the R-Y center frequency (4.40625 MHz), and since bursts of such differing frequency occur in successive line intervals, the output of detector 17 will comprise similar pulses in successive burst intervals, and the outputs of the respective sample-and-hold circuits will thus be substantially equal.

Illustratively, comparator 45 is arranged to provide a second output (which is delivered to level detector 49) which: (a) goes high when the output of sample-and-hold circuit 43 stays at a pulse presence indicating level while the output of sample-and-hold circuit 41 stays at a pulse absence indicating level (occurring, during SECAM signal reception, while the flip-flop phasing is incorrect); (b) goes low when the output of sample-and-hold circuit 43 stays at a pulse absence indicating level while the output of sample-and-hold circuit 41 stays at a pulse presence indicating level (occurring, during SECAM signal reception, when the flip-flop phasing is correct); and (c) goes to an intermediate level when the outputs of the respective sample-and-hold circuits are substantially equal (occurring during PAL signal reception). Level detector 49 discriminates between the high, intermediate and low levels which said second output of comparator 45 may attain to develop an output which effects switching (by apparatus 35) of the receiver to the SECAM-reception mode of operation only for condition (b). Thus, only when the low level

of the second output of the comparator indicates SECAM signal presence in association with correct phasing of flip-flop 29 is the output of modulator 23 delivered to terminal O. When said second output of comparator 45 is at an intermediate or a high level, the output of level detector 49 is such as to maintain switching apparatus 35 in its non-illustrated switching condition, delivering the output of filter 13 to terminal O.

Accordingly, during PAL signal reception, the receiver is automatically maintained in its PAL-reception mode of operation. During SECAM signal reception, the receiver is subject to automatic switching to a SECAM-reception mode of operation, but such switching is effected only upon attainment of correct phasing for flip-flop 29. When SECAM signal reception in association with incorrect flip-flop phasing is sensed, flip-flop 29 is shut down, and then allowed to restart, with such a sequence repeating, if necessary, until correct phasing is attained, whereupon switching to the SECAM-reception mode of operation is effected.

FIGURE 2 schematically illustrates circuit arrangements which may be advantageously employed in implementing the above-described functions of sample-and-hold circuits 41, 43 and comparator 45 of the FIGURE 1 system. In FIGURE 2, an emitter-follower 50 couples the output of the de-emphasis circuit 19 (FIGURE 1) to the respective inputs of the sample-and-hold circuits 41 and 43, each of which comprises a sampler of a general type disclosed, for example, in U.S. Patent No. 4,133,002.

In sampler 41, a pair of switching transistors 63, 65 are disposed in a differential configuration, with emitter electrodes joined and returned to ground via a current source transistor 67. The collector electrode of transistor 63 is directly connected to the base electrode of an emitter follower transistor 61, and the collector electrode of transistor 65 is directly connected to the emitter electrode of transistor 61. A first resistor couples the output of emitter-follower 50 to the base of transistor 61, and a second resistor couples the emitter of transistor 61 to the sampler output terminal H. A hold capacitor is coupled between output terminal H and ground. A train of line rate, negative-going pulses of burst interval timing from terminal BG (FIGURE 1) is applied to the base of switching transistor 63, while half line rate square waves from flip-flop terminal FF (FIGURE 1) are applied to the base of switching transistor 65. The levels associated with these control inputs are so related that only during alternate burst intervals, when line rate pulse appearance coincides with a portion of the square wave's positive half-cycle, is transistor 63 rendered non-conducting and transistor 65 rendered conducting. Under these conditions, transistor 61 is keyed on to develop a voltage across the hold capacitor representative of the FM detector output during this sampling inter-

val. During times intervening such sampling intervals, circuit 41 is in the hold state, with transistor 63 conducting and transistors 61 and 65 off.

Transistors 71, 73, 75, and 77 are disposed in sampler 43 in the same manner as transistors 61, 63, 65, and 67 in sampler 41, with the exception that the base of switching transistor 75 receives half line rate square waves (from terminal FF, FIGURE 1) which are opposite in phase to those supplied to the base of transistor 65. As a consequence of this difference in control, the sampling intervals for sampler 43 correspond to those burst intervals intervening the alternate burst intervals when sample 41 effects its sampling.

Comparator 45 comprises a pair of transistors 81, 83 disposed in a differential amplifier configuration, with transistor 85 serving as a current source transistor therefor, with emitter-follower transistor 87 coupling the output terminal H of sampler 41 to the base of transistor 81, and with emitter-follower transistor 89 coupling the output terminal H' of sampler 43 to the base of transistor 83. A first comparator output for delivery to level detector 47 (FIGURE 1) is developed at the collector of transistor 83, and a second comparator output for delivery to level detector 49 is developed at the collector of transistor 81.

FIGURES 3 and 4 show respective sets of waveforms which may be of aid in explaining the operation of the system of FIGURE 1 as implemented by the circuits of FIGURE 2.

In FIGURE 3, waveforms "v", "t", and "ff" illustrate, respectively, the FM detector output delivered by emitter-follower 50, a composite control wave for tuning control circuit 18, and the half line rate control waves developed at flip-flop terminal FF, under first illustrative conditions of: SECAM signal reception with incorrect flip-flop phasing.

Illustratively, positive-going excursions of the tuning control wave "t" effect switching of the FM detector tuning to the B—Y center frequency. As the illustrated relationship of waves "v" and "t" shows, the tuning switching is incorrectly phased: B—Y center frequency tuning occurring during the R—Y line interval's image portion, and R—Y center frequency tuning occurring during the B—Y line interval's image portion. As waveform "ff" shows, the passing of the waves provided at terminal FF in this instance is such that sampler 41 effects its sampling during the R—Y lead-in burst occurrence, with a resultant low level output (whereas sampler 43 effects its sampling during the B—Y lead-in burst occurrence, with a resultant high level output). Under these circumstances, the collector of transistor 83 goes low, causing level detector 47 to effect a disabling of flip-flop 29, while the collector of transistor 81 goes high, causing level detector 49 to maintain switching apparatus 35 in the PAL-reception switching state.

In FIGURE 4, the same waveforms "v", "t", and "ff" are shown, under second illustrative conditions: SECAM signal reception with correct flip-flop phasing.

Comparison of waveforms "v" and "t" in the FIGURE 4 set reveals correct phasing of the tuning switching: B—Y center frequency tuning occurring during the B—Y line interval's image portion, and R—Y center frequency tuning occurring during the R—Y line interval's image portion. The phasing of the waves (waveform "ff") provided at terminal FF, in this instance, is such that sampler 41 effects its sampling during the B—Y lead-in burst occurrence, with a resultant high level output (whereas sampler 43 effects its sampling during the R—Y lead-in burst occurrence, with a resultant low level output). Under these circumstances, the collector of transistor 83 goes high, causing level detector 47 to permit normal triggered operation of flip-flop 29, while the collector of transistor 81 goes low, causing level detector 49 to shift switching apparatus 35 to the SECAM-reception switching state.

Claims

1. A color television receiver for the reception of composite color television signals inclusive of a chrominance component encoded in SECAM format; said SECAM-encoded chrominance component comprising, during image portions of alternate line intervals, a first subcarrier frequency modulated in accordance with a first color-difference signal, and during image portions of the intervening line intervals, a second subcarrier frequency modulated in accordance with a second color-difference signal, with a lead-in burst of oscillations at the center frequency of said first subcarrier preceding the image portion of each of said alternate line intervals, and with a lead-in burst of oscillations at the center frequency of said second subcarrier preceding the image portion of each of said intervening line intervals; comprising:

an FM detector (17), responsive to the received signals, and subject to operation in either a first mode with center frequency tuning corresponding to the center frequency of said first subcarrier, or a second mode with center frequency tuning corresponding to the center frequency of said second subcarrier;

a triggered flip-flop circuit (29) for providing, when enabled, a pair of half line rate wave outputs of mutually opposite phase (FF FF);

a source (27) of line rate pulses (BG) timed to substantially coincide with the periods of appearance of said lead-in bursts; and

means (18) for controlling the operating mode of said FM detector (17) in response to one (FF) of said pair of half line rate wave outputs such that said FM detector operates in respective different ones of said modes during the image portions of successive line intervals;

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In FIGURE 4, the same waveforms "v", "t", and "ff" are shown, under second illustrative conditions: SECAM signal reception with correct flip-flop phasing.

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1. A color television receiver for the reception of composite color television signals inclusive of a chrominance component encoded in SECAM format; said SECAM-encoded chrominance component comprising, during image portions of alternate line intervals, a first subcarrier frequency modulated in accordance with a first color-difference signal, and during image portions of the intervening line intervals, a second subcarrier frequency modulated in accordance with a second color-difference signal, with a lead-in burst of oscillations at the center frequency of said first subcarrier preceding the image portion of each of said alternate line intervals, and with a lead-in burst of oscillations at the center frequency of said second subcarrier preceding the image portion of each of said intervening line intervals; comprising:

an FM detector (17), responsive to the received signals, and subject to operation in either a first mode with center frequency tuning corresponding to the center frequency of said first subcarrier, or a second mode with center frequency tuning corresponding to the center frequency of said second subcarrier;

a triggered flip-flop circuit (29) for providing, when enabled, a pair of half line rate wave outputs of mutually opposite phase (FF FF);

a source (27) of line rate pulses (BG) timed to substantially coincide with the periods of appearance of said lead-in bursts; and

means (18) for controlling the operating mode of said FM detector (17) in response to one (FF) of said pair of half line rate wave outputs such that said FM detector operates in respective different ones of said modes during the image portions of successive line intervals;



characterized by said controlling means being additionally responsive to said line rate pulses (BG) so that it operates in only said first mode during each period of lead in burst appearance so that the output of the FM detector (17) exhibits a first output due to it operating in the first mode during periods of lead in burst at the center frequency of the second subcarrier and a second output, different to the first output, due to it operating in the first mode during periods of lead in burst at the center frequency of the first subcarrier;

first sampling means (41), coupled to receive an output of said FM detector (17), and responsive to said line rate pulses (BG) and to said one (FF) of said pair of half line rate wave outputs, for sampling the output of said FM detector (17) only during alternate ones of said periods of appearance of lead-in-bursts;

second sampling means (43), coupled to receive said output of said FM detector (17), and responsive to said line rate pulses (BG) and to the other (FF) of said pair of half line rate wave outputs, for sampling the output of said FM detector (17) only during intervening ones of said periods of appearance of said lead-in-bursts;

the arrangement being such that if the phase of said one (FF) of the half line rate wave outputs relative to the received SECAM signal is such that the FM detector operates in the first mode during said alternate line intervals and in said second mode during said intervening line intervals, a predetermined one of the sampling means samples the said first output and the other samples the said second output;

means (45) for comparing the output levels of said first and second sampling means (41, 43); and

means (47), responsive to an output of said comparing means for disabling said flip-flop circuit (29) only when the output levels of the sampling means are indicative of said predetermined one of said sampling means sampling said second output and said other one of said sampling means sampling said first output.

2. A receiver in accordance with Claim 1 for the reception also of composite color television signals inclusive of a chrominance component encoded in a PAL format, and which includes:

a PAL chrominance component decoder; and means (23, 33, 31), responsive to an output of said FM detector (17), for forming a quasi-PAL chrominance component;

the receiver being further characterized in that it further includes:

a path (13) for received signals bypassing said FM detector and said quasi-PAL chrominance component forming means;

switching means (35) for supplying the output of said quasi-PAL chrominance component forming means to said decoder when in a first switching state, and for supplying the output of said bypassing path to said decoder when in a second switching state; and

means (49), responsive to an output of said comparing means (45), for causing said switching means (35) to assume said first switching state only when the output levels of the first and second sampling means are indicative of the predetermined one of the sampling means sampling the said first output and the other of the sampling means sampling the said second output.

Patentansprüche

1. Farbfernsehempfänger für den Empfang eines Farbfernsehsignalgemisches mit einem im SECAM-Format codierten Farbsignalanteil, welcher während der Bildteile alternierender Zeilenintervalle einen entsprechend einem ersten Farbdifferenzsignal frequenzmodulierten ersten Farbträger und während der Bildteile der dazwischenliegenden Zeilenintervalle einen entsprechend einem zweiten Farbdifferenzsignal frequenzmodulierten zweiten Farbträger enthält, wobei dem Bildteil der erwähnten alternierenden Zeilenintervalle jeweils ein einführender Zug von Schwingungen der Mittenfrequenz des ersten Farbträgers vorangeht und den Bildteilen der erwähnten dazwischenliegenden Zeilenintervalle jeweils ein einleitender Zug von Schwingungen der Mittenfrequenz des zweiten Farbträgers vorangeht, mit:

einem FM-Demodulator (16), welcher auf die empfangenen Signale anspricht und entweder in einer ersten Betriebsart mit einer Mittenfrequenzabstimmung entsprechend der Mittenfrequenz des ersten Farbträgers oder einer zweiten Betriebsart mit einer Mittenfrequenzabstimmung entsprechend der Mittenfrequenz des zweiten Farbträgers zu arbeiten vermag;

einer getasteten Flipflop-Schaltung (29), die, wenn eingeschaltet, zwei halbzeilenfrequente Ausgangsschwingungen entgegengesetzter Phasen (FF, FF) liefert;

einer Quelle (27) für zeilenfrequente Impulse (BG), die zeitlich im wesentlichen mit den Perioden zusammenfallen, während derer die einführenden Schwingungszüge auftreten, und

einer Anordnung (18) zum Steuern der Betriebsart des FM-Demodulators (17) in Ansprache auf die eine (FF) der beiden halbzeilenfrequenten Ausgangsschwingungen, so daß der FM-Demodulator während der Bildteile aufeinanderfolgender Zeilenintervalle in den entsprechenden verschiedenen Betriebsarten arbeitet, gekennzeichnet durch eine zusätzliche Steuerung der Steueranordnung durch die zeilenfrequenten Impulse (BG) derart, daß sie während jeder Periode, in der der einführende Schwingungszug auftritt, nur in der ersten Betriebsart arbeitet, so daß der Ausgang des FM-Demodulators (17) ein erstes Ausgangssignal, dadurch liefert, daß er während der Perioden des einführenden Schwingungszuges der Mittenfrequenz des zweiten Hilfsträgers in der ersten Betriebsart arbeitet, liefert und ein vom ersten Ausgangssignal verschiedenes zweites



gangssignal dadurch liefert, daß er während Perioden des einführenden Schwingungszuges der Mittenfrequenz des ersten Farbträgers in der ersten Betriebsart arbeitet;

eine erste Abtastanordnung (41), die für den Empfang eines Ausgangssignales des FM-Demodulators (17) gekoppelt und durch die zeilenfrequenten Impulse (BG) sowie die eine (FF) der beiden zeilenfrequenten Ausgangsschwingungen derart gesteuert ist, daß sie das Ausgangssignal des FM-Demodulators nur während alternierender Perioden des Auftretens der einführenden Schwingungszüge abtastet;

eine zweite Abtastanordnung (43), die für einen Empfang des Ausgangssignales des FM-Demodulators (17) gekoppelt und durch die zeilenfrequenten Impulse (BG) sowie die andere (FF) der beiden halbzeilenfrequenten Ausgangsschwingungen derart gesteuert ist, daß sie das Ausgangssignal des FM-Demodulators (17) nur während der erwähnten dazwischenliegenden Perioden des Auftretens der einführenden Schwingungszüge abtastet;

wobei die Anordnung so getroffen ist, daß wenn die eine (FF) der halbzeilenfrequenten Ausgangsschwingungen bezüglich des empfangenen SECAM-Signales eine solche Phase hat, daß der FM-Demodulator während der erwähnten alternierenden Zeilenintervalle in der ersten Betriebsart und während der erwähnten dazwischenliegenden Zeilenintervalle in der zweiten Betriebsart arbeitet, eine bestimmte der beiden Abtastanordnungen das erste Ausgangssignal und die andere das zweite Ausgangssignal abtastet;

eine Anordnung (45) zum Vergleichen der Ausgangssignalwerte der ersten und der zweiten Abtastanordnung (41, 43) ist, und

eine Anordnung (47), die durch ein Ausgangssignal der Vergleichsanordnung gesteuert ist, um die Flipflop-Schaltung (29) nur dann außer Betrieb zu setzen, wenn die Ausgangssignalwerte der Abtastanordnungen anzeigen, daß die vorgegebene eine Abtastanordnung das zweite Ausgangssignal und die andere der Abtastanordnungen das erste Ausgangssignal abtastet.

2. Empfänger nach Anspruch 1 für den zusätzlichen Empfang eines Farbfernsehsignalgemisches, welches einen im PAL-Format codierten Farbartsignalanteil enthält, mit

einem PAL-Farbartsignal-Decodierer und einer Anordnung (23, 33, 31), die durch ein Ausgangssignal des FM-Demodulators (17) gesteuert ist, um ein Quasi-PAL-Farbartsignal zu bilden, dadurch gekennzeichnet, daß der Empfänger ausserdem enthält:

einen Weg (13) für empfangene Signale, der den FM-Demodulator und die das Quasi-PAL-Farbartsignal bildende Anordnung umgeht;

eine Schaltungsvorrichtung (35) zum Zuführen des Ausgangssignales der das Quasi-PAL-Farbartsignal bildenden Anordnung zum Decodierer, wenn sie sich in einem ersten Schaltzustand befindet, und zum Zuführen des Aus-

gangssignals des vorbeileitenden Weges zum Decodierer zuzuführen, wenn sie sich in einem zweiten Schaltzustand befindet, und

eine Anordnung (49), die durch ein Ausgangssignal der Vergleichsanordnung (45), um zu bewirken, daß die Schaltungsvorrichtung (35) den ersten Schaltzustand nur dann annimmt, wenn die Ausgangssignalwerte der ersten und der zweiten Abtastanordnung anzeigen, daß die vorgegebene eine Abtastanordnung das erste Ausgangssignal und die andere Abtastanordnung das zweite Ausgangssignal abtasten.

Revendications

1. Récepteur de télévision en couleur pour la réception de signaux composites de télévision en couleur comprenant une composante de chrominance codée en format SECAM; ladite composante de chrominance codée SECAM comprenant, pendant des parties d'image d'intervalles de lignes alternées, une première fréquence de sous-porteuse modulée selon un premier signal de différence de couleurs, et pendant des parties d'image des intervalles de lignes intermédiaires, une seconde fréquence de sous-porteuse modulée selon un second signal de différence de couleurs avec une salve menante d'oscillations à la fréquence centrale de ladite première sous-porteuse précédant la partie d'image de chacun desdits intervalles de lignes alternées, et avec une salve menante d'oscillations à la fréquence centrale de ladite seconde sous-porteuse précédant la partie d'image de chacun desdits intervalles de lignes intermédiaires; comprenant:

un détecteur FM (17), répondant aux signaux reçus et soumis à un fonctionnement soit dans un premier mode avec un accord à la fréquence centrale correspondant à la fréquence centrale de ladite première sous-porteuse, ou un second mode avec un accord à la fréquence centrale correspondant à la fréquence centrale de ladite seconde sous-porteuse;

un circuit flip-flop déclenché (29) pour produire, quand il est validé, deux ordres de sortie à la demi-fréquence de ligne de phase mutuellement opposée (FF FF);

une source (27) d'impulsions à la fréquence de ligne (BG) cadencées pour coïncider sensiblement avec les périodes d'apparition desdites salves menantes; et

un moyen (18) pour contrôler le mode de fonctionnement dudit détecteur FM (17) en réponse à l'une desdites ondes de sortie à la demi-fréquence de ligne (FF) de façon que ledit détecteur FM fonctionne dans des modes respectifs différents pendant les parties d'image d'intervalles de lignes successives; caractérisé en ce que le moyen de contrôle répond de plus aux impulsions à la fréquence de ligne (BG) de façon à fonctionner uniquement dans le premier mode pendant chaque période d'apparition de salve menante pour que la sortie du détecteur FM (17) présente une première sortie due à son



fonctionnement dans le premier mode pendant les périodes de salve menante à la fréquence centrale de la seconde sous-porteuse et une seconde sortie, différente de la première sortie, due à son fonctionnement dans le premier mode pendant les périodes de salve menante à la fréquence centrale de la première sous-porteuse;

un premier moyen d'échantillonnage (41) couplé pour recevoir une sortie dudit détecteur FM (17) et répondant auxdites impulsions alternées (BG) et à la première desdites ondes de sortie à la demi-fréquence de ligne (FF) pour échantillonner la sortie dudit détecteur FM (17) uniquement pendant des périodes alternées d'apparition des salves menantes;

un second moyen d'échantillonnage (43) couplé pour recevoir la sortie dudit détecteur FM (17) et répondant aux impulsions à la fréquence de ligne (BG) et aux autres des ondes de sortie à la demi-fréquence de ligne (FF) pour échantillonner la sortie dudit détecteur FM (17) uniquement pendant les périodes intermédiaires d'apparition de salves menantes;

l'agencement étant tel que si la phase de l'une des ondes de sortie à la demi-fréquence de ligne (FF) par rapport au signal SECAM reçu est telle que le détecteur FM fonctionne dans le premier mode pendant des intervalles de lignes alternées et dans le second mode pendant des intervalles de lignes intermédiaires, un moyen d'échantillonnage prédéterminé échantillonne ladite première sortie et l'autre échantillonne ladite seconde sortie;

un moyen (45) pour comparer les niveaux de sortie desdits premier et second moyens d'échantillonnage (41, 43); et

un moyen (47) répondant à la sortie dudit moyen de comparaison pour inhiber le circuit

bascule (29) uniquement quand le niveau de sortie du moyen d'échantillonnage indique que le moyen d'échantillonnage prédéterminé échantillonne la seconde sortie et que l'autre des moyens d'échantillonnage échantillonne la première sortie.

2. Récepteur selon la revendication 1, pour la réception également de signaux composites de télévision en couleur comprenant une composante de chrominance codée en format PAL et qui comprend:

un décodeur de composante de chrominance PAL; et un moyen (23, 33, 31) répondant à une sortie dudit détecteur FM (17) pour former une composante de chrominance quasi-PAL;

le récepteur étant de plus caractérisé en ce qu'il comprend:

un trajet (13) pour les signaux reçus bypassant le détecteur FM et le moyen formant la composante de chrominance quasi-PAL;

un moyen de commutation (35) pour appliquer la sortie du moyen formant la composante de chrominance quasi-PAL au décodeur dans son premier état de commutation et pour appliquer la sortie du trajet by-passant audit décodeur quand il est à son second état de commutation; et

un moyen (49) répondant à une sortie dudit moyen de comparaison (45) pour forcer ledit moyen de commutation (33) à prendre son premier état de commutation uniquement quand les niveaux de sortie des premier et second moyens d'échantillonnage indiquent que le moyen prédéterminé d'échantillonnage échantillonne ladite première sortie et que l'autre des moyens d'échantillonnage échantillonne ladite seconde sortie.

