

Description

The present invention relates generally to DC stabilization systems for use in color television receivers, and particularly to systems for stabilizing the DC levels of the respective color signal drives for a color kinescope in receivers of the type incorporating apparatus for automatic control of color kinescope biasing.

An illustrative arrangement for automatic control of color kinescope biasing in a color television receiver is that described in 4,263,822 -HUS-A-Hinn. In the Hinn arrangement, a control period, occupying a period of several successive line intervals within each vertical blanking interval, is set aside for monitoring a black level current produced by an electron gun under reference signal conditions, for detection of departures from a desired current level, and for readjustment of gun bias to oppose the undesired departures. During a portion of the control period, the color kinescope grid receives a conduction-enhancing pulse; bias control is based upon information derived as indicative of the change in cathode current level introduced by the grid pulsing. An advantageous system for utilization of the above-described Hinn approach in maintenance of an appropriate bias relationship among the color kinescope's gun trio (in the face of aging and other parameter variations) is described in US-A-4,484,228 of R. P. Parker.

For successful use of automatic kinescope bias (AKB) control in the manner exemplified by the structures of the aforementioned Hinn and Parker patents, it is recognized in coiled European Patent Application EP-A-0 146 343 (RCA 76593) corresponding to US-A-4 554 588 entitled "Control System For Luminance/Chrominance Signal Processing Circuits" that the luminance/chrominance signal processing circuits, which process signal information for delivery to the color kinescope during the time periods intervening the periodically recurring kinescope bias control intervals, require some suitable form of manipulation during the kinescope bias control intervals to avoid undesirable disturbance or contamination of the current monitoring and bias adjustment functions.

The luminance/chrominance signal processing circuits of a color television receiver conventionally serve to process the luminance and chrominance components of received composite color television signals so as to derive therefrom a set of three color signals for delivery to a color kinescope to achieve a color image reproduction. Stability of the DC levels of the delivered color signals is important to achievement of faithful color renditions in the reproduced image. It is the particular concern of the present invention to provide a system for such DC level stabilization that will also facilitate ac-

curate operation of AKB control circuits incorporated in the receiver.

In accordance with the principles of the present invention, a color television receiver is advantageously provided with a DC stabilization system including a pair of control loops, both functioning to adjust the DC level of the luminance signal contribution to the formation of the set of color signals. One of the control loops includes a first keyed comparator, enabled only during gating intervals within horizontal blanking portions of line intervals which lie outside of the kinescope bias control intervals. The first keyed comparator serves to compare a reference voltage with the voltage attained by one of the color signals during said gating intervals. The first comparator output is applied to the receiver's luminance channel to oppose departures of said attained color signal voltage from substantial equality with the reference voltage. The other of the pair of control loops includes a second keyed comparator, enabled only during each of said kinescope bias control intervals, and serving to compare said reference voltage with the voltage attained by said one of the color signals during said kinescope bias control intervals. The second comparator output is applied to the receiver's luminance channel to oppose departures of said attained color signal voltage from substantial equality with the reference voltage.

Illustratively, the output of the first keyed comparator is stored by a capacitor during the periods intervening successive gating intervals, with the capacitor value chosen to provide the first control loop with an effective time constant which is long relative to a line interval so as to substantially avoid horizontal, as well as vertical, shading effects. In contrast, the effective time constant of the second control loop is short relative to a line interval duration.

As described in the aforementioned coiled European Patent Application EP-A-0 146 343 (RCA 76593) corresponding to US-A-4 554 588 it is desirable to set the luminance amplifier gain to a minimum value (independent of the viewer's contrast or picture control adjustments) during each kinescope bias control interval so as to protect AKB operations from disturbance by received signal components. However, full protection of the AKB operations may be compromised by signal leak-through of VITS (Vertical Interval Test Signal) signal components, for example, occurring in the luminance amplifier under the minimum gain conditions. The fast-acting second control loop, described above, provides a facility for lessening the adverse effects of any such signal leak-through by introducing significant degeneration at the video signal frequencies.

The above-described two-loop arrangement for

adjustment of the DC level of the luminance signal contribution to the formation of the color signal outputs is desirably accompanied by additional control loops for adjustment of the DC levels of the color-difference signal contributions to color signal formation.

In accordance with an illustrative embodiment of the present invention, employed in a color television receiver wherein I and Q color-difference signals are recovered by synchronous detection of received chrominance signals and matrixed to form a set of color-difference signals of R-Y, B-Y and G-Y form, the DC stabilization system includes a third control loop adjusting the DC level of the I signal input to the matrixing operation, and a fourth control loop adjusting the DC level of the Q signal input to the matrixing operation. The third and fourth control loops, with long effective time constants comparable to the first control loop's time constant, include respective third and fourth keyed comparators, enabled during gating intervals corresponding to those associated with the operation of the first keyed comparator. The third keyed comparator illustratively serves to compare the voltage attained by the red color signal during the gating intervals with the aforementioned reference voltage, while the fourth keyed comparator illustratively serves to compare the voltage attained by the green color signal during the gating intervals with the aforementioned reference voltage. Under these illustrative circumstances, the first and second keyed comparators are rendered responsive to the blue color signal.

In the accompanying drawings,

FIGURES 1 and 1a illustrate, partially schematically and partially by block representation, cooperating portions of a color television receiver incorporating a DC stabilization system in accordance with an embodiment of the present invention; and

FIGURE 2 illustrates graphically waveforms of aid in explaining the operation of the FIGURE 1 system.

The color television receiver portion illustrated in FIGURE 1 includes a gain controlled luminance signal amplifier 40. The circuitry (only partially illustrated) of amplifier 40, which processes the luminance signal component of received composite color video signals, includes an output NPN transistor 41, having a collector electrode connected to the positive terminal ($+V_{cc}$) of an operating potential supply via a load resistor 42. The luminance signal output of amplifier 40, developed across load resistor 42, appears at the amplifier output terminal L.

The amplifier output terminal L is directly connected to the base electrode of an NPN transistor 43, disposed in an emitter-follower configuration

with its collector electrode directly connected to the $+V_{cc}$ supply terminal. The emitter electrode of transistor 43 is connected via a resistor 44 to the collector electrode of an NPN current source transistor 46, which has its emitter electrode returned via a resistor 47 to the negative terminal (ground) of the operating potential supply. Transistors 43 and 46 cooperate with resistor 44 to form a luminance signal translating circuit of the level shifting type, subject to control in a manner to be described subsequently.

Level shifted luminance signals, appearing at the collector electrode of transistor 46, are coupled via the base-emitter path of an NPN emitter-follower transistor 45 to a luminance signal output terminal Y. The collector electrode of transistor 45 is directly connected to the $+V_{cc}$ terminal. An NPN transistor 48, functioning as a current source for the emitter-follower transistor 45, is disposed with its collector electrode directly connected to terminal Y, with its emitter electrode returned to ground via a resistor 49, and with its base electrode connected to the positive terminal ($+V_b$) of a suitable bias potential supply.

The luminance signals appearing at terminal Y are supplied to respective inputs of a trio of signal combiners 25, 27, 29. The signal combiners 25, 27, 29 function to combine the luminance signals with respective color-difference signals derived from the chrominance component of the received composite color video signals, to form a set of green, blue and red color signals at respective combiner output terminals G, B and R.

For signal recovery from the received chrominance component, the color television receiver's chrominance signal channel includes a pair of color demodulators 11, 13. The output of demodulator 11, which recovers a Q color-difference signal by conventional synchronous detection techniques, is subject to appropriate filtering by a Q filter 15, and then supplied as a signal input to a differential amplifier 19. The output of demodulator 13, which recovers an I color-difference signal by conventional synchronous detection techniques, is subject to appropriate filtering by an I filter 17, and then supplied as a signal input to a differential amplifier 21. Differential amplifiers 19 and 21 also receive control inputs from apparatus to be described subsequently. Push-pull versions of the Q color-difference signals, appearing at respective output terminals $+Q$ and $-Q$, of differential amplifier 19, and push-pull versions of the I color-difference signals, appearing at respective output terminals, $+I$ and $-I$, of differential amplifier 21, are supplied as inputs to matrix circuits 23.

Matrix circuits 23, illustratively of the general form disclosed in HUS-A-4,272,778 - Harwood, et al., provide appropriate combinations of the input

signals to develop a green color-difference signal at an output terminal G-Y, a blue color-difference signal at an output terminal B-Y, and a red color-difference signal at an output terminal R-Y. The signals at terminals R-Y, B-Y and G-Y serve as the respective color-difference signal inputs to the aforementioned signal combiners 25, 27 and 29.

Before considering the DC stabilization system elements of the FIGURE 1 arrangement, it is appropriate to consider the FIGURE 1a showing of apparatus for utilizing the respective color signals at the combiner output terminals R, B and G. As shown in FIGURE 1a, a trio of kinescope drivers 93, 94, 95 are provided, responsive respectively to the red color signal appearing at terminal R, the blue color signal appearing at terminal B, and the green color signal appearing at terminal G.

Display of color images in response to the trio of color signals is effected on the viewing screen of a color kinescope 97, incorporating an electron gun assembly comprising individually energized cathode electrodes 98R, 98B and 98G and a commonly energized control grid structure 99. The red content of the displayed color image is determined by control of the intensity of an electron beam emanating from cathode 98R, which is driven by the output of kinescope driver 93. The blue content of the displayed color image is determined by control of the intensity of an electron beam emanating from cathode 98B, which is driven by the output of kinescope driver 94. The green content of the displayed color image is determined by control of the intensity of an electron beam emanating from cathode 98G, which is driven by an output of kinescope driver 95.

The FIGURE 1a apparatus also includes automatic kinescope bias control circuits 96, which desirably operate in the manner described in the aforementioned Parker patent application. Thus, the bias control circuits 96 include means for supplying a conduction-enhancing pulse to the kinescope control grid 99 during a predetermined portion of the bias control interval (which interval, illustratively, occupies a period of seven-lines duration during a post-sync portion of each vertical blanking interval of the received signal). The bias control circuits 96 are responsive to inputs derived from the respective drivers (93, 94, 95) for sensing beam current changes induced by the grid pulsing, and develop therefrom respective DC outputs for application to the respective drivers (93, 94, 95) to suitably control the biases of the respective kinescope cathodes (98R, 98B, 98G), to which the driver outputs are DC coupled. As explained in the previously-mentioned coiled European Patent Application EP-A-0 146 343 (RAC 76593) corresponding to Patent Application Serial No. 561,176 for protection of the integrity of the AKB operations

effected by the control circuits 96, the luminance amplifier 40 (FIGURE 1) is desirably keyed to a minimum gain condition throughout each kinescope bias control interval.

The manner in which the DC levels of the respective color signal inputs to the drivers (93, 94, 95) are controlled will now be explained, with reference to a stabilization system illustrated in FIGURE 1 which includes a trio of keyed voltage comparators 31, 33 and 35. Each of the comparators 31, 33 and 35 is enabled only during keying periods established in response to a keying wave appearing at terminal K. As illustratively shown by waveform "k" of FIGURE 2, the keying wave at terminal K comprises a train of positive-going pulses, recurring at a line rate and timed to coincide with a "backporch" portion of horizontal blanking intervals of the received signal, but subject to disappearance during the aforementioned kinescope bias control intervals.

Comparator 31 accepts the green color signal from terminal G for comparison with a reference input derived from a reference voltage terminal RV, and develops its output across a storage capacitor 32. The red color signal at terminal R is subject to comparison with the same reference voltage (from terminal RV) in comparator 33, which develops its output across storage capacitor 34. The blue color signal at terminal B is also subject to comparison with the reference voltage appearing at terminal RV in comparator 35, which develops its output across storage capacitor 36.

A DC potential is developed across capacitor 32 which is representative of the difference, if any, existing between the green signal and reference inputs to comparator 31 during the aforementioned "backporch" keying periods, and is held during the intervals between successive keying periods. This DC potential is supplied as an input to differential amplifier 19, to modify the DC level of the Q color-difference signal input to matrix circuits 23 in a direction tending to reduce the difference between the inputs of comparator 31. Similarly, the DC potential stored across capacitor 34 (representative of the difference, if any, existing between the red signal and reference inputs to comparator 33 during the "backporch" keying periods) is supplied as an input to differential amplifier 21, to modify the DC level of the I color-difference signal inputs to matrix circuits 23 in a direction tending to reduce the difference between the inputs of comparator 33.

The DC potential stored across capacitor 36, which is representative of the difference, if any, existing between the blue signal and reference inputs to comparator 35 during the "backporch" keying periods, is utilized to modify the DC level of the luminance signal input to combiners 25, 27, 29

in a direction tending to reduce the difference between the inputs of comparator 35. For this purpose, the DC potential across capacitor 36 is applied to the base electrode of an NPN transistor 50, disposed as an emitter-follower, with its collector electrode directly connected to the $+V_{cc}$ supply terminal. The emitter electrode of transistor 50 is connected to the base electrode of an additional NPN emitter-follower transistor 51, also disposed with its collector electrode directly connected to the V_{cc} supply terminal. The emitter electrode of transistor 51 is returned to ground via the series combination of resistors 52 and 54. The junction of resistors 52, 54 is directly connected to the base electrode of the current source transistor 46 in the previously mentioned level shifting circuit 43-44-46. A translated version of the output of comparator 35 accordingly controls the magnitude of current drawn by current source transistor 46 through resistor 44, and is thus determinative of the luminance signal level shift introduced by the DC voltage drop across resistor 44.

In addition to the three keyed voltage comparators (31, 33, 35) discussed above, the system of FIGURE 1 includes a fourth keyed voltage comparator employing a differential amplifier 60. Differential amplifier 60 is formed by a pair of NPN transistors 61, 62 with emitter electrodes interconnected via the series combination of resistors 63 and 64. A current source for differential amplifier 60 is formed by an NPN transistor 65, disposed with its collector electrode connected to the junction of resistors 63 and 64, and with its emitter electrode grounded. The base-emitter path of transistor 65 is shunted by a diode 66, with its anode connected to the base electrode of transistor 65 and with its cathode grounded.

An NPN transistor 68 is disposed as an emitter-follower for supplying a keying wave to the base electrode of the current source transistor 65. The emitter electrode of transistor 68 is connected via a resistor 67 to the base electrode of current source transistor 65, while the collector electrode of transistor 68 is directly connected to the $+V_{cc}$ supply terminal.

The base electrode of the emitter-follower transistor 68 is connected to terminal A, at which keying waves, of the illustrative form shown by waveform "a" of FIGURE 2, are developed. Keying wave "a" comprises a train of positive-going pulses which recur at a field rate, and each of which is timed to coincide with one of the aforementioned kinescope bias control intervals. During the appearances of the pulse components of keying wave "a", current source transistor 65 is rendered conducting to enable the differential amplifier 60, which is disabled during all other intervals.

The differential amplifier 60 is provided with an

active load circuit employing a trio of PNP transistors 70, 71, 74, with the collector electrode of amplifier transistor 62 directly connected to the collector electrode of load transistor 71, and with the collector electrode of amplifier transistor 61 linked to the collector electrode of load transistor 74 via a forward-biased diode 76 (disposed with its anode connected to the collector electrode of transistor 74, and with its cathode connected to the collector electrode of transistor 61). The emitter electrodes of load transistors 71 and 74 are returned to the $+V_{cc}$ supply terminal via respective emitter resistors 73 and 75. The remaining PNP transistor 70 is disposed with its collector electrode grounded, with its base electrode directly connected to the joined collector electrodes of transistors 62 and 71, and with its emitter electrode returned via an emitter resistor 72 to the $+V_{cc}$ supply terminal, and directly connected to the base electrodes of the load transistors 71 and 74.

The above-described disposition of transistors 70, 71, and 74 forms a current mirror arrangement wherein the collector current of load transistor 74 mirrors the collector current of amplifier transistor 62. An output lead directly links the collector electrode of load transistor 74 with the previously mentioned terminal L (at the base electrode of the luminance signal translating emitter-follower transistor 43).

If the potentials at the base electrodes of amplifier transistors 61, 62 are balanced during a period of enablement of differential amplifier 60, the collector current demand of transistor 61 is matched in magnitude with the current supplied via the collector electrode of load transistor 74, and the differential amplifier output provides no disturbance of the potential at the base electrode of transistor 43. If, however, an imbalance exists such that the potential at the base electrode of transistor 62 is elevated relative to the potential at the base electrode of transistor 61 during an enablement period, the magnitude of the current supplied via the electrode of load transistor 74 exceeds the collector current demand of transistor 61, with the excess supplied via the output lead to result in elevation of the potential at terminal L. Conversely, if a base potential imbalance of the opposite sense exists during an enablement period, the collector current demand of transistor 61 exceeds the magnitude of current supplied via the collector electrode of load transistor 74, with the consequence that the deficit is supplied from the output lead, resulting in a depression of the potential at terminal L.

A reference voltage is supplied to one input of the differential amplifier 60 via the direct connection of the base electrode of amplifier transistor 62 to the reference voltage supply terminal RV. A signal voltage is supplied to the other input of the

differential amplifier 60 by means of the connection of the base electrode of transistor 61 via series resistor 81 to the blue color signal output terminal B. The series combination of a resistor 82 and a capacitor 83 is connected between the base electrode of transistor 61 and ground, and cooperates with series resistor 81 to form a low pass filter (80) for the blue color signal applied to the differential amplifier 60.

The output of a differential amplifier 60 is thus sensitive to departures, if any, of the blue color signal from substantial equality with the reference voltage at terminal RV during each enablement period, and the sense of the control it exerts upon the signal delivered to terminal Y is such as to oppose such departures.

In the stabilization system described above, it is desired to substantially avoid image shading effects that would accompany failure to hold the control voltages developed across capacitors 32, 34, 36 during the periods intervening successive enablement periods for comparators 31, 33, 35. Accordingly, relatively large capacitance values (e.g., 10 microfarads) are employed for capacitors 32, 34, 36, providing effective time constants for the three control loops utilizing comparators 31, 33, 35 which are long relative to the duration of a line interval.

In contrast, the control loop utilizing differential amplifier 60 employs no output storage capacitor and is provided with an effective time constant which is quite short relative to the duration of a line interval. The limit on the speed of response of the latter control loop is imposed by the low pass filter 80, introduced as a loop filter to insure stability. With illustrative values for filter elements 81, 82, 83 of 36 kilohms, 4 kilohms, and 20 picofarads, respectively, significant loop response is obtained at frequencies encompassing an appreciable portion of the luminance signal band.

In operation of the above-described stabilization system, the levels of the three color signals delivered to the kinescope drivers are stabilized against the effects of DC drifts in the receiver's luminance or chrominance channels by a system of three long-time-constant control loops (33, 34, 21; 31, 32, 19; 35, 36, 46) effecting level corrections of the I, Q, and Y signal components from which the three color signals are derived. Level correction of the Y signal component by one of the long-time-constant control loops (35, 36, 46) is augmented by the operation of an additional Y-correcting control loop (80, 60, 43) active only during the periodic kinescope bias control intervals (when the other three control loops are maintained in a "hold" state). By providing the additional control loop with a short time constant permitting fast response, disturbances of the color signal outputs during AKB

operations by received signal components such as VIT (vertical interval test) signals (which may leak through the gain-controlled luminance amplifier 40, even though the latter is desirably keyed to a minimum gain condition during each kinescope bias control interval) are substantially precluded. The additional control loop, moreover, protects the AKB operations from adverse effects of any luminance signal level shift that may undesirably accompany the aforementioned luminance amplifier keying to a minimum gain condition.

It may be noted that in one desirable arrangement for utilizing the present invention, means are incorporated for preventing the keying of comparators 31, 33 and 35 during at least a portion of the received signal's vertical sync interval, for error reduction purposes as explained in cofiled European Patent Application EP-A-0 145 490 (RCA 79620) corresponding to US-A-4 554 577 of R. Shanley et al., entitled Keyed DC Stabilization System With Protection From Error Introduction During Vertical Sync Interval.

In use of such an arrangement, the keying wave "k" will be free of positive-going keying pulse components during the selected vertical sync interval portion.

Claims

1. A color television receiver for displaying color images in response to composite video signals inclusive of respective image-representative luminance and chrominance components, said image-representative components being absent during horizontal blanking portions of successive line intervals within periodic field intervals, and also absent during the vertical blanking portion of each field interval, said receiver including: a color kinescope (97) having a plurality of beam intensity control electrodes (98R, 98B, 98G) for controlling the intensity of a plurality of electron beams tracing a raster of scanning lines upon a viewing screen; means (96) for automatically controlling the bias on the respective control electrodes during periodic bias control intervals encompassing a plurality of successive line intervals within each of said vertical blanking portions; a luminance signal channel for processing said luminance component and including a luminance signal translator (40); a chrominance signal channel for processing said chrominance signal component, and including means responsive to said chrominance signal component for developing a plurality of color-difference signal outputs; a signal combiner (27) responsive to one

differential amplifier 60 by means of the connection of the base electrode of transistor 61 via series resistor 81 to the blue color signal output terminal B. The series combination of a resistor 82 and a capacitor 83 is connected between the base electrode of transistor 61 and ground, and cooperates with series resistor 81 to form a low pass filter (80) for the blue color signal applied to the differential amplifier 60.

The output of a differential amplifier 60 is thus sensitive to departures, if any, of the blue color signal from substantial equality with the reference voltage at terminal RV during each enablement period, and the sense of the control it exerts upon the signal delivered to terminal Y is such as to oppose such departures.

In the stabilization system described above, it is desired to substantially avoid image shading effects that would accompany failure to hold the control voltages developed across capacitors 32, 34, 36 during the periods intervening successive enablement periods for comparators 31, 33, 35. Accordingly, relatively large capacitance values (e.g., 10 microfarads) are employed for capacitors 32, 34, 36, providing effective time constants for the three control loops utilizing comparators 31, 33, 35 which are long relative to the duration of a line interval.

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operations by received signal components such as VIT (vertical interval test) signals (which may leak through the gain-controlled luminance amplifier 40, even though the latter is desirably keyed to a minimum gain condition during each kinescope bias control interval) are substantially precluded. The additional control loop, moreover, protects the AKB operations from adverse effects of any luminance signal level shift that may undesirably accompany the aforementioned luminance amplifier keying to a minimum gain condition.

It may be noted that in one desirable arrangement for utilizing the present invention, means are incorporated for preventing the keying of comparators 31, 33 and 35 during at least a portion of the received signal's vertical sync interval, for error reduction purposes as explained in coiled European Patent Application EP-A-0 145 490 (RCA 79620) corresponding to US-A-4 554 577 of R. Shanley et al., entitled Keyed DC Stabilization System With Protection From Error Introduction During Vertical Sync Interval.

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of said color-difference signal outputs and to an output (Y) of said luminance signal translator for forming a first color signal (B); and means (94) for applying said first color signal to one of said kinescope electrodes; and further including a DC stabilization system comprising:

a first control loop for controlling the DC level of the output of said luminance signal translator including

a first keyed voltage comparator (35), having a first input terminal coupled to receive a reference voltage (RV) and a second input terminal coupled to receive said first color signal (B), said first voltage comparator being keyed (k) into operation only during gating intervals within those horizontal blanking portions of line intervals which lie outside of said bias control intervals

a second keyed voltage comparator (60), having a first input terminal (BASE OF 62) coupled to receive said reference voltage (RV) and a second input terminal (BASE OF 61) coupled to receive said first color signal, said second voltage comparator being keyed into operation only during said bias control intervals and

means (36,43,46), coupled to said luminance signal translator and responsive to the outputs of said keyed voltage comparators, for opposing departures of the voltage attained by said first color signal voltage, during the periods of operation of said voltage comparators, from substantial equality with said reference voltage.

2. A receiver in accordance with Claim 1, wherein said first control loop (1) exhibits an effective time constant, when closed by operation of said first keyed voltage comparator (35), which is long relative to a line interval duration, and (2) exhibits an effective time constant, when closed by operation of said second keyed voltage comparator (60), which is short relative to a line interval duration.
3. A receiver in accordance with Claim 1 or 2, wherein said color-difference signal output developing means includes a pair of color demodulators (11,13) for recovering first (Q) and second (I) color-difference signals from said processed chrominance component and supplying said first and second color-difference signals as inputs to a matrix circuit (23) which forms said plurality of color-difference signal outputs therefrom; and said receiver also includes a second signal combiner (25), responsive to a second color-difference signal (G-Y)

output of said matrix circuit and to said output (Y) of said luminance signal translator, for forming a second color signal (G) a third signal combiner (29), responsive to a third color-difference signal (R-Y) output of said matrix circuit and to said output (Y) of said luminance signal translator, for forming a third color signal (R) and respective means (95,93) for applying said second and third color signals to respective additional ones (98G,98R) of said beam intensity control electrodes; and there is provided a second control loop for controlling the DC level of said first color-difference signal input to said matrix circuit, said second control loop including a third keyed voltage comparator (31) for comparing the voltage attained by said second color signal (G) during gating intervals, within those horizontal blanking portions of line intervals which lie outside of said bias control intervals, with said reference voltage (RV) and means (32,19) for modifying said first color-difference signal input to said matrix, in response to the output of said second keyed comparator means, so as to oppose departures of said attained second color signal voltage from substantial equality with said reference voltage, and

a third control loop for controlling the DC level of said second color-difference signal input to said matrix circuit, said third control loop including a fourth keyed voltage comparator (33) for comparing the voltage attained by said third color signal (R) during gating intervals, within those horizontal blanking portions of line intervals which lie outside of said bias control intervals, with said reference voltage; and means (34,21) for modifying said second color-difference signal input to said matrix circuit, in response to the output of said third keyed comparator means, so as to oppose departures of said attained third color signal voltage from substantial equality with said reference voltage.

4. A receiver in accordance with Claim 3, wherein each of said first (35), third (31), and fourth (33) keyed voltage comparators includes a capacitor (36,32,34) for storing the output of the respective comparator during the periods intervening between successive gating intervals.
5. A receiver in accordance with Claim 4 or 5, comprising a low pass filter (81,82,83) for filtering the first color signal (B) applied to said second input terminal of said second keyed voltage comparator (60), the response characteristic of said low pass filter exhibiting a break point at a midband frequency within the spectrum of frequencies occupied by said



composite video signals.

6. A receiver in accordance with any one of Claims 1 to 5 comprising a gain-controlled luminance signal amplifier (40) for delivering a luminance signal to said luminance signal translator, said gain-controlled luminance signal amplifier being effectively disabled during said bias control intervals.
7. A receiver in accordance with Claim 4, wherein said first color-difference signal comprises an I signal, said second color-difference signal comprises a Q signal, and said first, second and third color signals are blue, green, and red signals, respectively.

Revendications

1. Récepteur de télévision en couleur pour visualiser des images couleurs en réponse à des signaux vidéo composites comprenant des composantes respectives de luminance et de chrominance représentatives de l'image, lesdites composantes représentatives de l'image étant absentes pendant des portions d'effacement horizontal d'intervalles successifs de ligne pendant des intervalles périodiques de trame et également absentes pendant la portion d'effacement vertical de chaque intervalle de trame, ledit récepteur comprenant : un tube-image couleur (97) ayant un certain nombre d'électrodes de réglage de l'intensité des faisceaux (98R, 98B, 98G) pour régler l'intensité d'un certain nombre de faisceaux d'électrons traçant une trame de lignes de balayage sur un écran de visualisation ; un moyen (96) pour régler automatiquement la polarisation sur les électrodes respectives de réglage, pendant des intervalles périodiques de réglage de polarisation contenant un certain nombre d'intervalles successifs de ligne pendant chaque portion d'effacement vertical ; un canal de signaux de luminance pour traiter ladite composante de luminance et comprenant un moyen de translation (40) de signaux de luminance ; un canal de signaux de chrominance pour traiter ladite composante du signal de chrominance, et comprenant un moyen répondant à ladite composante du signal de chrominance pour développer un certain nombre de signaux de différence de couleurs de sortie ; un moyen de combinaison de signaux (27) répondant à l'un desdits signaux de différence de couleurs de sortie et à une sortie (Y) dudit moyen de translation de signaux de luminance pour former un premier signal couleur (B) ; et un

moyen (94) pour appliquer ledit premier signal couleur à l'une desdites électrodes du tube-image et comportant de plus un système de stabilisation du courant continu comprenant :

une première boucle de réglage pour régler le niveau en courant continu de la sortie dudit moyen de translation de signaux de luminance comportant

un premier comparateur manipulé de tension (35) ayant une première borne d'entrée couplée pour recevoir une tension de référence (RV) et une seconde borne d'entrée couplée pour recevoir ledit premier signal de couleur (B), ledit premier comparateur de tension étant mis en fonctionnement (k) uniquement pendant les intervalles de déclenchement pendant les portions d'effacement horizontal des intervalles de ligne qui se trouvent en dehors desdits intervalles de réglage de polarisation

un second comparateur de tension manipulé (80) ayant une première borne d'entrée (BASE DE 82) couplée pour recevoir ladite tension de référence (RV) et une seconde borne d'entrée (BASE DE 61) couplée pour recevoir ledit premier signal de couleur, ledit second comparateur de tension étant mis en fonctionnement uniquement pendant les intervalles de réglage de polarisation et

un moyen (36, 43, 46) couplé audit moyen de translation de signaux de luminance et répondant aux sorties desdits comparateurs de tension pour s'opposer à des écarts de la tension atteints par la tension dudit premier signal de couleur, pendant les périodes de fonctionnement desdits comparateurs de tension, d'une égalité sensible avec ladite tension de référence.

2. Récepteur selon la revendication 1, où ladite première boucle de réglage (1) présente une constante effective de temps, lorsqu'elle est fermée par fonctionnement dudit premier comparateur de tension (35), qui est longue relativement à la durée d'un intervalle d'une ligne, et (2) présente une constante effective de temps, lorsqu'elle est fermée par fonctionnement dudit second comparateur de tension (80), qui est courte relativement à la durée d'un intervalle d'une ligne.
3. Récepteur selon la revendication 1 ou 2, où ledit moyen développant un signal de différence de couleurs de sortie comprend une paire de démodulateurs couleur (11, 13) pour récupérer des premier (Q) et second (I) signaux de différence de couleurs de ladite composante traitée de chrominance et fournir lesdits premier et second signaux de différence de



couleurs en tant qu'entrées à un circuit matrice (23) qui forme lesdites sorties de signaux de différence de couleurs ; et ledit récepteur comprend également un second moyen de combinaison de signaux (25), répondant à un second signal de différence de couleur (G-Y) à la sortie dudit circuit matrice et à ladite sortie (Y) dudit moyen de translation de signaux de luminance pour former un second signal de couleur (G), un troisième moyen de combinaison de signaux (29), répondant à un troisième signal de différence de couleurs (R-Y) à la sortie dudit circuit matrice et à ladite sortie (Y) dudit moyen de translation de signaux de luminance pour former un troisième signal couleur (R) et des moyens respectifs (95, 93) pour appliquer lesdits deuxième et troisième signaux de couleur à des électrodes additionnelles respectives de réglage d'intensité des faisceaux (98G, 98R) ; et en ce qu'une seconde boucle de réglage est prévue pour régler le niveau en courant continu dudit premier signal de différence de couleurs introduit au circuit matrice, ladite seconde boucle de réglage comprenant un troisième comparateur de tension (31) pour comparer la tension atteinte par ledit second signal couleur (G) pendant les intervalles de déclenchement, pendant les portions d'effacement horizontal des intervalles de ligne qui se trouvent en dehors desdits intervalles de réglage de polarisation, avec ladite tension de référence (RV) et des moyens (32, 19) pour modifier ledit premier signal de différence de couleurs introduit à ladite matrice en réponse à la sortie dudit second moyen comparateur afin de s'opposer à des écarts de ladite seconde tension atteinte du signal de couleur d'une égalité sensible avec ladite tension de référence, et

une troisième boucle de réglage pour régler le niveau en courant continu dudit second signal de différence de couleurs à l'entrée dudit circuit matrice, ladite troisième boucle de réglage comprenant un quatrième comparateur de tension manipulé (33) pour comparer la tension atteinte par ledit troisième signal de couleur (R) pendant des intervalles de déclenchement, pendant les portions d'effacement horizontal des intervalles de ligne qui se trouvent en dehors desdits intervalles de réglage de polarisation, avec ladite tension de référence ; et des moyens (34, 21) pour modifier ledit second signal de différence de couleurs introduit audit circuit matrice en réponse à la sortie dudit troisième moyen comparateur afin de s'opposer à des écarts de ladite tension atteinte dudit troisième signal de couleur, d'une égalité sensible avec ladite tension de référence.

4. Récepteur selon la revendication 3, où chacun desdits premier (35), troisième (31) et quatrième (33) comparateurs de tension comprend un condensateur (36, 32, 34) pour stocker la sortie du comparateur respectif pendant des périodes entre des intervalles successifs de déclenchement.
5. Récepteur selon la revendication 4 ou 5, comprenant un filtre passe bas (81, 82, 83) pour filtrer le premier signal de couleur (B) appliqué à ladite seconde borne d'entrée dudit second comparateur de tension (80), la caractéristique de réponse dudit filtre passe-bas présentant un point de rupture à une fréquence de bande moyenne dans le spectre des fréquences occupé par lesdits signaux vidéo composites.
6. Récepteur selon l'une quelconque des revendications 1 à 5, comprenant un amplificateur de signaux de luminance (40) à gain réglé pour délivrer un signal de luminance audit moyen de translation de signaux de luminance, ledit amplificateur de signaux de luminance à gain réglé étant effectivement inhibé pendant lesdits intervalles de réglage de polarisation.
7. Récepteur selon la revendication 4, où ledit premier signal de différence de couleurs forme un signal (I), ledit second signal de différence de couleurs forme un signal (Q) et lesdits premier, second et troisième signaux de couleur sont respectivement les signaux du bleu, du vert et du rouge.

Ansprüche

1. Farbfernsehempfänger zur Wiedergabe von Farbbildern als Reaktion auf ein Videosignalgemisch, welches entsprechende bildrepräsentative Leuchtdichte- und Farbart-Anteile enthält, die während Horizontalaustastteilen aufeinanderfolgender Zeilenintervalle innerhalb periodischer Teilbildintervalle sowie auch während des Vertikalaustastteiles jedes Teilbildintervalles fehlen, mit:
einer Farbbildröhre (97), welcher eine Mehrzahl von Strahlintensitäts-Steuerelektroden (98R, 98B, 98G) zum Steuern der Intensität einer Mehrzahl von Elektronenstrahlen, welche ein Raster von Abtastzeilen auf einen Bildschirm schreiben, enthält; einer Anordnung (96) zum automatischen Regeln der Vorspannung an entsprechenden Steuerelektroden während periodischer Vorspannungsregelintervalle, welche eine Mehrzahl von aufeinanderfolgenden Zeilenintervallen innerhalb je-



des der Vertikalaustastteile umfassen; einem zur Verarbeitung des Leuchtdichteanteiles dienenden Leuchtdichtesignalkanal, der einen Leuchtdichtesignalumsetzer (40) enthält; einem zum Verarbeiten des Farbartsignalanteiles dienenden Farbartsignalkanal, welcher eine auf den Farbartsignalanteil ansprechende Anordnung zum Erzeugen einer Mehrzahl von Farbdifferenz-Ausgangssignalen enthält; einer Signalkombiniereinrichtung (27), die auf eines der Farbdifferenz-Ausgangssignale und auf ein Ausgangssignal (Y) des Leuchtdichtesignalumsetzers anspricht, um ein erstes Farbsignal (B) zu erzeugen; und einer Anordnung (94) zum Anlegen des ersten Farbsignales an eine der erwähnten Bildröhrenelektroden; und weiterhin mit einem Gleichstromstabilisierungssystem, welches

eine erste Regelschleife zum Regeln des Gleichstromwertes des Ausgangssignales des Leuchtdichtesignalumsetzers mit

einem ersten getasteten Spannungsvergleichers (35), welcher einen ersten Eingangsanschluß, der für einen Empfang einer Referenzspannung (RV) geschaltet ist, und einen zweiten Eingangsanschluß, der für einen Empfang des ersten Farbsignales (B) geschaltet ist, aufweist und nur während Tastintervallen innerhalb derjenigen Horizontalaustastteile der Zeilenintervalle, die nicht in den Vorspannungsregelintervallen liegen, in den Betriebszustand getastet (k) wird,

einem zweiten getasteten Spannungsvergleichers (60), welcher einen ersten Eingangsanschluß (Basis von 62), der für einen Empfang der Referenzspannung (RV) geschaltet ist, und einen zweiten Eingangsanschluß (Basis von 61), der für einen Empfang des ersten Farbsignales geschaltet ist, aufweist und nur während der Vorspannungsregelintervalle in den Betriebszustand getastet wird, und

einer Anordnung (36, 43, 46), die mit dem Leuchtdichtesignalumsetzer gekoppelt ist und auf die Ausgangssignale der getasteten Spannungsvergleichers anspricht, um Abweichungen der vom ersten Farbsignal während der Betriebsperioden der Spannungsvergleichers angenommenen Spannung von einer wenigstens annähernden Übereinstimmung mit der Referenzspannung entgegenzuwirken, enthält.

2. Empfänger nach Anspruch 1, bei welchem die erste Regelschleife 1), wenn sie durch das Arbeiten des ersten getasteten Spannungsvergleichers (53) geschlossen ist, eine effektive Zeitkonstante aufweist, welche lang im Vergleich zur Dauer eines Zeilenintervalles ist, und 2), wenn sie durch das Arbeiten des zwei-

ten getasteten Spannungsvergleichers (36) geschlossen ist, eine effektive Zeitkonstante aufweist, die kurz im Vergleich zur Dauer eines Zeilenintervalles ist.

3. Empfänger nach Anspruch 1 oder 2, bei welchem die Anordnung zum Erzeugen der Farbdifferenz-Ausgangssignale zwei Farbde-
modulatoren (11, 13) zur Gewinnung eines ersten (Q) und eines zweiten (I) Farbdifferenzsignals aus dem verarbeiteten Farbartsignalanteil und zum Anlegen des ersten und des zweiten Farbdifferenzsignales als Eingangssignale an eine Matrixschaltung (23), welche die Mehrzahl von Farbdifferenz-Ausgangssignalen hieraus bildet, enthält; und bei welchem der Empfänger ausserdem eine zweite Signalkombiniereinrichtung (25), welche auf ein zweites Farbdifferenz-Ausgangssignal (G-Y) der Matrixschaltung und das Ausgangssignal (Y) des Leuchtdichtesignalumsetzers anspricht, um ein zweites Farbsignal (G) zu erzeugen, ferner eine dritte Signalkombiniereinrichtung (29), die auf ein drittes Farbdifferenz-Ausgangssignal (R-Y) der Matrixschaltung und das Ausgangssignal (Y) des Leuchtdichtesignalumsetzers anspricht, um ein drittes Farbsignal (R) zu bilden, und entsprechende Anordnungen (95, 93) zum Anlegen des zweiten und des dritten Farbsignales an entsprechende weitere (98G, 98R) der Strahlintensitäts-Steuerelektroden, enthält; und daß ferner vorgesehen sind eine zur Regelung des Gleichstromwertes des ersten Farbdifferenz-Eingangssignales der Matrixschaltung dienende zweite Regelschleife, welche einen dritten getasteten Spannungsvergleichers (31) zum Vergleichen der Spannung, die das zweite Farbsignal (G) während Tastintervallen in den Horizontalaustastteilen derjenigen Zeilenintervalle, die ausserhalb der Vorspannungsregelintervalle liegen, annimmt, mit der Referenzspannung (RV) sowie eine Anordnung (32, 19) zum Modifizieren des ersten Farbdifferenz-Eingangssignales der Matrix als Reaktion auf das Ausgangssignal der zweiten getasteten Vergleichersanordnung, um Abweichungen der vom zweiten Farbsignal angenommenen Spannung von einer wenigstens annähernden Übereinstimmung mit der Referenzspannung entgegenzuwirken, und

eine zur Regelung des Gleichstromwertes des zweiten Farbdifferenz-Eingangssignales der Matrixschaltung dienende dritte Regelschleife, welche einen vierten getasteten Spannungsvergleichers (33) zum Vergleichen der Spannung, die das dritte Farbsignal (R) während Tastintervallen in den Horizontalaustastteilen derjenigen Zeilenintervalle, die außerhalb



- der Vorspannungsregelintervalle liegen, annimmt, mit der Referenzspannung, und eine Anordnung (34, 21) zur Modifizierung des zweiten Farbdifferenz-Eingangssignales der Matrixschaltung in Ansprache auf das Ausgangssignal der dritten getasteten Vergleichsanordnung, um Abweichungen der vom dritten Farbsignal angenommenen Spannung von einer wenigstens annähernden Übereinstimmung mit der Referenzspannung entgegenzuwirken. 5 10
4. Empfänger nach Anspruch 3, bei welchem der erste (35), der dritte (31) und der vierte (33) getastete Vergleichs jeweils einen Kondensator (36, 32, 34) zum Speichern des Ausgangssignales des jeweiligen Vergleichers während der zwischen den aufeinanderfolgenden Tastintervallen liegenden Perioden enthalten. 15
5. Empfänger nach Anspruch 4 oder 5, mit einem zum Filtern des dem zweiten Eingangsanschluß des zweiten getasteten Vergleichers (60) zugeführten ersten Farbsignales (B) dienendes Tiefpaßfilter (81, 82, 83) dessen Frequenzgang bei einer Bandmittenfrequenz in dem vom Videosignalgemisch eingenommenen Frequenzspektrum einen Knickpunkt aufweist. 20 25
6. Empfänger nach einem der Ansprüche 1 bis 5 mit einem zur Lieferung eines Leuchtdichtesignals an den Leuchtdichtesignalumsetzer dienenden verstärkungsgeregelten Leuchtdichtesignalverstärker (40), der während der Vorspannungsregelintervalle effektiv abgeschaltet ist. 30 35
7. Empfänger nach Anspruch 4, bei dem das erste Farbdifferenzsignal ein I-Signal, das zweite Farbdifferenzsignal ein Q-Signal und das erste, das zweite sowie das dritte Farbsignal ein Blausignal, ein Grünsignal bzw. ein Rotsignal umfassen. 40 45 50 55

