

Description

The invention relates to a circuit in a television apparatus for controlling raster width distortion due to dynamic audio loading.

The raster of a television picture will not have straight edges if deflection is not uniform at the edges of the raster. Pincushion distortion is a problem with large-screen picture tubes. If the faceplate is almost flat, the distance from the point of deflection to the corners of the screen is longer than to the center. The electron beam is deflected more than at the center, resulting in a raster with the scanning lines bowed inwardly and the corners stretched outwardly. Pincushion distortion is often more severe with wide-angle picture tubes of 90 degrees or more. Pincushion distortion in monochrome picture tubes may be corrected by permanent magnets mounted on the yoke housing; however, pincushion magnets can not be used with color picture tubes, because the magnets would affect the three beams by different amounts, causing problems with color purity and convergence. Accordingly, dynamic pincushion correction is used with color picture tubes.

Pincushion correction signals may be applied to the scanning coils of a deflection yoke. Horizontal scanning coils are driven by a side pincushion correction current to straighten the sides of the raster. Vertical scanning coils may be driven by a top to bottom pincushion correction current to straighten the top and bottom of the raster. In order to correct horizontal pincushion distortion, also referred to as side or East-West pincushion distortion, the sides of the raster must be pushed out at the center. More horizontal scanning current is needed for the horizontal lines produced midway between the top and bottom of the raster. Side pincushion correction may be achieved by modulating horizontal deflection current at the vertical scanning rate (60 Hz in NTSC systems). The resulting vertical modulation is a parabolic waveform, which stretches the width of the horizontal lines in the middle of the vertical scan but not at the top and bottom.

Raster size will vary with certain loading conditions, for example, beam current loading. Beam current loading is a function of brightness, the need for illuminating a bright picture tending to load the power supply and result in an improper raster width. Circuits have been developed for controlling raster width by monitoring beam current and developing a feedback signal for modulating a side or East-West pincushion correction circuit.

Another loading factor which can be very disruptive of proper raster width maintenance is dynamic audio loading. Dynamic audio loading may be particularly troublesome in those television apparatus having enhanced sound systems such as stereo television receivers, which require more power for audio opera-

tion. The particular adverse effect of heavy audio loading on raster width is a condition whereby the width of the raster cyclically and perceptibly varies at a frequency related to the audio signal. The condition tends to manifest itself at frequencies in the range of approximately 1 Hz to 30 Hz. Efforts have been made to control the effect of audio loading on raster width by controlling the primary power source for the receiver or television apparatus. The solution may be effective under some circumstances, but is undesirable in so far as the voltage level of the power source is thereby unnecessarily raised for other loads in the receiver.

The patent publication US - A - 4 298 829 discloses a power supply associated to a deflection generator with a simple raster size compensation due to load current variations caused in particular by an audio load.

The patent publication US - A - 4 129 806 discloses a pincushion distortion correction circuit additionally used to compensate the general load dependent raster size variations (e.g. audio load).

It is an aspect of the invention to control raster width distortion resulting from dynamic audio loading by modulating the side pincushion correction circuit of a television apparatus. It is a further aspect of the invention to monitor audio loading and to develop an audio load control signal for modulating the correction current produced by the side pincushion correction circuit. The power supply source for the audio circuit may be monitored directly and a control signal proportional to the voltage may be developed. Reductions in the voltage level of the power supply for the audio load is a reliable indication of a detrimental load factor which must be corrected in order to prevent distortion of raster width.

Diode modulators are known for controlling side pincushion correction. Such diode modulators often include a control circuit which has a differential amplifying input stage having inverting and noninverting inputs. Such a control circuit may generate a modulation sink current having a controllable average value which sets a voltage level in an energy storage device. The voltage level controls the diode modulator. A reference voltage may be applied to one input of the differential amplifier input stage. A negative feedback current having a DC or average value that is proportional to the voltage level in the energy storage device, during any given horizontal period, may be fed to the other input of the differential amplifier input stage.

In accordance with an aspect of the invention, an audio loading control signal enables regulation of raster width during variations in dynamic audio loading. A voltage signal which is related to audio loading may be combined with or otherwise coupled to the reference voltage in order for the control circuit to further compensate for raster width distortion under signifi-

cant audio loading conditions. The coupling may be achieved by algebraically summing the voltages. It may also be desirable under certain circumstances to couple the voltage signal related to audio loading to the side pincushion waveform feedback signal, although it may be necessary to provide an inverted audio load control voltage signal.

In accordance with another aspect of the invention, an audio loading control signal may be applied to a side pincushion correction circuit to avoid unnecessary increases in supply voltages utilized by other loads in the television apparatus. For example, there is no significant concurrent modulation of the ultor voltage. The audio loading control signal may be applied to modulate only the side pincushion correction current.

In accordance with the foregoing aspects of this invention, the power demand of a dynamic audio load is monitored, for example, by directly sensing the voltage output level of the power supply for the audio load with a sense resistor. An audio load control signal is generated, corresponding to the dynamic audio power demand. The audio load control signal is advantageously applied to the correction current producing circuit for modulating the side pincushion correction current by the audio load power demand. The audio load modulated side pincushion correction current may then be advantageously used to modulate a horizontal deflection current in order to compensate for both side pincushion distortion and dynamic audio load induced raster width distortion. A filter network, which may include a capacitor, may also be advantageously provided for removing high frequency signal components from the audio feedthrough signal.

The invention is as set out in the claims.

In the Drawing:

The sole FIGURE illustrates an East-West raster distortion correction circuit of a horizontal deflection circuit that includes a side pincushion correction circuit modulated by an audio load control signal from a dynamic audio load source.

A horizontal deflection circuit output stage 10 also operates as a power supply for generating a supply voltage V. The associated power supply circuitry, including the horizontal deflection circuit output stage, 10, shown in schematic form in the FIGURE, is similar to that disclosed in detail in commonly owned copending U.S. Application Serial No. 273,529, filed 21 November 1988 entitled POWER SUPPLY PROTECTION CIRCUIT, by Wilber, et al.

The output stage 10 includes a deflection switching transistor Q1 and diode D2. A regulated power supply 12, coupled to a source of AC voltage V_{AC} , develops a regulated input supply voltage $B+$, for example +126V. The power supply 12 is of the type regulated by a silicon controlled rectifier SCR, as is well known. The invention may be adapted for use with receivers having other types of power supplies, as ex-

plained hereinafter. A primary winding W1 of a flyback transformer T1 is coupled between the input supply voltage $B+$ and the collector electrode of transistor Q1. A horizontal deflection winding L_y , a linearity inductor L_{LIN} , a primary winding T2a of a transformer T2 of an East-West pincushion distortion correction circuit 30 and a trace capacitor C1 form a series arrangement coupled between the collector of transistor Q1 and ground. Transistor Q1 is switched at a horizontal rate in accordance with a drive signal that is developed at its base electrode. The drive signal is produced in a horizontal oscillator and driver stage 20 in a well known manner. The switching operation of transistor Q1 produces a horizontal deflection current I_y .

A secondary winding W3 of flyback transformer T1 includes a rectifying filtering means, including capacitor C7 and diode D3 for developing a DC power supply source, having a first output voltage level for driving a high voltage circuit 15, for example, the ultor circuit. Loading of the power supply circuit, for example from a dynamic audio load which derives its supply power from winding W2, may reduce the ultor voltage U through the magnetic coupling of the flyback transformer. A reduction in ultor voltage will cause the raster width to expand, as the electron beams move more slowly through the deflection zone, and are deflected further than necessary, left and right. In some receivers, for example those having SCR regulators, an increase in audio loading may result in an increase in the amplitude of the retrace pulses. The increase in amplitude increases the ultor voltage. This tends to decrease the raster width as the electron beams move more quickly through the deflection zone, and thus are not deflected far enough, left and right.

Another secondary winding W2 of flyback transformer T1 has a first terminal coupled to filter capacitor C2, forming part of another rectifying and filtering means for developing another DC power supply source at a second output voltage level, denoted as voltage V. A second terminal of winding W2 is coupled via a rectifier arrangement to ground. The rectifier arrangement, including diodes CR1 and CR2 and capacitors C3 and C4, operates as the output stage 40 of a diode modulator, for modulating the horizontal deflection current by a side pincushion correction current. The diode modulator is generally considered to also comprise transistor Q2, diode D1, inductor L_m and capacitor C_m .

During trace, when transistor Q1 or diode D2 is conductive, a trace voltage approximately equal to voltage $B+$ is developed in winding W1 of flyback transformer T1. During trace, a voltage forming a trace portion of an AC voltage is developed by transformer action across winding W2. In accordance with the operation of the rectifier arrangement, the voltage across winding W2 produces a half wave rectified current in winding W2, which is coupled to filter ca-

capacitor C2 and to receiver load circuits, for example, vertical and audio loads, as shown. The 2 ohm resistor R1 reduces the extent to which vertical signals are coupled to the audio load.

In normal operation, during trace, a current flows in a current path that includes diodes CR1 and CR2 of the rectifier arrangement of output stage 40 in a forward direction, that causes the diodes to be conductive. Consequently, voltage V is equal to the value of voltage B+ multiplied by the turns ratio between windings W2 and W1. During retrace, when transistor Q1 and diode D2 are nonconductive, a relatively high retrace voltage of the opposite polarity is developed across winding W1. A retrace pulse voltage is developed in winding W2 of the opposite polarity to the polarity during trace, causing the diodes to become nonconductive. Thus, in normal operation, the diodes are conductive throughout trace and nonconductive during retrace.

Pincushion distortion correction circuit 30 includes the transformer T2. A secondary winding T2b of transformer T2 has a first terminal 31 coupled to a modulation voltage developing capacitor C_m. The other terminal 32 is coupled between diodes CR1 and CR2 of the rectifier arrangement of output stage 40. voltage V_m across capacitor C_m produces an oscillatory current I_{T2b}.

During horizontal retrace, when the diodes of output stage 40 are nonconductive, a retrace voltage developed in winding T2b causes current I_{T2b} in winding T2b to reverse its direction and to flow in the direction shown by the arrow, at the end of retrace and during the first half of trace. At the same time, a retrace voltage is developed at terminal 32. During the second half of trace, trace current I_{T2b} flows in the opposite direction to that of the arrow.

A control circuit 30a of pincushion distortion correction circuit 30 is coupled to terminal 31 of capacitor C_m. Control circuit 30a produces a modulation sink current I_m having a controllable average value that controls voltage V_m in capacitor C_m in accordance with the average value DC component of current I_m. When the average value of sink current I_m is zero, for example, voltage V_m is at a maximum. On the other hand, when the average value of current I_m is at a maximum, voltage V_m is at a minimum.

Modulation voltage V_m is controlled by control circuit 30a and establishes in turn, by the transformer action of transformer T2, the level of voltage across primary winding T2a of transformer T2. Thus, the voltage across winding T2a is modulated in accordance with voltage V_m or current I_m. The voltage across winding T2a is applied in a direction that causes the trace voltage across deflection winding L_y to be smaller than the voltage developed across trace capacitor C1.

When the average value of current I_m is at a minimum, the consequent maximum voltage across wind-

ing T2a causes the amplitude of deflection current I_y to be at a minimum. On the other hand, when the average value of current I_m is at a maximum, the consequent minimum voltage across winding T2a results in the amplitude of deflection current I_y being at a maximum.

Control circuit 30a, which produces the sink current I_m, includes an input stage having a differential amplifier 33 and an output stage having a switching transistor Q2. Differential amplifier 33 has noninverting and inverting input terminals 34 and 35, respectively. A voltage reference signal V_Z is developed across Zener diode Z. The Zener diode Z may be further coupled through a biasing resistor R5 to a voltage source such as the +26V supply. In the illustrated circuit, voltage reference signal V_Z is 5.6 volts. The base of transistor Q2 is coupled to the output of differential amplifier 33. The emitter of transistor Q2 is coupled to ground. The collector of transistor Q2 is coupled via an inductor L_m to capacitor C_m. The collector of transistor Q2 forms a switching output terminal for producing the sink current I_m in inductor L_m that provides East-West pincushion distortion correction. Transistor Q2 also effects a signal inversion of the output from differential amplifier 33.

A horizontal retrace pulse signal is coupled from a winding W4, another secondary winding of flyback transformer T1, to a pin control circuit 60. During horizontal retrace, the retrace pulse signal in winding W4 is used to generate a sawtooth signal in pin control circuit 60. The sawtooth signal is modulated by a vertical parabola signal, produced by vertical parabola generator 50, to generate a side pincushion correction waveform.

When the voltage level at the noninverting input 34 of differential amplifier 33 exceeds a reference voltage V_{ref} at inverting input 35 during trace, transistor Q2 will be turned on to produce the side pincushion modulating sink current I_m. After transistor Q2 is turned off during trace, sink current I_m continues flowing, as a result of the magnetic energy stored in inductor L_m, in a current path that includes a diode D1. Diode D1 is coupled between the collector of transistor Q2 and voltage supply V.

The signal at the noninverting input of the differential amplifier will vary in a vertical rate parabolic manner. The result is that the length of the interval when transistor Q2 is conductive, and hence each of voltage V_m and the average value of current I_m, varies at a vertical rate in parabolic manner.

A negative feedback path 36 is coupled between the collector of transistor Q2 and pin control circuit 60. The feedback path produces a negative feedback current having, during a given horizontal period, a DC or average value that is proportional to voltage V_m. As a result of the negative feedback, voltage V_m is closely controlled in a closed loop and varies in a parabolic manner.

As a result of the parabola modulation, the instant within horizontal retrace when transistor Q2 becomes conductive occurs earlier at the center of vertical trace than at the top and bottom. Hence, each of the average value of current i_m , that sinks charge from capacitor C_m in each horizontal period, and the level of voltage V_m , is at a maximum at the center of vertical trace and at a minimum at the top and bottom of vertical trace. Consequently, the amplitude of deflection current I_y is at a maximum at the center of vertical trace and at a minimum at the top and bottom, thereby providing East-West pincushion distortion correction. A potentiometer, not shown, may be coupled to one of the inverting and noninverting inputs to provide width adjustment.

Audio loading modulation of the side pincushion correction circuit, in accordance with an aspect of the invention, does not interfere with the operation of the high voltage power supply and power supply protection circuits, which are not shown in detail. An audio load 22 is powered by the +26 volt power supply source developed across capacitor C2 from current flowing through winding W2. Dynamic audio loads, which may be, for example, 5 watts in each channel of a stereo television receiver, will significantly load the +26 volt power supply. In the absence of some correction responsive to such audio loading, the raster width will become distorted notwithstanding the side pincushion correction and the B+ regulation.

In accordance with an inventive aspect, the audio loading is monitored or sensed, for example by a voltage divider network including resistors R2, R3 and R4. Resistors R3 and R4 are effectively connected in parallel. The input of the network is at terminal 37. The output of the network is the common junction of resistors R2, R3 and R4, at the inverting input 35 of the differential amplifier 33. The voltage at terminal 37 is proportional to the extent of audio loading, and serves as an audio load control signal in the form of an audio load voltage representative signal V_a . The amount of voltage signal V_a causes a very small current to flow through resistor R2, for example, on the order of 0.1 milliamperes. V_a is reduced in magnitude at the output of the voltage divider to a level compatible with the operating parameters of differential amplifier 33. Amplifier 33 presents a high input impedance. A fixed voltage reference level V_z is developed by the Zener diode Z. Voltage level V_z and the audio load control voltage reference signal V_a are combined, for example algebraically summed, at inverting input 35. The combination forms a composite voltage V_{ref} proportional to the sum of the Zener voltage V_z and the audio load control voltage V_a .

The voltage V_a is referred to as a control signal, rather than a feedback signal, because V_a is not part of a closed loop control circuit. There is no direct feedback control over the power supply source for the audio load, responsive to variations at V_a , nor on any

other power supply source. On the contrary, V_a is on an open loop signal path which terminates at the horizontal deflection circuit, producing more or less deflection current, as needed to compensate for audio loading. The system response of feedthrough control signals is normally undesirable, as system response among units tends to differ widely according to the random tolerance variations of each element in each circuit of each unit. However, V_a passes through and becomes part of a closed loop control circuit which includes a negative feedback signal path, namely negative feedback signal path 36 in the side pincushion control circuit. Therefore, the control circuit according to the invention is not subject to the unacceptable random tolerance variations as would otherwise be expected.

The effect of V_a on raster width can be appreciated by following the effect of V_a on the side pincushion correction current and the side pincushion correction current circuit. The pin control circuit 60 receives, as inputs, horizontal retrace pulses from secondary winding W4 of flyback transformer T1 and a vertical rate parabola from signal generator 50. The retrace pulse signal is used to generate a sawtooth signal which is modulated by the vertical rate parabola. This results in a positive polarity side pincushion correction waveform being generated as an input to noninverting input 34 of differential input amplifier 33. Ignoring the effect of V_a for the moment, the positive polarity side pincushion correction signal appears at the output of differential input amplifier 33. Output transistor Q2 effects a signal inversion, resulting in a negative polarity side pincushion correction signal at the collector of transistor Q2. This inverted output signal is sampled through negative feedback line 36 and is the source for a negative polarity feedback correction signal for controlling the side pincushion correction waveform. Voltage V_m across capacitor C_m tracks the negative polarity signal through the action of sink current i_m . Accordingly, the side pincushion correction current, in the form of a negative polarity signal, is coupled from winding T2b to winding T2a of transformer T2, where it is subtracted from the trace voltage, which essentially corresponds to the B+ voltage level, across trace capacitor C1. The subtraction of the negative polarity correction current from the trace voltage has the effect of adding the correction current to the trace voltage. This results in additional voltage toward the center of trace, which tends to widen the raster and correct for side pincushion distortion.

Assume, for purposes of illustration, that power supply 12 is of the kind which will increase the amplitude of the retrace pulses in response to an increase in dynamic audio loading, for example due to SCR regulation. An increase in dynamic audio load will result in a decrease of V_a . The sum of V_a and V_z will also decrease at the inverting input 35 of differential input amplifier 33. By reason of application to the inverting

input, the decrease of V_{al} will result in an increase in the output voltage of amplifier 33, thereby increasing the amplitude of the side pincushion correction current. More precisely, lowering the reference voltage V_{ref} enables the amplifier 33 and transistor Q1 to begin sinking current i_m sooner in time, and for a longer period of time, which effectively increases the sink current i_m . The output of transistor Q2 will therefore exhibit a side pincushion correction current having a greater negative amplitude, which will be coupled through transformer T2 and create a greater negative amplitude signal to be subtracted from the B+ trace voltage. This will result in an even larger trace voltage, which will expand the raster width and counteract the tendency of the raster width to contract due to increased audio loading. At the same time, the component of V_{al} by which the side pincushion correction current is modified will also be sensed on negative feedback line 36, obviating most of the undesirable effects which might otherwise be expected from utilizing an open loop control signal. The feedback signal is essentially a composite raster width and side pincushion correction negative feedback signal.

If the power supply is such that dynamic audio loading results in expansion of the raster width, then the audio load control signal V_{al} may be coupled to the side pincushion correction waveform at the noninverting input 34 of differential amplifier 33. This would result in the side pincushion correction waveform being decreased in amplitude, which would eventually result in a smaller amplitude signal being subtracted from the retrace voltage, which would reduce raster width.

For each of the effects on raster width, due to the operating characteristics of the power supply circuits, alternative coupling of audio load control signal V_{al} may be effected. Means may be provided for reversing the polarity of the audio load control voltage or otherwise sensing the audio load so as to produce an audio load control signal of opposite polarity. Such a negative polarity signal may be combined with the signal fed to other inputs of the amplifier 33, for example by algebraic summing. It will therefore be appreciated that a further aspect of the invention provides a closely controlled negative feedback signal path for both audio and video processing. Moreover, there is no significant concurrent modulation of other control voltages, for example, the ultor voltage U.

Capacitive filtering means may be associated with the power supply developing voltage V or the audio load 26, for example capacitors C2 or C6. These generally remove audio frequency components of approximately 500 Hz and higher. Accordingly, the audio load control signal V_{al} will still tend to include high frequency audio components, for example up to 500 Hz, which makes the signal unsuitable for a control signal. A filter network including the resistor R3 and a capacitor C5 coupled in parallel thereto may be coupled be-

tween inverting input 35 and the cathode of Zener diode Z. The filter formed by resistor R3 and capacitor C4 provides a path for removing the high frequency components in V_{al} by shunting the high frequency components away from the differential amplifier to ground. The cathode of Zener diode Z forms an effective AC ground for this purpose. The filter illustrated in the Figure will shunt frequency components equal to and in excess of approximately 25-30 Hz. The existing capacitors in the power supply and/or audio load circuits are effective capacitive filtering means, as noted, for frequency components in excess of, for example, 500 Hz. The remaining frequency components, for example, approximately 1 Hz to 25-30 Hz, which are primarily responsible for audio modulation of the deflection current, can be closely tracked and compensated for by the differential amplifier 33. Resistor R4 is a compensation resistor, which may be used to center the range of pincushion correction by adjusting the range of a potentiometer, not shown, to compensate for the effect of the audio load control circuit on the pincushion correction range.

A changing audio load will cause a variation in the audio load control voltage V_{al} , which will effectively change the voltage at one of the inputs of the differential amplifier. Under such circumstances, control circuit 30a will begin sinking current i_m sooner or later in time than would otherwise have been the case, increasing or decreasing the voltage V_m in a manner that maintains proper raster width. Accordingly, more or less sink current i_m will flow in a manner which is directly related to dynamic audio loading, so as to automatically compensate for the tendency of the raster width to vary with audio loading, in addition to compensating for side pincushion distortion.

Transformers T1 and T2 electrically isolate, with respect to electrical shock hazard, voltage V and control circuit 30a from voltage B+ and from AC mains supply voltage V_{AC} . Voltage B+ is electrically nonisolated with respect to electrical hazard from AC mains supply voltage V_{AC} used for producing voltage B+. Thus transformers T1 and T2 provide an isolation barrier. The hot, or electrically nonisolated, ground is designated by reference numeral 13 and the cold, or electrically isolated, ground is designated by reference numeral 17.

Claims

1. A raster distortion corrected horizontal deflection circuit for a television apparatus, comprising:
 - a horizontal deflection circuit for generating horizontal deflection current;
 - a side pincushion distortion correction control circuit (30a) comprising an amplifier (Q2, 33) for producing side pincushion correction current (i_m) as an output, the amplifier having a differential



input, the decrease of V_{al} will result in an increase in the output voltage of amplifier 33, thereby increasing the amplitude of the side pincushion correction current. More precisely, lowering the reference voltage V_{ref} enables the amplifier 33 and transistor Q1 to begin sinking current i_m sooner in time, and for a longer period of time, which effectively increases the sink current i_m . The output of transistor Q2 will therefore exhibit a side pincushion correction current having a greater negative amplitude, which will be coupled through transformer T2 and create a greater negative amplitude signal to be subtracted from the B+ trace voltage. This will result in an even larger trace voltage, which will expand the raster width and counteract the tendency of the raster width to contract due to increased audio loading. At the same time, the component of V_{al} by which the side pincushion correction current is modified will also be sensed on negative feedback line 36, obviating most of the undesirable effects which might otherwise be expected from utilizing an open loop control signal. The feedback signal is essentially a composite raster width and side pincushion correction negative feedback signal.

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input stage (33) with inverting (35) and noninverting (34) inputs; means (60) for generating a side pincushion correction waveform signal coupled to a first input (34) of the differential input stage (33); a DC power supply source (26V); a dynamic audio load (22) powered by the DC power supply source controlled by an audio load control signal (Val); a capacitive filtering means (C6) coupled to the audio load; means (R2, R4) coupled to the side pincushion distortion correction control circuit (30a) and responsive to the audio load control signal (Val) for modulating the side pincushion correction current (Im) in accordance with dynamic audio loading; means (R3, C5) for removing high frequency signal components in the audio load control signal (Val), not already removed by the capacitive filtering means (C6); means (40) for modulating the horizontal deflection current (IY) in accordance with the audio load modulated side pincushion correction current (Im) to correct side pincushion distortion and dynamic audio loading induced raster width distortion; means (Z) for generating a voltage reference signal (Vz) coupled to the second input (35) of the differential input stage (33); means (R2, R3, R4) for combining the audio load control signal (Val) with one of the side pincushion correction waveform signal and the voltage reference signal (Vz); and means (36) for monitoring the correction current (Im) and generating a negative feedback signal coupled to the waveform generating means (60).

2. The circuit of Claim 1 characterized by:

a first resistor (R3) and a capacitor (C5), as means for removing high frequency signal components in the audio load control signal, coupled together as a parallel network for shunting the high frequency signal component signal (Val) from the differential input stage (33); a Zener diode (Z) for generating the voltage reference signal (Vz), coupled in series to one junction of the first resistor (R3) and the capacitor (C5); and a second resistor (R5) coupled in series between the DC power supply (+26V) and the junction of the first resistor (R3) and the capacitor (C5), the voltage reference signal (Vz) and the audio load control signal (Val) being algebraically summed at the second input (35) of the differential input stage (33).

3. The circuit of Claim 2, characterized in that the Zener diode (Z) has an anode coupled to ground and a cathode coupled through the first resistor

(R3) and the capacitor (C5) to the second input (35) of the differential input stage (33), the cathode of the Zener diode (Z) forming an effective AC ground for the frequency components shunted by the parallel network (R3, C5).

Patentansprüche

1. Horizontal-Ablenkschaltung mit Rasterverzerrungs-Korrektur für ein Fernsehgerät, enthaltend:

- eine Horizontal-Ablenkschaltung zur Erzeugung eines Horizontal-Ablenkstroms;
- eine Seiten-Kissenverzerrungs-Korrektur-Steuerschaltung (30a), enthaltend einen Verstärker (Q2,33) zum Erzeugen eines Seiten-Kissenverzerrungs-Korrekturstroms (Im) als Ausgangssignal, welcher Verstärker eine Differenz-Eingangsstufe (33) mit invertierendem (35) und nichtinvertierendem (34) Eingang aufweist; ein Mittel (60) zum Erzeugen eines Seiten-Kissenverzerrungs-Korrektur-Signalverlaufs, der an einen ersten Eingang (34) der Differenz-Eingangsstufe (33) gekoppelt ist; ein DC-Netzteil (26V);
- eine dynamische Audiolast oder Ton-Belastung (22), die von dem DC-Netzteil - gesteuert von einem Audiolast-Steuersignal (Val) - gespeist wird;
- ein kapazitives Filtermittel (C6), das mit der Audiolast gekoppelt ist; ein Mittel (R2,R4), das mit der Seiten-Kissenverzerrungs-Korrektur-Steuerschaltung (30a) gekoppelt ist und auf das Audiolast-Steuersignal (Val) anspricht, zum Modulieren des Seiten-Kissenverzerrungs-Korrekturstroms (Im) entsprechend der dynamischen Audiolast;
- ein Mittel (R3,C5) zum Beseitigen von Hochfrequenz-Signalkomponenten im Audiolast-Steuersignal (Val), soweit nicht bereits durch das kapazitive Filtermittel (C6) entfernt;
- ein Mittel (40) zum Modulieren des Horizontal-Ablenkstroms (IY) in Übereinstimmung mit dem von der Audiolast modulierten Seiten-Kissenverzerrungs-Korrekturstrom (Im) zum Korrigieren von Seiten-Kissenverzerrung und - von dynamischer Audiolast herstammender - Rasterbreiten-Verzerrung;
- ein Mittel (Z) zum Erzeugen eines Spannungs-Referenzsignals (Vz), das mit dem zweiten Eingang (35) der Differenz-Eingangsstufe (33) gekoppelt ist;
- ein Mittel (R2,R3,R4) zum Kombinieren des Audiolast-Steuersignals (Val) mit der Seiten-Kissenverzerrungs-Korrektur-



Signalform oder dem Spannungs-Referenzsignal (V_z); und

- ein Mittel (36) zum Beobachten des Korrekturstroms (I_m) und zur Erzeugung eines negativen Rückkopplungssignals, das an das Signalform-Erzeugungsmittel (60) gekoppelt ist.

2. Schaltung nach Anspruch 1, gekennzeichnet durch

- einen ersten Widerstand (R_3) und einen Kondensator (C_5), als Mittel zum Beseitigen oder Entfernen von Hochfrequenz-Signalkomponenten in dem Audiolast-Steuer-signal, die als Parallel-Netzwerk zusammengegekoppelt sind, um die Hochfrequenz-Signalkomponente des Signals (V_{al}) vor der Differenz-Eingangsstufe (33) abzuleiten;
- eine Zenerdiode (Z) zum Erzeugen des Spannungs-Referenzsignals (V_z), die bzw. das in Reihe mit der einen Verbindung des ersten Widerstands (R_3) und des Kondensators (C_5) gekoppelt ist; und einen zweiten Widerstand (R_5), der in Reihe zwischen dem DC-Netzteil (+26V) und der Verbindung von erstem Widerstand (R_3) und Kondensator (C_5) gekoppelt ist, wobei das Spannungs-Referenzsignal (V_z) und das Audiolastungs-Steuersignal (V_{al}) algebraisch am zweiten Eingang (35) der Differenz-Eingangsstufe (33) summiert werden.

3. Schaltung nach Anspruch 2, dadurch gekennzeichnet, daß die Zenerdiode (Z) eine Anode, die mit dem Masseanschluß gekoppelt ist, und eine Kathode aufweist, die über den ersten Widerstand (R_3) und den Kondensator (C_5) an den zweiten Eingang (35) der Differenz-Eingangsstufe (33) gekoppelt ist, wobei die Kathode der Zenerdiode (Z) eine wirksame AC-Erde für die Frequenzkomponenten bildet, die von dem Parallel-Netzwerk (R_3, C_5) abgeleitet oder kurzgeschlossen werden.

Revendications

1. Circuit de déflexion horizontale à distorsion de trame corrigée pour un équipement de télévision, comportant :

- un circuit de déflexion horizontale servant à générer un courant de déflexion horizontale ;
- un circuit de commande de correction de distorsion latérale en coussin (30a) constitué d'un amplificateur ($Q_2, 33$) délivrant en sortie un courant de correction de distorsions latérales en coussin (I_m), ledit ampli-

ficateur comportant un étage à entrées différentielles (33) doté d'entrées avec inversion (35) et sans inversion (34) ;

- un moyen (60) générant le signal onde de correction de distorsions latérales en coussin couplé à la première entrée (34) de l'étage à entrées différentielles (33) ;
- une source d'alimentation CC (26V) ;
- une charge audio dynamique (22) alimentée par ladite source d'alimentation CC, commandée par un signal de commande de charge audio (V_{al}) ;
- un moyen de filtrage capacitif (C_6) couplé à ladite charge audio ;
- un moyen (R_2, R_6) couplé audit circuit de commande de correction de distorsions latérales en coussin (30a) modulant ledit courant de correction de distorsions latérales en coussin (I_m) en fonction de la charge audio dynamique en réponse audit signal de commande de charge audio (V_{al}) ;
- un moyen (R_3, C_5) éliminant les composants de signal à haute fréquence dudit signal de commande de charge audio (V_{al}) non éliminés par ledit moyen de filtrage capacitif (C_6) ;
- un moyen (40) modulant, de manière à corriger la distorsion latérale en coussin et la distorsion de largeur de trame induite par chargement audio dynamique, le courant de déflexion horizontale (I_Y) en fonction dudit courant de correction de distorsions latérales en coussin (I_m), lui même modulé suivant la charge audio ;
- un moyen (Z) générant un signal de référence de tension (V_z) couplé à la deuxième entrée (35) de l'étage à entrées différentielles (33) ;
- un moyen (R_2, R_3, R_4) combinant le signal de commande de charge audio (V_{al}) avec le signal onde de correction de distorsions latérales en coussin ou avec le signal de référence de tension (V_z) ; et
- un moyen (36) contrôlant le courant de correction (I_m) et générant un signal de réaction négatif couplé au moyen de génération d'ondes (60).

2. Circuit selon la Revendication 1, et caractérisé en ce que :

- une première résistance (R_3) et un condensateur (C_5) éliminant les composants de signal à haute fréquence du signal de commande de charge audio sont couplés de manière à constituer un réseau parallèle servant à dériver le signal composant de signal à haute fréquence (V_{al}) de l'étage à entrées différentielles (33) ;



- une diode Zener (Z) générant ledit signal de référence de tension (V_Z) est couplée en série à une connexion entre ladite première résistance (R3) et ledit condensateur (C5); et caractérisé en ce que :

- une deuxième résistance (R5) est couplée en série entre la source d'alimentation CC (+26V) et ladite connexion entre ladite première résistance (R3) et ledit condensateur (C5), la somme algébrique du signal de référence de tension (V_Z) et du signal de commande de la charge audio (V_a) étant réalisée au niveau de ladite deuxième entrée (35) dudit étage à entrées différentielles (33).

3. Circuit selon la Revendication 2, et caractérisé en ce que :

- ladite diode Zener (Z) et dotée d'une anode couplée à la masse et d'une cathode couplée par ladite première résistance (R3) et ledit condensateur (C5) à ladite deuxième entrée (35) de l'étage à entrées différentielles (33), la cathode de la diode Zener (Z) constituant une masse CA effective pour les composants de fréquences dérivés par le réseau parallèle (R3, C5).

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