

Description

This invention relates to S-correction for deflection circuits.

Conventional cathode ray tubes for video apparatus such as television receivers or computer monitors require symmetrical linearity correction to the deflection current, referred to as S-correction, in order to correct for the difference between the beam scanning radius of curvature and the tube faceplate radius of curvature. New, flatter faceplate tubes having nonspherical faceplate curvatures require a more complex form of S-correction than is provided with a conventional spherical faceplate cathode ray tube.

A tube of the type having a complex curvature faceplate is described in the following U.S. patent applications:

1. U.S. Patent Application Serial Number 469,772, filed February 25, 1983, in the name of F. R. Ragland, Jr. and entitled, Cathode-Ray Tube Having An Improved Shadow Mask Contour, corresponding to UK Published Application GB-A-2136200, published 12 September 1984.

2. U.S. Patent Application Serial Number 469,774, filed February 25, 1983 in the name of F. R. Ragland, Jr. and entitled, Cathode-Ray Tube Having A Faceplate Panel With A Substantially Planar Periphery, corresponding to UK Published Application GB-A-2136198, published 12 September 1984.

3. U.S. Patent Application Serial Number 469,775, filed February 25, 1983, in the names of R. J. D'Amato et al., and entitled, Cathode-Ray Tube Having Different Curvature Along Major And Minor Axes, corresponding to UK Published Application GB-A-2136199, published 12 September 1984.

4. U.S. Patent Application Serial Number 529,644, filed September 6, 1983, in the names of R. J. D'Amato et al., and entitled, Cathode-Ray Tube Having A Faceplate Panel With An Essentially Planar Screen Periphery, corresponding to UK Published Application GB-A-2147142, published 1 May 1985.

In one form of flatter faceplate tube, as typified by the RCA 110° COTY-SP, square-planar, 27V, color TV picture tube, A68ACC10X, the formula for the tube faceplate sagittal height, z , in millimeters, with reference to the center of the faceplate is given by:

$$Z = A_1 X^2 + A_2 X^4 + A_3 Y^2 + A_4 X^2 Y^2 + A_5 X^4 Y^2 + A_6 Y^4 + A_7 X^2 Y^4 + A_8 X^4 Y^4,$$

where X and Y are the distance coordinates, in millimeters, from the faceplate center along the major and minor axes, respectively, and where:

$$\begin{aligned} A_1 &= -0.236424229 \times 10^{-4} \\ A_2 &= -0.363538575 \times 10^{-8} \\ A_3 &= -0.422441063 \times 10^{-3} \\ A_4 &= -0.213537355 \times 10^{-8} \\ A_5 &= +0.883912220 \times 10^{-13} \\ A_6 &= -0.100020398 \times 10^{-9} \\ A_7 &= +0.117915353 \times 10^{-14} \\ A_8 &= +0.527722295 \times 10^{-21} \end{aligned}$$

The picture tube faceplate defined by this formula has a relatively shallow curvature near the center of the faceplate, which increases near the edges along paths parallel to both the major and minor axes of the tube. The overall result is a faceplate of relatively flat appearance and with planar edges, namely, with points along the top, bottom, right and left edges located substantially in a common plane. Such a picture tube produces symmetrical raster distortion during a line scan that cannot be corrected by conventional S-shaping means used in conjunction with tubes having spherical faceplate contours.

In accordance with the invention which is set out in the claims, an S-corrected line deflection circuit for a picture tube includes a line deflection winding and an S-shaping capacitance coupled thereto. A trace switch coupled to the line deflection winding and operated at a line deflection rate generates a trace current during a trace interval of a line deflection cycle. The trace current is a generally sawtooth current modified in accordance with the waveshaping provided by the S-shaping capacitance. A resonant circuit is coupled to the line deflection winding for providing additional modification of the sawtooth trace current.

The provision of such a resonant circuit for providing additional modification has been suggested in US-A-4181874, in which a resonant circuit tuned to twice the line deflection frequency is connected in parallel with the S-shaping capacitance, in order to divert the second harmonic component from the S-shaping capacitance and thereby eliminate that component from the correction provided by the S-shaping capacitance. The present invention also provides additional modification by means of a resonant circuit, which, however, is differently tuned and has a different effect as will be described.

In carrying out the invention, the resonant circuit is a LC circuit that generates a sinusoidal correction current having a period of oscillation approximately half that of the trace interval. In providing S-correction for a picture tube having a generally flat contoured faceplate that is aspherical, the tuned circuit introduces an oscillatory correction current into the trace current that has a di/dt with a sign value opposite that of the di/dt of the component of the trace current introduced by the S-shaping capacitance, in those portions of the line scan intermediate the center and left and right edges.

Figure 1 illustrates a top view, partially in breakaway, of a square-planar color picture tube that may use an S-corrected line deflection circuit embodying the invention;

Figure 2 illustrates a display of vertical lines of the faceplate of the picture tube of Figure 1 showing residual S-shaping error that may occur when using a conventional line deflection circuit;

Figure 3 illustrates an S-corrected line deflection circuit embodying the invention; and

Figure 4 illustrates waveforms associated with the operation of the circuit of Figure 3.

Figure 1 illustrates a color picture tube 10 of the square-planar type. Picture tube 10 has a glass envelope 11 comprising a generally rectangular faceplate panel 12 and a tubular neck 14 connected by a funnel 16. Panel 12 comprises a viewing faceplate 18 and a peripheral flange or side wall 20, which is sealed to funnel 16 by a glass frit 17. A generally rectangular 3-color cathodoluminescent phosphor screen 22 is carried by the inner surface of faceplate 18. The screen is preferably a line screen, with the phosphor lines extending substantially parallel to the minor or vertical axis Y—Y of the tube (a direction normal to the plane of Figure 1). Alternatively, the screen may be a dot screen. A multi-aperture color selection electrode or shadow mask 24 is removably mounted within faceplate panel 12 in predetermined spaced relation to screen 22. An electron gun 26, shown schematically by dotted lines in Figure 1, is centrally mounted within neck 14 to generate and accelerate three electron beams 28 along convergent paths through mask 24 to screen 22.

Picture tube 10 is designed to be used with an external magnetic deflection yoke 30, schematically illustrated in Figure 1 as surrounding neck 14 and funnel 16 in the neighborhood of their junction. Horizontal deflection coils L_H and vertical deflection coils L_V of deflection yoke 30 are coupled to a horizontal deflection circuit 40 and a vertical deflection circuit 50, respectively, for generating respective line and field deflection currents. The line and field deflection currents subject the three electron beams 28 to vertical and horizontal magnetic flux that scans the beams horizontally in the direction of the major or horizontal axis X—X and vertically in the direction of the minor axis Y—Y, in a rectangular raster pattern over screen 22. The longitudinal axis of picture tube 10 is labeled Z—Z in Figure 1.

The faceplate 18 of a square-planar color picture tube 10 is relatively flat. The curvature of the faceplate is complex and may be approximated in accordance with the polynomial expression given above. In the line scanning direction, or as the electron beams are scanned from left edge to right edge, horizontally, the curvature of the faceplate decreases from left edge to center and then increases again to the right edge.

Because of the change in curvature of the faceplate surface, conventional S-shaping techniques provide inadequate correction of symmetrical, geometrical linearity distortion. Consider a situation in which a pattern of equally spaced vertical lines is displayed on the screen of the square-planar color picture tube of Figure 1 using a conventional horizontal deflection circuit that provides S-correction only by means of an S-shaping capacitor coupled in series with the deflection winding. Because the curvature of the faceplate during a given line scan increases from the center region to the left and right edges, the S-shaping produced by the S-capacitor cannot correct for the error introduced by the faceplate geometry at all points along the line scan. At best, a compromise situation may be obtained, wherein, by proper selection of the S-capacitor value, linearity of line scan may be obtained in the center region and at the left and right edges. Residual distortion will remain in the intermediate regions in the left-center and right-center. Such a situation is illustrated in Figure 2 wherein a pattern at equally spaced vertical lines, separated by an average distance s_0 , are displayed in the center region and in the left and right sides L and R, separated by one given distance, whereas they are displayed in the left-center and right-center regions separated by another, greater distance. The short, dotted-line, vertical tick marks of Figure 2 indicate the ideal locations of the vertical lines when complete S-correction is provided. The nonlinearity, wherein, for example, the display of vertical lines appears compressed around the center and at the left and right sides, while it appears expanded inbetween, is a result of the nonspherical shape of the faceplate of the square-planar picture tube of Figure 1 and cannot be corrected by changing the value of the S-capacitor.

The residual non-linearity caused by the faceplate geometry may be corrected by using horizontal deflection circuit 40, of Figure 3, embodying the invention. Horizontal deflection circuit 40 includes a horizontal oscillator and driver circuit 41, a trace switch S1, comprising a horizontal output transistor Q1 and a damper diode D1, a retrace capacitor C_R and the series connection of an S-shaping capacitor C_s and a horizontal deflection winding L_H .

Horizontal oscillator and driver circuit 41 operates trace switch S1 at the line deflection rate for generating a trace current component of the line deflection current i_l of Figure 4b during the trace interval, between times t_1 — t_7 , and a retrace current component during the retrace interval, between times t_7 — t_8 . When trace switch S1 is nonconductive during the retrace interval, a retrace pulse voltage V_1 , illustrated in Figure 4a, is developed across retrace capacitor C_R . The energy stored in an input choke L_o , coupled between a B+ terminal and trace switch S1, replenishes line deflection losses.

The trace current in deflection winding L_H is generally a sawtooth current modified in accordance with the waveshaping provided by S-capacitor C_s . S-capacitor C_s and deflection winding L_H form a first resonant branch circuit, resonant at a frequency lower than the line deflection frequency, illustratively, $f_H = 15.625$ kilohertz. Typically, the resonant frequency f_{os} of the S-capacitor—line deflection coil branch circuit is between 6 and 8 kilohertz for 110° deflection.

When using only an S-capacitor for current waveshaping in a 110° deflection, square-planar color picture tube having a faceplate curvature that is greater at the left and right edges than the curvature in the

center, proper S-correction cannot be achieved at all points along the line scan. A current waveshape similar to the dashed-line current waveform i_1' of Figure 4b is produced when only an S-capacitor is used for S-correction. The slope, or di/dt of the deflection current determines the distance between displayed lines of a video signal of an equally spaced vertical line pattern. Using only an S-capacitor, incomplete S-correction is provided by the current i_1' . The solid-line waveform i_1 represents the desired current waveform. The di/dt of the dashed-line current i_1' in the left-center and right-center regions is excessive, resulting in an expanded display in those regions relative to the display in the remaining regions.

In accordance with a feature of the invention, a tapped resonant circuit 60 provides an additional degree of S-correction to produce an S-corrected deflection current waveform i_1 of Figure 4b that is substantially corrected at all points in the line scan. Resonant circuit 60 comprises a first capacitive branch C_1 coupled to a second inductive branch at a terminal 3 of inductor L_1 . The S-capacitor-deflection winding branch is connected to resonant circuit 60 at a terminal 2, a tap terminal of inductor L_1 .

By means of adjustable inductor L_1 , resonant circuit 60 is tuned to have a resonant period of half the trace interval duration, or a resonant frequency f_0 of about 38 kilohertz. Illustratively, when the trace interval is 52.8 microseconds in duration. This produces two cycles of oscillation of the current i_2 in the capacitive branch C_1 , during the trace interval. As illustrated in Figure 4c, the oscillation of current i_2 is symmetrically located relative to the center of trace, time t_4 .

During the retrace interval, the deflection retrace resonant circuit of L_H , C_H drives resonant circuit 60 with the deflection retrace current, producing approximately one cycle of oscillation of current i_2 during retrace, between times t_7 and t_8 of Figure 4c. Proper phasing between the two cycles of current oscillation during trace and the one cycle of current oscillation during retrace is achieved due to the fact that current i_2 becomes approximately zero at the beginning and end of the trace interval, at times t_1 and t_7 , respectively of Figure 4c. To provide symmetrical correction relative to the center of trace, it is desirable for the current i_2 to have substantially the same phase at the beginning of trace, times t_1 and t_8 of Figure 4, as at the end of trace, times t_6 and t_7 . The amplitude of current i_2 is determined by the value of inductor L_1 .

As just described, the phase, frequency and amplitude of current i_2 provides the proper modulation of the deflection current waveshaping provided by S-capacitor C_s to produce a resultant deflection current waveform i_1 of Figure 4b having the required waveshape for correcting the geometrical line scan nonlinearities of a square-planar picture tube. The voltage V_{LH} applied across deflection winding L_H during trace is the sum of the S-capacitor voltage V_{cs} and the voltage V_2 between terminals 2 and 1 of inductor L_1 . Thus, $V_{LH} = V_{cs} + V_2$. The voltage V_2 , illustrated in Figure 4d, lags the current i_2 by 90° during trace, and is therefore proportional to $-di_2/dt$. Thus

$$V_{LH} = -L_H di_1/dt = V_{cs} + k di_2/dt,$$

where k is a constant.

From the above, one notes that the S-capacitor voltage component V_{cs} of the voltage applied to deflection winding L_H contributes or introduces a current component during trace similar in waveshape to the dashed-line current i_1' of Figure 4b. Tuned circuit 60 introduces a component V_2 to the applied deflection winding voltage that introduces a slope component to the deflection current slope that is proportional to di_2/dt .

When current i_2 of Figure 4c is ramping downward, such as from time t_1 to t_2 , time t_3 to t_4 , and time t_5 to t_6 , current i_2 produces an increased slope to the deflection current i_1 over that contributed by the dashed-line S-capacitor current component i_1' . In these intervals the display is expanded.

When current i_2 of Figure 4c is ramping upward, such as in the left-center and right-center regions of line scan, from time t_2 to t_3 and from time t_4 to t_5 , the di/dt or slope of current i_2 opposes the di/dt of the dashed-line S-capacitor current component i_1' . In these regions, the slope of deflection current i_1 is decreased, producing a compression of the display.

Ideally, neglecting dissipative damping effects, the maxima, minima and zero-crossings of the current and voltage waveforms i_2 and V_2 of Figures 4c and 4d are equally separated in time during the line trace interval.

Figure 4e illustrates current i_2 flowing in inductor L_1 from terminal 2 to terminal 1. The flat portions of current i_2 indicate an increased di/dt to the deflection current i_1 . The steep portions indicate a decreased di/dt .

As previously mentioned, LC resonant circuit 60 is tuned to make two complete cycles of oscillation during the trace interval. The frequency of the S-capacitor contribution to deflection circuit i_1 during trace is much lower, approximately 7.5 kilohertz, than the frequency of ringing current i_2 , approximately 38 kilohertz. The deflection current, therefore, does not contribute to the ringing current excitation during trace.

The energy which circulates in tuned circuit 60 is replenished during the second half of retrace as illustrated in Figure 4c wherein the maxima of current i_2 during retrace is of greater magnitude than the minima of the current. The average of the voltage V_2 increases towards the end of retrace, as illustrated in Figure 4d. The increase indicates the energy added during the second half of retrace. It should also be noted that, although not readily apparent in the waveform illustrations, the amplitudes of current i_2 and voltage V_2 decrease slightly toward the end of trace due to incurred losses.

Since resonant circuit 60 is tuned such that current i_2 produces two cycles of oscillation during the trace interval, current i_2 has the same phase at times t_1 and t_7 . In contrast, the S-capacitor contribution to deflection current i_1 produces only about one-half cycle of oscillation during trace. As a result, the deflection current has a phase at time t_7 that is opposite the phase at time t_1 . The two currents i_1 and i_2 , therefore, have opposite phases at time t_7 . This observation is supported by noting that voltage V_2 of Figure 4d starts to decrease at time t_7 , while voltage V_1 of Figure 4a starts to increase at time t_7 .

The high di_1/dt of deflection current i_1 shifts the phase of current i_2 by 360 degrees during each retrace period. The opposite phase of current i_1 at time t_7 and its high positive di_1/dt during retrace causes a rapid decrease of current i_2 to its zero crossing point during retrace. The time of zero crossing depends upon the Q of tuned circuit 60 and upon the amount of energy circulating in circuit 60 compared to the amount of circulating deflection energy. For example, a damping resistor, hypothetically placed in parallel with capacitor C_1 , results in an earlier zero crossing because the amplitude of current i_2 is smaller at time t_7 and thus it takes less time of phase shift current i_2 . During the remainder of retrace, namely, during the interval between the zero crossing point of current i_2 and time t_8 , current i_2 charges capacitor C_1 positively relative to ground. During this interval, current i_2 is proportional to di_1/dt and returns to zero at time t_8 .

In this manner, the phase of current i_2 is set at time t_8 or time t_1 such that current i_2 , which rings independently during trace, starts from substantially zero and is negative going. Then, by tuning LC resonant circuit 60 to provide two cycles of oscillation during trace, the phase of current i_2 becomes equal at times t_1 and t_7 .

A tapped coil L_1 provides better isolation between currents i_1 and i_2 and results in a better Q of circuit 60 than without the tap. During retrace, the remainder of deflection circuit 40 loads resonant circuit 60 and reduces the Q of circuit 60. A high Q of circuit 60 is advantageous for providing symmetrical S-correction. A low Q results in a stronger decrease of the amplitudes of current i_2 and voltage V_2 towards the end of trace, and results in less S-correction at the right side of the screen than at the left side.

By proper selection of S-capacitor value, to provide slight overcorrection or compression of the display at the center and left and right edges of line scan, and to provide slight undercorrection or expansion at the left and right-center areas, resonant circuit 60 may be used to introduce a compensating correction current component i_2 that opposes the over and undercorrection provided by S-capacitor C_s to substantially linearize the display over the entire line scan.

When resonant circuit 60 is added to deflection circuit 40 of Figure 3, the vertical line pattern of Figure 2 changes to one of equally spaced lines located at the tick mark positions. Vertical lines A through E do not change their locations since points on these lines correspond to line scanning instants when current i_2 is zero.

The addition of resonant circuit 60 results in a small reduction of the line deflection current due to the added impedance. This reduction may be compensated by the width control adjustment circuitry of the line deflection circuit, not illustrated in Figure 3.

The preferred values of circuit components in Figure 3 are as follows:

$C_R = 13,000$ picofarad
 $C_s = 0.47$ microfarad
 $L_H = 1$ millihenry, 1 ohm
 $C_1 = 0.047$ microfarad
 $L_1 = 400$ microhenry between terminals 3 and 1
 $= 16$ microhenry between terminals 2 and 1.

The color picture tube is a 110°, 27V, COTY-SP Color Picture Tube, A68ACC10X, manufactured by RCA Corporation, Video Component and Display Division, Lancaster, Pennsylvania.

The amount R of residual S-distortion present when using only the S-capacitor equals approximately 7%, as measured by the greatest deviation of two vertical lines in Figure 2 from the average spacing s_0 , where

$$R = (s_{\max} - s_0) / s_0 \times 100\%,$$

and where $s_{\max}$ equals the greatest spacing between two vertical lines.

Resonant circuit 60 supplies additional S-correction in the amount G. Empirically, it has been found that when the ratio between the inductance of the lower portion of inductor L_1 and the inductance of horizontal deflection winding L_H equals approximately 4, the correct amount of additional S-correction has been provided.

60 Claims

1. An S-corrected line deflection circuit, comprising:

a line deflection winding;

an S-shaping capacitance coupled to said line deflection winding;

a trace switch coupled to said line deflection winding and operated at a line deflection rate for

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1. An S-corrected line deflection circuit, comprising:
 a line deflection winding;

an S-shaping capacitance coupled to said line deflection winding;

a trace switch coupled to said line deflection winding and operated at a line deflection rate for



generating a trace current in said line deflection winding during a trace interval of a line deflection cycle, and a retrace current during a retrace interval, said trace current being a generally sawtooth current modified in accordance with the waveshaping provided by said S-shaping capacitance;

- 5 and a resonant circuit (60) coupled to said line deflection winding (L_H) for providing additional modification of the sawtooth trace current by generation of a generally sinusoidal correction current; characterized in that said resonant circuit (60) is tuned to generate in the line deflection circuit during the line trace interval such a generally sinusoidal correction current having a frequency of oscillation which is a harmonic of the reciprocal of the trace interval.

- 10 2. An S-corrected line deflection circuit according to Claim 1 characterized in that said correction current has a period of oscillation which is half of the trace interval.

3. An S-corrected line deflection circuit according to Claim 2 characterized in that said correction current undergoes two cycles of oscillation during the trace interval of said line deflection cycle and undergoes one cycle of oscillation during the retrace interval.

- 15 4. An S-corrected line deflection circuit according to Claim 1 characterized in that the retrace current from said line deflection winding (L_H) rephases said correction current during said retrace interval to enable the phase of said correction current to be the same at the beginning and end of said trace interval.

5. An S-corrected line deflection circuit according to Claim 1 characterized in that said line deflection winding (L_H) and S-shaping capacitance (C_s) are series-connected to form a first branch, and wherein said resonant circuit comprises a first capacitive branch (C_1) coupled to a second inductive branch (L_1) at a 20 juncture (3), said deflection winding (L_H) being coupled to said juncture (3).

6. An S-corrected line deflection circuit according to Claim 5 characterized in that the retrace current from said line deflection winding (L_H) produces a rapid charging in said capacitive branch (C_1) to provide one cycle of correction current oscillation during said retrace interval.

- 25 7. An S-corrected line deflection circuit according to any previous claim characterized in that said correction current provides correction for line deflection nonlinearity introduced by raster scanning in a picture tube (10) with an aspherical faceplate (18) having a curvature that is different at the side edges than in the center.

- 30 8. An S-corrected line deflection circuit according to Claim 5 characterized in that said inductive branch comprises a tapped coil (L_1), said line deflection winding (L_H) being coupled to said juncture (3) via the tap (2) of said coil (L_1).

9. An S-corrected line deflection circuit included in a television display apparatus having a picture tube that includes an electron gun structure for generating and accelerating an electron beam to strike a phosphor screen located on a faceplate of the picture tube, wherein said S-corrected line deflection circuit comprises:

- 35 a line deflecting winding;
an S-shaping capacitance coupled to said line deflection winding;
a trace switch coupled to said line deflection winding for generating therein a trace current during a trace interval of a line deflection cycle to line scan said electron beam across said phosphor screen between the left and right edges of said faceplate;

- 40 and an LC tuned circuit (60) coupled to said line deflection winding (L_H) for providing additional modification of the sawtooth trace current:

- 45 and is characterized in that, with said tube being of a type in which said faceplate (18) has a relatively flat contour having a curvature that is generally greater at the left and right edges than in the center, said LC tuned circuit (60) is coupled to said deflection winding (L_H) for introducing into the trace current an oscillatory correction current component which, in a portion of the line scan intermediate a center portion and a left or right edge portion thereof, has a di/dt with a sign value opposite that of the di/dt of the component of the trace current introduced by said S-shaping capacitance (C_s).

10. An S-corrected line deflection circuit, comprising:

- 50 a line deflection winding;
an S-shaping capacitance coupled to said line deflection winding;
a trace switch coupled to said line deflection winding and operated at a line deflection rate for generating a trace current in said line deflection winding during a line trace interval of a line deflection cycle and a retrace current during a line retrace interval, said trace current being a generally sawtooth current modified in accordance with the waveshaping provided by said S-shaping capacitance; and

- 55 a resonant circuit (60) for generating a generally sinusoidal oscillatory correction current during said line trace interval, said resonant circuit (60) being coupled to said line deflection winding (L_H); characterized in that said resonant circuit is tuned for generating in the line deflection winding an oscillatory correction current that is phased to produce a zero oscillatory correction current at both the beginning and end of said line trace interval for providing additional modification of the sawtooth trace current in accordance with said correction current.



Patentansprüche

1. S-korrigierte Zeilenablenkschaltung mit:
 einer Zeilenablenkwicklung
 5 einer S-Formungskapazität, die mit der Zeilenablenkwicklung gekoppelt ist;
 einem Hinlaufschalter, der mit der Zeilenablenkwicklung gekoppelt ist und mit einer Zeilenablenkfrequenz arbeitet, um während eines Hinlaufintervalles eines Zeilenablenkzyklus einen Hinlaufstrom in der Zeilenablenkwicklung zu erzeugen und einen Rücklaufstrom während eines Rücklaufintervalles, wobei der Hinlaufstrom ein im wesentlichen sägezahnförmiger Strom ist, der
 10 entsprechend der Schwingungsformung durch die S-Formungskapazität modifiziert ist; und
 einem Resonanzkreis (60), der mit der Zeilenablenkwicklung (L_H) gekoppelt ist, um eine weitere Modifikation des Hinlaufsägezahnstromes durch Erzeugen eines im wesentlichen sinusförmigen Korrekturstromes zu bewirken;
 dadurch gekennzeichnet, daß der Resonanzkreis (60) so abgestimmt ist, daß er während des
 15 Zeilenhinlaufintervalles in der Zeilenablenkwicklung einen solchen, im wesentlichen sinusförmigen Korrekturstrom erzeugt, der eine Schwingungsfrequenz hat, die eine Oberwelle des Kehrwertes des Hinlaufintervalles ist.
2. S-korrigierte Zeilenablenkschaltung nach Anspruch 1, dadurch gekennzeichnet, daß der Korrekturstrom eine Schwingungsperiode hat, die gleich der Hälfte des Hinlaufintervalles ist.
- 20 3. S-korrigierte Zeilenablenkschaltung nach Anspruch 2, dadurch gekennzeichnet, daß der Korrekturstrom während des Hinlaufintervalles des Zeilenablenkzyklus zwei Schwingungszyklen und während des Rücklaufintervalles einen Schwingungszyklus durchläuft.
4. S-korrigierte Zeilenablenkschaltung nach Anspruch 1, dadurch gekennzeichnet, daß der Rücklaufstrom von der Zeilenablenkwicklung (L_H) die Phase des Korrekturstromes während des
 25 Rücklaufintervalles neu einstellt, um eine Phasengleichheit des Korrekturstromes am Anfang und am Ende des Hinlaufintervalles zu ermöglichen.
5. S-korrigierte Zeilenablenkschaltung nach Anspruch 1, dadurch gekennzeichnet, daß die Zeilenablenkwicklung (L_H) und die S-Formungskapazität (C_s) unter Bildung eines ersten Zweiges in Reihe geschaltet sind und daß der Resonanzkreis einen ersten, kapazitiven Zweig (C_1) enthält, der an einer
 30 Verbindung (3) mit einem zweiten, induktiven Zweig (L_1) gekoppelt ist, und daß die Ablenkwicklung (L_H) mit der Verbindung (3) gekoppelt ist.
6. S-korrigierte Zeilenablenkschaltung nach Anspruch 5, dadurch gekennzeichnet, daß der Rücklaufstrom von der Zeilenablenkwicklung (L_H) eine schnelle Aufladung im kapazitiven Zweig (C_1) bewirkt, um einen Zyklus der Korrekturstromschwingung während des Rücklaufintervalles zu erzeugen.
- 35 7. S-korrigierte Zeilenablenkschaltung gemäß einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß der Korrekturstrom eine Korrektur für eine Zeilenablenk-Nichtlinearität bewirkt, die durch eine Rasterabtastung in einer Bildröhre (10) mit einer asphärischen Frontplatte (18) verursacht ist, die an den Seitenrändern eine andere Krümmung als in der Mitte hat.
8. S-korrigierte Zeilenablenkschaltung nach Anspruch 5, dadurch gekennzeichnet, daß der induktive
 40 Zweig eine Spule (L_1) mit Abgriff enthält und daß die Zeilenablenkwicklung (L_H) mit der genannten Verbindung (3) über den Abgriff (2) der Spule (L_1) gekoppelt ist.
9. S-korrigierte Zeilenablenkschaltung in einem Fernseh wiedergabegerät, welches eine Bildröhre aufweist, die eine Elektronenstrahlerzeugungsanordnung zum Erzeugen und Beschleunigen eines Elektronenstrahls enthält, der auf einen Lumineszenzschirm auftrifft, welcher sich auf einer Frontplatte der
 45 Bildröhre befindet, wobei die S-korrigierte Zeilenablenkschaltung
 eine Zeilenablenkwicklung;
 eine S-Formungskapazität, die mit der Zeilenablenkwicklung gekoppelt ist;
 einen Hinlaufschalter, der mit der Zeilenablenkwicklung gekoppelt ist, um in dieser während eines
 50 Hinlaufintervalles eines Zeilenablenkzyklus einen Hinlaufstrom für eine Zeilenablenkung des Elektronenstrahls zwischen dem linken und dem rechten Rand der Frontplatte über den Leuchtschirm zu erzeugen; und
 einen abgestimmten LC-Kreis (60), der mit der Zeilenablenkwicklung (L_H) gekoppelt ist, um eine zusätzliche Modifikation des Hinlauf-Sägezahnstromes zu bewirken, enthält
 55 dadurch gekennzeichnet, daß bei einer Röhre eines Typs, bei der die Frontplatte (18) eine relativ flache Kontur mit einer Krümmung, die im wesentlichen am linken und rechten Rand größer ist als in der Mitte, aufweist, der abgestimmte LC-Kreis (60) mit der Ablenkwicklung (L_H) gekoppelt ist, um in den Ablenkstrom eine Korrekturstromschwingungskomponente einzuführen, welche in einem Teil der Zeilenablenkung zwischen einem mittleren Teil und einem linken sowie einem rechten Randteil der Ablenkung ein di/dt mit einem Vorzeichen hat, das dem des di/dt der durch die S-Formungskapazität (C_s) in den Ablenkstrom
 60 eingeführten Komponente entgegengesetzt ist.
10. S-korrigierte Zeilenablenkschaltung mit
 einer Zeilenablenkwicklung;
 einer S-Formungskapazität, die mit der Zeilenablenkwicklung gekoppelt ist;
 einem Hinlaufschalter, der mit der Zeilenablenkwicklung gekoppelt ist und mit einer
 65 Zeilenablenkfrequenz arbeitet, um in der Zeilenablenkwicklung während eines Zeilenhinlaufintervalles



eines Zeilenablenkzyklus einen Hinlaufstrom und während eines Zeilenrücklaufintervalles einen Rücklaufstrom zu erzeugen, wobei der Hinlaufstrom im wesentlichen ein Sägezahnstrom ist, der entsprechend der Schwingungsformung durch die S-Formungskapazität modifiziert ist; und einem mit der Zeilenablenkwicklung (L_H) gekoppelten Resonanzkreis (60) zum Erzeugen eines im wesentlichen sinusförmigen Korrektorschwingungsstromes während des Zeilenhinlaufintervalles; dadurch gekennzeichnet, daß der Resonanzkreis so abgestimmt ist, daß er in der Zeilenablenkwicklung einen Korrektorschwingungsstrom erzeugt, der eine solche Phasenlage hat, daß sowohl am Anfang als auch am Ende des Zeilenablenkintervalles ein Korrektorschwingungsstrom des Wertes Null erzeugt wird, um eine zusätzliche Modifikation des Hinlaufsägezahnstromes entsprechend dem Korrekturstrom zu erzeugen.

Revendications

1. Circuit de déviation horizontale corrigé en S, comprenant:
 - un enroulement de déviation horizontale;
 - une capacitance de mise en forme de S couplée audit enroulement de déviation horizontale;
 - un commutateur d'aller couplé audit enroulement de déviation horizontale et fonctionnant à une fréquence de déviation horizontale pour produire un courant d'aller dans ledit enroulement de déviation horizontale pendant un intervalle d'aller d'un cycle de déviation horizontale, et un courant de retour pendant un intervalle de retour, ledit courant d'aller étant un courant généralement en dents de scie modifié selon la mise en forme d'onde produite par ladite capacitance de mise en forme de S; et un circuit résonnant (60) couplé audit enroulement de déviation horizontale (L_H) pour produire une modification additionnelle du courant d'aller en dents de scie par production d'un courant généralement sinusoïdal de correction;
2. Circuit de déviation horizontale corrigé en S selon la revendication 1, caractérisé en ce que ledit circuit résonnant (60) est accordé pour produire, dans le circuit de déviation horizontale, pendant l'intervalle d'aller horizontal, un tel courant généralement sinusoïdal de correction ayant une fréquence d'oscillation qui est l'harmonique de l'inverse de l'intervalle d'aller.
3. Circuit de déviation horizontale corrigé en S selon la revendication 2, caractérisé en ce que ledit courant de correction a une période d'oscillation qui est égale à la moitié de l'intervalle d'aller.
4. Circuit de déviation horizontale corrigé en S selon la revendication 1, caractérisé en ce que ledit courant de correction subit deux cycles d'oscillation pendant l'intervalle d'aller dudit cycle de déviation horizontale et subit un cycle d'oscillation pendant l'intervalle de retour.
5. Circuit de déviation horizontale corrigé en S selon la revendication 1, caractérisé en ce que le courant de retour dudit enroulement de déviation horizontale (L_H) remet en phase ledit courant de correction pendant ledit intervalle de retour pour permettre à la phase dudit courant de correction d'être la même au début et à la fin dudit intervalle d'aller.
6. Circuit de déviation horizontale corrigé en S selon la revendication 1, caractérisé en ce que ledit enroulement de déviation horizontale (L_H) et ladite capacitance de mise en forme de S (C_s) sont connectés en série pour former une première branche et où ledit circuit résonnant comprend une première branche capacitive (C_1) couplée à une seconde branche inductive (L_1) à une jonction (3), ledit enroulement de déviation (L_H) étant couplé à ladite jonction (3).
7. Circuit de déviation horizontale corrigé en S selon la revendication 5, caractérisé en ce que le courant de retour dudit enroulement de déviation horizontale (L_H) produit une charge rapide dans ladite branche capacitive (C_1) pour produire un cycle de l'oscillation du courant de correction pendant ledit intervalle de retour.
8. Circuit de déviation horizontale corrigé en S selon la revendication 5, caractérisé en ce que le courant de retour dudit enroulement de déviation horizontale (L_H) produit une charge rapide dans ladite branche capacitive (C_1) pour produire un cycle de l'oscillation du courant de correction pendant ledit intervalle de retour.
9. Circuit de déviation horizontale corrigé en S selon toutes revendications précédentes, caractérisé en ce que ledit courant de correction produit une correction d'une non linéarité de déviation horizontale introduite par l'exploration de la trame dans un tube-image (10) ayant un fond asphérique (18) dont la courbure est différente sur les bords latéraux et au centre.
10. Circuit de déviation horizontale corrigé en S selon la revendication 5, caractérisé en ce que ladite branche inductive comprend une bobine à prise (L_1), ledit enroulement de déviation horizontale (L_H) étant couplé à ladite jonction (3) via la prise (2) de ladite bobine (L_1).
11. Circuit de déviation horizontale corrigé en S incorporé dans un appareil de visualisation de télévision ayant un tube-image qui comprend une structure de canon d'électrons pour produire et accélérer un faisceau d'électrons pour faire impact sur un écran de luminophores qui se trouve sur un fond d'un tube-image, où ledit circuit de déviation horizontale corrigé en S comprend:
 - un enroulement de déviation horizontale;
 - une capacitance de mise en forme de S couplée audit enroulement de déviation horizontale;
 - un commutateur d'aller couplé audit enroulement de déviation horizontale pour y produire un courant d'aller pendant un intervalle d'aller d'un cycle de déviation horizontale pour l'exploration horizontale dudit faisceau d'électrons à travers ledit écran de luminophores entre les bords droit et gauche dudit fond; et un circuit accordé LC (60) couplé audit enroulement de déviation horizontale (L_H) pour produire une modification additionnelle du courant d'aller en dents de scie;
 - et est caractérisé en ce qu'avec ledit tube d'un type dans lequel le fond (18) a un contour relativement plat dont la courbure est généralement plus grande aux bords gauche et droit qu'au centre, ledit circuit



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accordé LC (60) est couplé audit enroulement de déviation (L_H) pour introduire, dans le courant d'aller, une composante de courant de correction qui oscille qui, dans une portion du balayage horizontal entre une portion centrale et une portion de bord droit ou gauche, a une di/dt dont la valeur de signe est opposée à celle de di/dt de la composante du courant d'aller qui est introduite par ladite capacitance de mise en forme de S (C_s).

10. Circuit de déviation horizontale corrigé en S, comprenant:

un enroulement de déviation horizontale;

une capacitance de mise en forme de S couplée audit enroulement de déviation horizontale;

un commutateur d'aller couplé audit enroulement de déviation horizontale et fonctionnant à une fréquence de déviation horizontale pour produire un courant d'aller dans ledit enroulement de déviation horizontale pendant un intervalle d'aller horizontal d'un cycle de déviation horizontale et un courant de retour pendant un intervalle de retour horizontal, ledit courant d'aller étant généralement un courant en dents de scie modifié selon la mise en forme d'onde produite par ladite capacitance de mise en forme de S; et

un circuit résonnant (60) pour produire un courant oscillant généralement sinusoïdal de correction pendant ledit intervalle d'aller horizontal, ledit circuit résonnant (60) étant couplé audit enroulement de déviation horizontale (L_H);

caractérisé en ce que ledit circuit résonnant est accordé pour produire, dans l'enroulement de déviation horizontale, un courant oscillant de correction qui est en phase pour produire un courant oscillant nul de correction au début et à la fin de l'intervalle d'aller horizontal afin de produire une modification additionnelle du courant d'aller en dents de scie selon ledit courant de correction.

