

Description

This invention relates to horizontal deflection circuits, and more particularly to horizontal deflection circuits for use with multiple-scanning type television receivers that can receive video signals having different horizontal frequencies.

Recently, a so-called multiple-scanning type television receiver has been developed. This receiver requires a horizontal deflection circuit that can provide a constant horizontal deflection regardless of a change in the horizontal or line frequency of the input video signal. An example of a proposed horizontal deflection circuit for use in a multiple-scanning type television receiver is shown in Figure 1. In that example, a horizontal synchronizing signal is applied to an input terminal 1, and then fed to a frequency-to-voltage converter 2, where it is converted to a voltage signal whose level is changed in proportion to the frequency of the horizontal synchronizing signal. The voltage signal from the converter 2 is supplied to one input of a multiplier 3.

A second input terminal 4 has supplied thereto a deflection control signal that is used to vary the width of deflection of the beam in the horizontal direction. The deflection control signal applied to the input terminal 4 is supplied to the other input terminal of the multiplier 3, so that the voltage signal corresponding to the frequency of the horizontal synchronizing signal is changed in response to the deflection width indicated by the deflection control signal. The product signal from the multiplier 3 is supplied to a switching regulator 5 as a control signal, and the switching regulator 5 produces a DC output signal in response to the multiplied signal. This DC output signal is supplied to a horizontal output circuit 6 as a power supply source signal, and the horizontal synchronizing signal at the input terminal 1 is also supplied to the horizontal output circuit 6, whereby a horizontal deflection output signal having a cycle based on the horizontal synchronizing signal is developed at an output terminal 6a, which is connected to the deflection coil (not shown) of the television receiver.

With this horizontal deflection circuit, in response to a change in the horizontal frequency of the input video signal, the frequency of the horizontal synchronizing signal at the input terminal 1 will change accordingly, whereby the power supply source voltage fed to the horizontal output circuit 6 from the switching regulator 5 will also change. Therefore, the horizontal deflection width can be controlled to fall substantially in a predetermined range, regardless of changes in the line frequency of the video input signal.

Alternatively, the horizontal deflection circuit may be constructed as shown in Figure 2, in which like parts corresponding to those of Figure 1 have the same reference numerals and will not be described in

detail.

In Figure 2, the horizontal synchronizing signal applied to the horizontal synchronizing signal input terminal 1 is again supplied directly to the horizontal output circuit 6, and the output signal from the horizontal output circuit 6 is supplied to a deflection width detecting circuit 7. The deflection width detecting circuit 7 detects a horizontal deflection width from the output signal of the horizontal output circuit 6, and produces an output signal that is integrated by an integrating circuit 8, and is then fed to one input of a comparator 9. An electronic control signal that is proportional to the deflection width is applied to a deflection control signal input terminal connected to the other input of comparator 9. The comparator 9 compares the deflection width indicated by the control signal with a real deflection width indicated by the detected signal to generate a compared result, that is, a difference signal. This difference signal is supplied to the switching regulator 5 as a control signal, and a DC signal from the switching regulator 5 is supplied to the horizontal output circuit 6 as a power source voltage. The deflection width detecting circuit 7 operates so that a horizontal deflection pulse signal derived from the horizontal output circuit 6 is peak-rectified, thereby detecting the deflection width from a rectified value.

The method in which the horizontal deflection pulse is peak-rectified to detect the deflection width, however, cannot avoid the disadvantage that when the line frequency fluctuates, the value to be detected also fluctuates, thereby causing an error in the detected value. This error condition will be described more fully with reference to the waveform diagram of Figure 3.

If it is assumed that a horizontal deflection pulse signal generated from the horizontal output circuit is shown by a dashed line in Figure 3, then a peak-rectified value P1 of the horizontal deflection pulse signal will change in a predetermined range near the peak value of the pulse signal, as shown by a solid line in Figure 3. Assuming that the horizontal frequency of the incoming video signal is reduced by one half, then the interval between the horizontal deflection pulse signals is widened by a factor of two, whereby the width in which a peak-rectified value P2 is changed is widened to twice that of the peak-rectified value P1. As a result, the mean value level a2 will be lower than the mean value level a1. When the mean value is lowered as described above, even although the real deflection width is not changed, it is detected as if the deflection width had changed, thereby producing an error in the detected value.

With recent developments in broadcasting techniques, the horizontal frequency of video signals has become higher and higher. In fact, the horizontal frequency may be as high as several times the horizontal frequency of the ordinary broadcasting standard

(15.75 kHz). If a video signal with such a high horizontal frequency is supplied to the detecting circuit, there is then the substantial possibility that an error will occur in detecting the deflection width.

With the horizontal deflection circuit of Figure 2, as in the example of the horizontal deflection circuit of Figure 1, regardless of a change in horizontal frequency of the video signal, the horizontal deflection width can be controlled to fall substantially in a predetermined range. More particularly, the deflection width to be controlled and the real deflection width are compared by the comparator 9, and the switching regulator 5 is controlled so as to reduce the resultant difference, whereby the horizontal deflection width can be prevented from fluctuating with changes in horizontal frequency.

Nevertheless, the horizontal deflection circuit shown in Figure 1 has the unavoidable disadvantage that the horizontal deflection width fluctuates very slightly in accordance with an increase in horizontal frequency f_H of the incoming video signal.

More specifically, although the horizontal frequency f_H and the output voltage V of the switching regulator 5 are directly proportional to each other, as shown by a dashed line in Figure 4, in practice the output voltage V increases at a higher rate in accordance with increases of the horizontal frequency f_H , as shown by a solid line in Figure 4, resulting in the horizontal deflection width fluctuating by about 10 to 20%. The reason that the horizontal deflection width fluctuates is that even although the horizontal frequency changes, the beam blanking period, or retrace period, does not change. This will be described in more detail with reference to Figures 5A and 5B.

In a signal supplied to a horizontal deflection coil during one horizontal scanning period H at a certain horizontal frequency, as shown in Figure 5A, the voltage value is linearly increased during a video scanning period T_1 , whereas the voltage value is decreased during the retrace blanking period TR . Let it be assumed that, as shown in Figure 5B, the horizontal frequency is doubled thereby reducing one horizontal scanning period H_2 to half of the above-described one horizontal scanning period H_1 . Nevertheless, the blanking period TR is necessarily constant regardless of the horizontal frequency, so that the video scanning period T_2 of the horizontal scanning period H_2 must become shorter than half of the video scanning period T_1 or the horizontal scanning period H_1 . Therefore, the change in the horizontal frequency and the change of the video scanning period are not directly proportional to each other, so that in the horizontal deflection circuit of Figure 1 an error occurs in the deflection width in accordance with the increase of the horizontal frequency, whereby a fluctuation in the deflection width occurs.

Moreover, in the horizontal deflection circuit of Figure 2 wherein the deflection width is detected and

a detected difference is fed back to the switching regulator 5 in a feedback loop, although an error can be prevented from being produced in the deflection width due to the horizontal frequency, an integrating circuit is needed to reduce the cut-off frequency in order to prevent the circuits forming the loop section from oscillating. Nevertheless, if the cut-off frequency is reduced as described above, then the response characteristic of the switching regulator 5 deteriorates and it cannot follow rapid changes in the horizontal frequency f_H . There is then the substantial risk that the horizontal output circuit 6 will be damaged.

According to the present invention there is provided a horizontal deflection circuit for a multiple-scanning type television receiver that displays input video signals having different respective horizontal frequencies, the circuit comprising:

a horizontal output circuit responsive to an input horizontal synchronizing signal for producing a horizontal deflection output signal; characterized by a detecting circuit responsive to said horizontal deflection output signal for detecting a deflection width of an input video signal and producing a detected output signal; and

a comparator for comparing said detected output signal with a picture size signal proportional to a picture size of the input video signal in the horizontal direction and producing a compared output signal;

a voltage signal generator responsive to said input horizontal synchronizing signal for generating a voltage signal proportional to the horizontal frequency of the input video signal;

an adder for adding the compared output signal from the comparator (20) and the picture size signal; and a multiplier for multiplying an output signal of said adder and said voltage signal, and producing an output signal for controlling said horizontal output circuit of the television receiver.

Using this circuit the horizontal output circuit of the television receiver is controlled on the basis of the output signal of the multiplying circuit. With such a horizontal deflection circuit, a satisfactory horizontal deflection without any error can be provided following a rapid change in the horizontal frequency of the input video signal.

According to another aspect of the present invention a horizontal deflection width detecting circuit is provided in which a horizontal deflection width of a video signal supplied to a multiple-scanning type television receiver capable of receiving a video signal of a plurality of horizontal frequencies is detecting by peak-rectifying a horizontal deflection pulse. In this horizontal deflection width detecting circuit, a discharging current source proportional to the horizontal frequency of the input video signal is connected to a peak-rectifying circuit, so that a deflection width can be satisfactorily detected without error.

The invention will now be described by way of ex-

ample with reference to the accompanying drawings, throughout which like parts are referred to by like references, and in which:

Figures 1 and 2 are block diagrams of respective examples of previously proposed deflection circuit;

Figures 3, 5A and 5B are waveforms relating to the circuits of Figures 1 and 2;

Figure 4 is a graph of horizontal frequency versus output voltage relating to the circuit of Figure 1;

Figures 6 and 7 are block diagrams of respective embodiments of horizontal deflection circuit according to the present invention;

Figure 8 is a schematic diagram of an embodiment;

Figure 9 is a waveform diagram relating to the embodiments;

Figure 10 is a schematic circuit diagram of another embodiment of horizontal deflection circuit based on the circuit of Figure 8, and according to the present invention; and

Figure 11 is a block diagram of another embodiment of horizontal deflection circuit according to the present invention.

In Figure 6, an embodiment of horizontal deflection circuit according to the present invention is shown, in which the horizontal deflection circuit is applied to a so-called multiple-scanning type television receiver. A horizontal synchronizing signal of an input video signal of the kind that is supplied to the above-described multiple-scanning type television receiver (not shown) is fed to an input terminal 11 and supplied to a frequency-to-voltage converter 12, in which it is converted to a voltage signal whose voltage level changes in proportion to the frequency of the horizontal synchronizing signal. The voltage signal output from the converter 12 is supplied to one input of a multiplier 13.

Another input terminal 14 receives a deflection control signal having a voltage level proportional to a deflection width as determined by the size of the picture to be displayed on the television receiver screen. The deflection control signal applied to the input terminal 14 is fed to one input of an adder 15. For example, the deflection control signal might be a voltage signal that is 1 Volt when the picture is a standard size and which becomes 0.5 Volt when the picture is half the standard size. The adder 15 also receives at another input a difference signal from a comparator 20, and the adder 15 adds the deflection control signal and the difference signal.

The sum signal output from the adder 15 is supplied to the other input of the multiplier 13, so that in the multiplier 13 the voltage signal corresponding to the frequency of the horizontal synchronizing signal is changed in response to the sum signal by the multiplication operation, and the product signal is supplied as a control signal to a switching regulator 16.

The switching regulator 16 generates a DC output signal in response to the multiplied signal that is supplied to a horizontal output circuit 17 as a power supply source signal. The horizontal synchronizing signal applied to the input terminal 11 is also supplied to the horizontal output circuit 17, whereby a horizontal deflection output signal based on the horizontal synchronizing signals is fed to an output terminal 17a that is connected to the horizontal deflection coil (not shown).

In this embodiment, the output signal from the horizontal output circuit 17 is also supplied to a deflection width detecting circuit 18, wherein a horizontal deflection width of the output signal of the horizontal output circuit 17 is detected by the deflection width detecting circuit 18. The detected signal is supplied to an integrating circuit 19, in which it is integrated and is fed as one input to the comparator 20. The deflection control signal that is proportional to the deflection width and that is applied to the deflection control signal input terminal 14 is the other signal supplied to the comparator 20. The comparator 20 compares the deflection width indicated by the control signal with a real deflection width to generate a compared result, that is, a difference signal. The difference signal from the comparator 20 is supplied to the other input of the adder 15.

In the operation of the horizontal deflection circuit described above, the voltage signal from the converter 12 is a signal based on the frequency of the horizontal synchronizing signal applied to the input terminal 11. Whereas, the signals added by the adder 15 are the deflection control signal applied to the input terminal 14 and the difference signal from the comparator 20. The comparator 20 compares the deflection control signal, which is applied to the input terminal 14 and whose level is determined by the size of the picture, and the detected signal indicative of the real deflection state in the horizontal output circuit 17 and which is detected by the deflection width detecting circuit 18. More specifically, the difference between the deflection width to be controlled and the real deflection width is represented by the difference signal from the comparator 20. When this difference signal and the deflection control signal, as determined by the size of the picture, are added to each other in the adder 15, a deflection control signal corrected by the difference signal is generated. The thus corrected deflection control signal is then supplied to the multiplier 13, wherein the voltage signal based on the frequency of the horizontal synchronizing signal is multiplied with the corrected deflection control signal. In this manner, the voltage signal is changed in response to the deflection width to be controlled. The thus multiplied voltage signal is supplied to the switching regulator 16, so that a power supply source signal based on this voltage signal is supplied to the horizontal output circuit 17.

The power supply source signal supplied to the horizontal output circuit 17 is controlled as described above, whereby the power supply source signal proportional to the horizontal frequency of the incoming video signal is controlled by the converter 12, and the power supply source signal based on the difference between the real deflection width and the deflection width corresponding to the size of picture is controlled by the comparator 20. In that case, although control proportional to the horizontal frequency of the input video signal by the converter 12 results in a maximum error of about 20% due to the horizontal frequency f_H , as shown in Figure 4, the converter 12 has a high response characteristic relative to fluctuations in the horizontal frequency, so that the output source voltage signal of the switching regulator 16 can be changed in a ganged relation to fluctuations of the horizontal frequency, thereby resulting in a very small error. This error is detected as the difference signal by the comparator 20 and the deflection control signal is corrected on the basis of this difference signal, whereby the voltage signal after being multiplied by the multiplier 13 is a voltage signal whose error is corrected. Therefore, the switching regulator 16 can be controlled satisfactorily without error, and a good power supply source voltage signal without error, which can cope with fluctuations of the horizontal frequency, is supplied to the horizontal output circuit 17, thus making it possible to perform satisfactory horizontal deflection following fluctuations of the horizontal frequency, so that the size of the picture is not changed at all.

The error at that time is about 20% of the fluctuation at maximum, as described above, so that the comparator 20 can be prevented from detecting a large difference of the deflection width. Accordingly, even when the response characteristic is made low by the integrating circuit 19, the amount to be corrected is small. Thus, when the horizontal frequency f_H changes rapidly, the horizontal output circuit 17 can be prevented from being overdriven and damaged.

While the size of picture, that is, the deflection width, is changed by changing the deflection control signal supplied to the input terminal 14, and whose level is changed in response to the size of picture in the above-described embodiment, the horizontal deflection circuit of the first embodiment is modified so that the size of the picture is fixed.

In another embodiment shown in Figure 7, the deflection control signal is formed of a signal of constant potential from a reference voltage source 21 and supplied to one input terminal of the adder 15 and to an input of the comparator 20. The remainder of this embodiment is the same as that of Figure 6.

With this arrangement, the comparator 20 compares the real deflection width and a constant deflection width, so that a deflection width being controlled always falls within a predetermined range.

An example of a horizontal deflection width detecting circuit used in the above-described embodiment of the present invention will be described with reference to Figures 8 to 10. More particularly, Figure 8 shows a basic horizontal deflection width detecting circuit. The horizontal synchronizing signal supplied to the input terminal 11 is also supplied to the horizontal output circuit 17, and the horizontal output circuit 17 produces a horizontal deflection pulse signal whose phase is matched with that of the horizontal synchronizing signal. This horizontal deflection pulse signal is applied to one side of the horizontal deflection coil (not shown), that causes an electron beam to be deflected in the horizontal direction. Simultaneously, this horizontal deflection pulse signal is supplied to a horizontal deflection detecting circuit.

More specifically, the horizontal deflection pulse signal from the horizontal output circuit 17 is supplied to the anode of a diode 22 whose cathode is connected to one electrode of a charging capacitor 23. The other electrode of the capacitor 23 is earthed. The cathode of the diode 22 is also connected to a current source 24, and the signal developed at the cathode of the diode 22 is fed to a deflection width detecting signal output terminal 25. The deflection width is based on the voltage value of the signal developed at the output terminal 25. In this embodiment, the current value of the current source 24 is controlled by the frequency-to-voltage converter 12 as shown by the connection thereto. The converter 12 receives the horizontal synchronizing signal fed in at the horizontal synchronizing signal input terminal 11 and produces an output voltage on the basis of the frequency of that horizontal synchronizing signal. Thus, the current flow due to the current source 24 is controlled by the output voltage signal from the converter 12, so in effect the current flow caused by the current source 24 is controlled in response to the frequency of the horizontal synchronizing signal.

The horizontal deflection pulse signal from the horizontal output circuit 17 is a pulse signal corresponding to the interval of the horizontal synchronizing signals, as represented by the dashed line in Figure 9. A peak value of this pulse signal is peak-rectified by the diode 22 and the capacitor 23. More specifically, this pulse signal charges the capacitor 23, and the current flowing through the current source 24 becomes the discharge current for the capacitor 23. The voltage value of the peak-rectified signal developed at the output terminal 25 is determined by the amount of the discharging current. The peak value P1 of the horizontal deflection pulse signal determined as described above is represented by the solid line in Figure 9.

Assuming, for example, that the horizontal frequency of the input video signal is reduced by half, then the interval between the horizontal deflection pulses is widened by a factor of two. If the discharging

current is constant, the mean value is lowered as shown in Figure 3. According to this embodiment, however, if the horizontal frequency changes, the discharging current of the current source 24 changes in proportion to the change of the horizontal frequency. Accordingly, as represented by the one-dot chain line of Figure 9, a peak-rectified value P3 at this horizontal frequency gradually changes with a more gentle slope. Therefore, when the amount by which the discharge current changes is determined so that the mean values of the peak-rectified values P1 and P3 are kept constant at level a1, so long as the deflection width is constant, the mean voltage of the output signal at the output terminal can be prevented from changing due to changes in the horizontal frequency. Consequently, errors can be prevented from being produced in the deflection width detection based on the output voltage developed at the output terminal 25.

Figure 10 is a schematic circuit diagram of another embodiment of the present invention, forming a horizontal deflection circuit based on the principle of Figure 8.

Referring to Figure 10, the output signal from the switching regulator 16, whose output signal is changed in response to the horizontal frequency, is supplied to the horizontal output circuit 17 and also to a resistor 26 in the current source or current control circuit 24. A horizontal deflection pulse signal from the horizontal output circuit 17 is supplied through the diode 22 to the capacitor 23, whose other electrode is earthed. Connected to the junction of the diode 22 and the capacitor 23 is the output terminal 25, at which a deflection width detecting signal is developed. In the current control circuit 24, the other end of the resistor 26 is earthed via a series circuit made up of a diode 27 and a resistor 28. At the junction between the resistor 26 and the diode 27 the base electrode of an NPN transistor 29 is connected. The collector electrode of the transistor 29 is connected to the capacitor 23, and the emitter electrode thereof is earthed via a resistor 30 that serves as a discharging resistor.

With the above-described circuit arrangement, a voltage signal proportional to the horizontal frequency is developed at the junction between the resistor 26 and the diode 27 in the current control circuit 24. This voltage signal is supplied to the base of the transistor 29, whereby the amount of current flowing through the resistor 30 from the collector-emitter circuit of the transistor 29 is controlled by the voltage signal. Therefore, the discharge of the capacitor 23 is controlled in proportion to the horizontal frequency so that, as long as the horizontal deflection width is constant, as shown in Figure 9, the mean voltage value of the deflection detecting signal developed at the output terminal 25 becomes constant, thereby preventing an error from occurring in the detecting sig-

nal.

The control signal for the current source is not limited to the output signal of the switching regulator 16, as shown in the embodiment of Figure 10, and may be another signal whose voltage level is changed in proportion to the horizontal frequency. For example, as shown in Figure 11, the amount of the discharging current may be controlled by the output signal of the frequency-to-voltage converter that controls the switching regulator. This will be described more fully with reference to Figure 11.

In Figure 11, the horizontal synchronizing signal applied to the input terminal 11 is supplied to the frequency-to-voltage converter 12, in which it is converted to the voltage signal whose voltage level changes in proportion to the frequency of the horizontal synchronizing signal. The voltage signal from the converter 12 is supplied to one input terminal of the multiplier 13. The input terminal 14 receives the deflection control signal having a voltage proportional to the deflection width, which is based on the size of the picture to be displayed. The deflection control signal applied to the input terminal 14 is supplied to one input terminal of the adder 15. In this case, the deflection control signal may be a voltage signal that is 1 Volt when the size of the picture is standard and which becomes 0.5 Volt when the size of the picture is half the standard size.

The adder 15 also receives the difference signal output from the comparator 20, which will be described below. In the adder 15, the difference signal is added to the deflection control signal, and the summed signal from the adder 15 is supplied to the other input terminal of the multiplier 13. In the multiplier 13, the voltage signal corresponding to the frequency of the horizontal synchronizing signal is changed in response to the summed signal by multiplication, and the product signal is supplied to the switching regulator 16 as a control signal. The switching regulator 16 generates a DC output signal in response to the product signal from the multiplier 13, and this DC output signal from the switching regulator 16 is supplied to the horizontal output circuit 17 as the power supply source signal. Then, the horizontal synchronizing signal applied to the input terminal 11 is supplied to the horizontal output circuit 17, from which there is derived the horizontal deflection pulse signal having a period based on this horizontal synchronizing signal.

In this embodiment, the output signal of the horizontal output circuit 17 is supplied through the diode 22 to the capacitor 23 and to the discharging current source 24. In that case, the value of current flowing through the current source 24 is controlled by the output voltage of the converter 12. Then, the voltage signal developed at the junction between the capacitor 23 and the diode 22 is supplied to one input terminal of the comparator 20. The deflection control signal applied to the deflection control signal input terminal

14, which is proportional to the deflection width, is supplied to the other input of the comparator 20. The comparator 20 compares the deflection width indicated by the control signal and the real deflection width indicated by the detected signal. Then, the difference signal derived from the comparator 20 is supplied to the other input terminal of the adder 15.

In operation of this circuit, the voltage signal from the converter 12 is a signal based on the frequency of the horizontal synchronizing signal applied to the input signal 11. The signals added to the adder 15 are the deflection control signal applied to the input terminal 14 and the difference signal from the comparator 20. In this embodiment, the comparator 20 compares the deflection control signal applied to the input terminal 14, which is determined on the basis of the size of picture, and the charging potential of the capacitor 23, which indicates the real deflection state from the horizontal output circuit 17. In other words, the difference between the deflection width to be controlled and the real deflection width is represented by the difference signal from the comparator 20. In the adder 15, the difference signal is added to the deflection control signal, which is based on the size of the picture, thereby producing a deflection control signal that is corrected by the difference signal. The corrected deflection control signal is supplied to the multiplier 13, wherein the voltage signal based on the frequency of the horizontal synchronizing signal is multiplied with the corrected deflection control signal, and the voltage level of the multiplied voltage signal is changed in response to the deflection width to be controlled. The multiplied signal is supplied to the switching regulator 16, and the power supply source signal based on the voltage signal is supplied to the horizontal output circuit 17.

As described above, the power supply source signal supplied to the horizontal output circuit 17 is effectively controlled, by controlling the horizontal frequency of the input video signal by the frequency-to-voltage converter 12 and by basing the power supply source signal on the difference between the real deflection width and the deflection width corresponding to the size of picture as determined by the comparator 20. In that case, the value of current flowing through the current source 24 is controlled by the voltage signal proportional to the horizontal frequency derived from the converter 12, whereby the deflection width is accurately detected. Thus, the comparator 20 accurately detects the difference between the reference deflection width and the real deflection width, thus making it possible accurately to control the deflection width satisfactorily.

In the case of Figure 11, since the current source 24 is controlled by the output voltage the converter 12 that is developed for controlling the switching regulator 16, an exclusive current control signal generating circuit is not required, which can simplify the circuit

arrangement.

With an embodiment of horizontal deflection circuit according to the present invention, horizontal deflection can be performed rapidly following fluctuation of the horizontal frequency, and satisfactory horizontal deflection can be carried out without change in picture size due to fluctuations of the horizontal frequency.

Moreover, the deflection width, that is, the picture size, of the received video image can be satisfactorily detected without being adversely affected by fluctuations in the horizontal frequency. There is then the advantage that the invention can be applied to a so-called multiple-scanning type television receiver for receiving a video signal of a plurality of horizontal frequencies.

Claims

1. A horizontal deflection circuit for a multiple-scanning type television receiver that displays input video signals having different respective horizontal frequencies, the circuit comprising:
 - a horizontal output circuit (17) responsive to an input horizontal synchronizing signal for producing a horizontal deflection output signal;
 - a detecting circuit (22 to 24) responsive to said horizontal deflection output signal for detecting a deflection width of an input video signal and producing a detected output signal; and
 - a comparator (20) for comparing said detected output signal with a picture size signal proportional to a picture size of the input video signal in the horizontal direction and producing a compared output signal; characterized by
 - a voltage signal generator (12) responsive to said input horizontal synchronizing signal for generating a voltage signal proportional to the horizontal frequency of the input video signal;
 - an adder (15) for adding the compared output signal from the comparator (20) and the picture size signal; and
 - a multiplier (13) for multiplying an output signal of said adder (15) and said voltage signal, and producing an output signal for controlling said horizontal output circuit (17) of the television receiver.
2. A circuit according to claim 1 wherein said picture size signal is produced as a constant potential by a DC voltage source (21) and is fed to said comparator (20) and to said adder (15).
3. A circuit according to claim 1 wherein said detecting circuit (22 to 24) comprises a discharging current source (24) producing a current proportional to the horizontal frequency of the input video signal, and a peak-rectifying circuit (22, 23) con-



14, which is proportional to the deflection width, is supplied to the other input of the comparator 20. The comparator 20 compares the deflection width indicated by the control signal and the real deflection width indicated by the detected signal. Then, the difference signal derived from the comparator 20 is supplied to the other input terminal of the adder 15.

In operation of this circuit, the voltage signal from the converter 12 is a signal based on the frequency of the horizontal synchronizing signal applied to the input signal 11. The signals added to the adder 15 are the deflection control signal applied to the input terminal 14 and the difference signal from the comparator 20. In this embodiment, the comparator 20 compares the deflection control signal applied to the input terminal 14, which is determined on the basis of the size of picture, and the charging potential of the capacitor 23, which indicates the real deflection state from the horizontal output circuit 17. In other words, the difference between the deflection width to be controlled and the real deflection width is represented by the difference signal from the comparator 20. In the adder 15, the difference signal is added to the deflection control signal, which is based on the size of the picture, thereby producing a deflection control signal that is corrected by the difference signal. The corrected deflection control signal is supplied to the multiplier 13, wherein the voltage signal based on the frequency of the horizontal synchronizing signal is multiplied with the corrected deflection control signal, and the voltage level of the multiplied voltage signal is changed in response to the deflection width to be controlled. The multiplied signal is supplied to the switching regulator 16, and the power supply source signal based on the voltage signal is supplied to the horizontal output circuit 17.

As described above, the power supply source signal supplied to the horizontal output circuit 17 is effectively controlled, by controlling the horizontal frequency of the input video signal by the frequency-to-voltage converter 12 and by basing the power supply source signal on the difference between the real deflection width and the deflection width corresponding to the size of picture as determined by the comparator 20. In that case, the value of current flowing through the current source 24 is controlled by the voltage signal proportional to the horizontal frequency derived from the converter 12, whereby the deflection width is accurately detected. Thus, the comparator 20 accurately detects the difference between the reference deflection width and the real deflection width, thus making it possible accurately to control the deflection width satisfactorily.

In the case of Figure 11, since the current source 24 is controlled by the output voltage the converter 12 that is developed for controlling the switching regulator 16, an exclusive current control signal generating circuit is not required, which can simplify the circuit

arrangement.

With an embodiment of horizontal deflection circuit according to the present invention, horizontal deflection can be performed rapidly following fluctuation of the horizontal frequency, and satisfactory horizontal deflection can be carried out without change in picture size due to fluctuations of the horizontal frequency.

Moreover, the deflection width, that is, the picture size, of the received video image can be satisfactorily detected without being adversely affected by fluctuations in the horizontal frequency. There is then the advantage that the invention can be applied to a so-called multiple-scanning type television receiver for receiving a video signal of a plurality of horizontal frequencies.

Claims

1. A horizontal deflection circuit for a multiple-scanning type television receiver that displays input video signals having different respective horizontal frequencies, the circuit comprising:
 - a horizontal output circuit (17) responsive to an input horizontal synchronizing signal for producing a horizontal deflection output signal;
 - a detecting circuit (22 to 24) responsive to said horizontal deflection output signal for detecting a deflection width of an input video signal and producing a detected output signal; and
 - a comparator (20) for comparing said detected output signal with a picture size signal proportional to a picture size of the input video signal in the horizontal direction and producing a compared output signal; characterized by
 - a voltage signal generator (12) responsive to said input horizontal synchronizing signal for generating a voltage signal proportional to the horizontal frequency of the input video signal;
 - an adder (15) for adding the compared output signal from the comparator (20) and the picture size signal; and
 - a multiplier (13) for multiplying an output signal of said adder (15) and said voltage signal, and producing an output signal for controlling said horizontal output circuit (17) of the television receiver.
2. A circuit according to claim 1 wherein said picture size signal is produced as a constant potential by a DC voltage source (21) and is fed to said comparator (20) and to said adder (15).
3. A circuit according to claim 1 wherein said detecting circuit (22 to 24) comprises a discharging current source (24) producing a current proportional to the horizontal frequency of the input video signal, and a peak-rectifying circuit (22, 23) con-



nected to said discharging current source (24).

4. A circuit according to claim 3 further comprising a switching regulator (16) for receiving the output signal from said multiplier (13) for producing a power supply voltage fed to the horizontal output circuit (17), and further comprising the discharging current source (24) which receives the power supply voltage, so that the current of said discharging current source (24) is controlled in response to the deflection width of the input video signal.
5. A circuit according to claim 3 wherein said discharging current source (24) is controlled in response to said output voltage signal from said voltage generating means (12).

Patentansprüche

1. Horizontalablenkschaltung für einen Mehrfachabstastfernsehempfänger, welcher Eingangsvideosignale mit jeweils verschiedenen Horizontalfrequenzen zeigt, wobei die Schaltung umfaßt: eine Horizontalausgangsschaltung (17), welche auf ein Eingangs-Horizontalsynchronisationssignal zur Erzeugung eines Horizontalablenkungsausgangssignal anspricht; eine Detektionsschaltung (22 bis 24), welche auf das Horizontalablenkungsausgangssignal zum Detektieren einer Ablenkungsbreite eines Eingangsvideosignals und zur Erzeugung eines detektierten Ausgangssignals anspricht; und einen Komparator (20) zum Vergleich des detektierten Ausgangssignals mit einem Bildgrößensignal, welches proportional zu einer Bildgröße des Eingangsvideosignals in der Horizontalrichtung ist, und zur Erzeugung eines mit diesem verglichenen Ausgangssignals; gekennzeichnet durch einen Spannungssignalgenerator (12), welcher auf das Eingangs-Horizontalsynchronisationssignal zur Erzeugung eines Spannungssignals reagiert, welches proportional zu der Horizontalfrequenz des Eingangsvideosignals ist; einen Addierer (15) zur Addition des verglichenen Signals von dem Komparator (20) mit dem Bildgrößensignal; und einen Multiplizierer (13) zum Multiplizieren eines Ausgangssignals des Addierers (15) mit dem Spannungssignal, und zum Erzeugen eines Ausgangssignals zur Steuerung der Horizontalausgangsschaltung (17) des Fernsehempfängers.
2. Schaltung nach Anspruch 1, bei welcher das Bildgrößensignal als ein konstantes Potential mittels einer Gleichspannungsquelle (21) erzeugt wird

und dem Komparator (20) und dem Addierer (15) zugeführt wird.

3. Schaltung nach Anspruch 1, bei welcher die Detektionsschaltung (22 bis 24) eine Entladestromquelle (24), welche einen Strom erzeugt, der proportional zu der Horizontalfrequenz des Eingangsvideosignals ist, und eine Spitzenwertgleichrichterschaltung (22, 23), welche mit der Entladungsstromquelle verbunden (24) ist, umfaßt.
4. Schaltung nach Anspruch 3, welche weiterhin einen Umschaltregler (16) zum Empfang des Ausgangssignals von dem Multiplizierer (13) zur Erzeugung einer Versorgungsspannung, welche der Horizontalausgangsschaltung (17) zugeführt wird, aufweist, und außerdem die Entladungsstromquelle (24) umfaßt, welche die Versorgungsspannung empfängt, so daß der Strom der Entladungsstromquelle (24) als Reaktion auf die Ablenkungsbreite des Eingangsvideosignals gesteuert wird.
5. Schaltung nach Anspruch 3, bei welcher die Entladungsstromquelle (24) als Reaktion auf das Ausgangsspannungssignal der Spannungserzeugungseinrichtung (12) gesteuert wird.

Revendications

1. Circuit de déviation horizontale pour récepteur de télévision du type à balayage multiple qui affiche des signaux vidéo d'entrée ayant des fréquences horizontales respectives différentes, le circuit comprenant:
 - un circuit de sortie horizontale (17) sensible à un signal d'entrée de synchronisation horizontale pour produire un signal de sortie de déviation horizontale;
 - un circuit de détection (22 à 24) sensible audit signal de sortie de déviation horizontale pour détecter une largeur de déviation d'un signal vidéo d'entrée et produire un signal de sortie détecté; et
 - un comparateur (20) pour comparer ledit signal de sortie détecté à un signal de format d'image proportionnel à un format d'image du signal vidéo d'entrée dans la direction horizontale, et produire un signal de sortie comparé; caractérisé par
 - un générateur de signal de tension (12) sensible audit signal d'entrée de synchronisation horizontale pour engendrer un signal de tension proportionnel à la fréquence horizontale du signal vidéo d'entrée;
 - un additionneur (15) pour additionner le si-



gnal de sortie comparé provenant du comparateur (20) et le signal de format d'image; et

un multiplicateur (13) pour multiplier un signal de sortie dudit additionneur (15) par ledit signal de tension, et produire un signal de sortie pour commander ledit circuit de sortie horizontale (17) du récepteur de télévision.

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2. Circuit selon la revendication 1, dans lequel ledit signal de format d'image est produit sous la forme d'un potentiel constant par une source de tension continue (21), et est appliqué audit comparateur (20) et audit additionneur (15).

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3. Circuit selon la revendication 1, dans lequel ledit circuit de détection (22 à 24) comprend une source de courant de décharge (24) produisant un courant proportionnel à la fréquence horizontale du signal vidéo d'entrée, et un circuit redresseur de crête (22, 23) connecté à ladite source de courant de décharge (24).

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4. Circuit selon la revendication 3, comprenant en outre un régulateur de commutation (16) pour recevoir le signal de sortie provenant dudit multiplicateur (13) afin de produire une tension d'alimentation appliquée au circuit de sortie horizontale (17), et comprenant en outre la source de courant de décharge (24) qui reçoit la tension d'alimentation de sorte que le courant de ladite source de courant de décharge (24) est commandé en réponse à la largeur de déviation du signal vidéo d'entrée.

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5. Circuit selon la revendication 3, dans lequel ladite source de courant de décharge (24) est commandée en réponse audit signal de tension de sortie provenant dudit moyen générateur de tension (12).

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