

The present invention relates to a method for generating a voltage with a triangular-shaped curve pattern. Such voltages are required for generating a correction current, e.g. for the vertical deflection in television receivers. The deflection of the electron beams takes place, as is known, with the aid of saw-tooth-shaped deflection currents. For particular picture tubes, correction circuits are required which have to generate a true-to-phase fundamental wave for the frequency of the deflection current. There is known e.g. the use of filter circuits or else of synchronised oscillator circuits, in which case however tuning to the fundamental wave must take place, which necessitates additional circuitry with the corresponding costs. Particularly if the circuit has to be suitable optionally for a plurality of vertical deflection frequencies, said correction circuits have to be matched to the corresponding deflection frequency. The use of different deflection frequencies is highly topical for the purpose of higher picture resolution and for the purpose of avoiding interfering flicker phenomena on the screen. Television receivers of the future will be capable of processing deflection frequencies of 50, 60, 100 or else 120 Hz.

There is known, for the elimination of pincushion distortions on the screen of a television receiver, the generation, via two diodes, of a correction signal out of two halves of the vertical-frequency, saw-tooth-shaped deflection signal, the two halves of the saw tooth being adjustable asymmetrically. A sloping branch of the saw-tooth-shaped signals and one rising from the middle of the deflection period are involved here. The zero crossing of the a.c. voltage component of the resulting signal therefore does not lie in the middle of the deflection period, but at $\pi/2$ and at $3\pi/2$ (IBM Technical Disclosure Bulletin, Vol. 13, no. 6, November 1970, pp. 1405-1406, "CRT Distortion Correction Circuit").

There is also known the generation of a correction current with the aid of a diode bridge, in which said correction current acquires an approximately parabolic pattern due to corresponding bias voltages of the diodes. In this case also the apex of the parabola lies somewhere in the middle of the deflection period (US-A-3 911 295). Such a curve pattern is not suited, however, to solving the problem on which the invention is based, which consists in finding a method for generating a frequency-independent fundamental wave for a correction which is of like phase with the vertical deflection current, in which expensive circuitry is to be avoided and no adjustment as a function of the frequency of the deflection current is required.

The invention is based on the aim of finding a method for generating a frequency-independent fundamental wave for a correction which is of like phase with the vertical deflection current, in which expensive circuitry is to be avoided, which requires no adjustment as a function of the frequency of the deflection current. This aim is achieved by the measures characterised in patent claims 1 and 2. Further developments of the invention arise from the sub-claims.

The invention will be explained below from an exemplifying embodiment.

Figure 1 shows a block circuit diagram for implementing the method applied for;

Figure 2.1 show diagrams explaining the formation of the and 2.2 required triangular-shaped curve pattern;

Figure 3 shows a detailed circuit diagram for implementing the method.

In Figure 1 there is fed to the one input of an adder circuit 1 a first voltage with a saw-tooth-shaped curve pattern. A second voltage of opposite phase to the first voltage with a saw-tooth-shaped curve pattern and with twice the amplitude of the first saw-tooth-shaped voltage is fed to a diode bridge 2. Said diode bridge 2 is biased by means of a symbolically shown voltage U_v . At the output of the diode bridge 2 there is obtained a saw-tooth-type voltage with horizontal parts partly occasioned by the bias voltage U_v , which is fed to the other input of the adder circuit 1. Due to the addition there is produced at the output of said adder circuit 1 the voltage with the triangular-shaped curve pattern. This will be explained with the aid of Figure 2.1 from the diagrams. Curve A denotes the voltage curve which is fed to the one input of the adder circuit 1. Curve B, whose peak value is twice as big as that of curve A, is of opposite phase to curve A. Said voltage curve arrives at the input of the diode bridge 2. The bias voltage U_v is entered in curve B. Only the peaks of curve B pass across the diode bridge 2 to its output, so that horizontal sub-sections are obtained, as is shown in curve C. The peak values of curve A and of curve C must be equal. By addition of the two curves A and C there is obtained curve D with the desired triangular-shaped curve pattern.

Figure 2.2 shows a further possibility for generating the triangular-shaped voltage, if the pattern as per curve C is generated according to claim 2. The limitation of the signal shape as per curve B may take place e.g. with the aid of diodes.

The method which is the subject of the application will be described with the aid of Figure 3 from a detailed exemplifying embodiment of a circuit arrangement. There is fed to the input 3 of an amplifier stage 4 the vertical-frequency saw-tooth-shaped signal V. The saw-tooth-shaped signal A of like phase with the signal V is picked off at the emitter resistance 5 of the amplifier stage 4 and fed to the adder circuit 1. At the collector resistance 6 of the amplifier stage 4 the saw-tooth-shaped signal B of opposite phase to the signal V is picked off and fed via the capacitor 7 to a diode bridge 2. As a result of the signal peaks of the voltage B there is obtained at the RC circuit 8, 9 a bias voltage for the diode bridge 2. At the output of the diode bridge 2 there is obtained the saw-tooth-type signal voltage C with the horizontal parts caused by the bias voltage. The signal C is fed to the other input of the adder circuit 1. At the output of the adder circuit 1 there is obtained the signal

D, which is fed via a capacitor 10 to an amplifier 11. The triangular-shaped signal D is coupled out via the capacitor 12. The middle horizontal part of the signal C remains largely constant in its length over time, even with differences in the input voltage, if an accompanying d.c. voltage is suppressed by means of the RC circuit 8, 9. The resistance 8 of the RC circuit 8, 9 determines the discharge time of the capacitor 9, so that the desired duration of the horizontal part of the signal C is determined in this way. Because of the accompanying charging voltage of the capacitor 9 the input voltage may fluctuate by e.g. $\pm 15\%$ without the associated curve pattern of the signal C being disturbed. Because of the absence of frequency-dependent elements said arrangement may be used in a large frequency range. Thus the circuit arrangement may process e.g. frequencies of 40 to 200 Hz. For the purpose of phase displacement of the signal D a bias current I_v may be introduced via a resistance 13 into the diode bridge 2. Phase displacements of ± 90 degrees of the signal D may be achieved in this way.

Claims

1. Method of producing a voltage with a triangular-shaped curve pattern (D) by the addition of a saw-tooth-shaped first voltage (A) to a saw-tooth-type voltage (C) with the same peak values, characterised in that the saw-tooth-type voltage (C) is, by suppression of a part (U_v), symmetrical to the centre line, of a second saw-tooth-shaped voltage with twice the amplitude (B) and of opposite phase to the first saw-tooth-shaped voltage (A), transformed in such a way that it possesses in the time interval $0.25T$ to $0.75T$ horizontal sections of zero amplitude, and that the addition of the saw-tooth-shaped voltage (A) to the saw-tooth-type voltage of opposite phase (C) provided with the horizontal sections takes place in such a way that the triangular-shaped curve pattern (D) exhibits zero crossings at zero, $0.5T$ and T of the period T .
2. Method of producing a voltage with a triangular-shaped curve pattern (D) by the addition of a saw-tooth-shaped first voltage (A) to a saw-tooth-type voltage (C) with the same peak values, characterised in that the saw-tooth-type voltage (C) is, by limitation to a component (U_v), symmetrical to the centre line, of a saw-tooth-shaped voltage with twice the amplitude and of opposite phase to the saw-tooth-shaped first voltage (A), transformed in such a way that it possesses in the time intervals zero to $0.25T$ and $0.75T$ to T horizontal sections of the above-mentioned amplitude, and that the addition of the saw-tooth-shaped first voltage (A) to the saw-tooth-type voltage of opposite phase (C) provided with the horizontal sections takes place in such a way that the triangular-shaped curve pattern (D) exhibits zero crossings at zero, $0.5T$ and T of the period T .



D, which is fed via a capacitor 10 to an amplifier 11. The triangular-shaped signal D is coupled out via the capacitor 12. The middle horizontal part of the signal C remains largely constant in its length over time, even with differences in the input voltage, if an accompanying d.c. voltage is suppressed by means of the RC circuit 8, 9. The resistance 8 of the RC circuit 8, 9 determines the discharge time of the capacitor 9, so that the desired duration of the horizontal part of the signal C is determined in this way. Because of the accompanying charging voltage of the capacitor 9 the input voltage may fluctuate by e.g. $\pm 15\%$ without the associated curve pattern of the signal C being disturbed. Because of the absence of frequency-dependent elements said arrangement may be used in a large frequency range. Thus the circuit arrangement may process e.g. frequencies of 40 to 200 Hz. For the purpose of phase displacement of the signal D a bias current I_v may be introduced via a resistance 13 into the diode bridge 2. Phase displacements of ± 90 degrees of the signal D may be achieved in this way.

Claims

1. Method of producing a voltage with a triangular-shaped curve pattern (D) by the addition of a saw-tooth-shaped first voltage (A) to a saw-tooth-type voltage (C) with the same peak values, characterised in that the saw-tooth-type voltage (C) is, by suppression of a part (U_v), symmetrical to the centre line, of a second saw-tooth-shaped voltage with twice the amplitude (B) and of opposite phase to the first saw-tooth-shaped voltage (A), transformed in such a way that it possesses in the time interval $0.25T$ to $0.75T$ horizontal sections of zero amplitude, and that the addition of the saw-tooth-shaped voltage (A) to the saw-tooth-type voltage of opposite phase (C) provided with the horizontal sections takes place in such a way that the triangular-shaped curve pattern (D) exhibits zero crossings at zero, $0.5T$ and T of the period T .
2. Method of producing a voltage with a triangular-shaped curve pattern (D) by the addition of a saw-tooth-shaped first voltage (A) to a saw-tooth-type voltage (C) with the same peak values, characterised in that the saw-tooth-type voltage (C) is, by limitation to a component (U_v), symmetrical to the centre line, of a saw-tooth-shaped voltage with twice the amplitude and of opposite phase to the saw-tooth-shaped first voltage (A), transformed in such a way that it possesses in the time intervals zero to $0.25T$ and $0.75T$ to T horizontal sections of the above-mentioned amplitude, and that the addition of the saw-tooth-shaped first voltage (A) to the saw-tooth-type voltage of opposite phase (C) provided with the horizontal sections takes place in such a way that the triangular-shaped curve pattern (D) exhibits zero crossings at zero, $0.5T$ and T of the period T .



3. Method according to claim 1, characterised in that the saw-tooth-type voltage curve pattern (C) with the horizontal sections is produced by the fact that a saw-tooth-shaped second voltage (B) with twice the peak value (B) compared with the saw-tooth-shaped first voltage (A) is passed across a suitably biased diode bridge (2).
4. Method according to claim 3, characterised in that the bias voltage of the diode bridge (2) is produced by means of a battery voltage (U_v).
5. Method according to claim 3, characterised in that the bias voltage is produced by means of a parallel circuit consisting of a capacitor (9) and a resistor (8), which connects the d.c. voltage terminals of the diode bridge (2).
6. Circuit arrangement for carrying out the method according to claims 1, 3, 4 or 5, characterised in that a first voltage (A) with a saw-tooth-shaped curve pattern is supplied to the one terminal of an adder circuit (1) and a second voltage with a saw-tooth-shaped curve pattern of opposite phase to the first voltage (A) with a saw-tooth-shaped curve pattern and with twice the peak value compared with the first voltage is fed via a or the biased diode bridge (2) to the other terminal of the adder circuit (1), at the output of which the voltage with a triangular-shaped curve pattern may be picked off.
7. Circuit arrangement according to claim 6, characterised in that there may be fed to the diode bridge (2) a positive or negative bias current (I_v), so that a phase displacement of the voltage (D) with a triangular-shaped curve pattern of plus/minus 90 degrees is achievable.