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TELEVISION TIME BASE CIRCUIT

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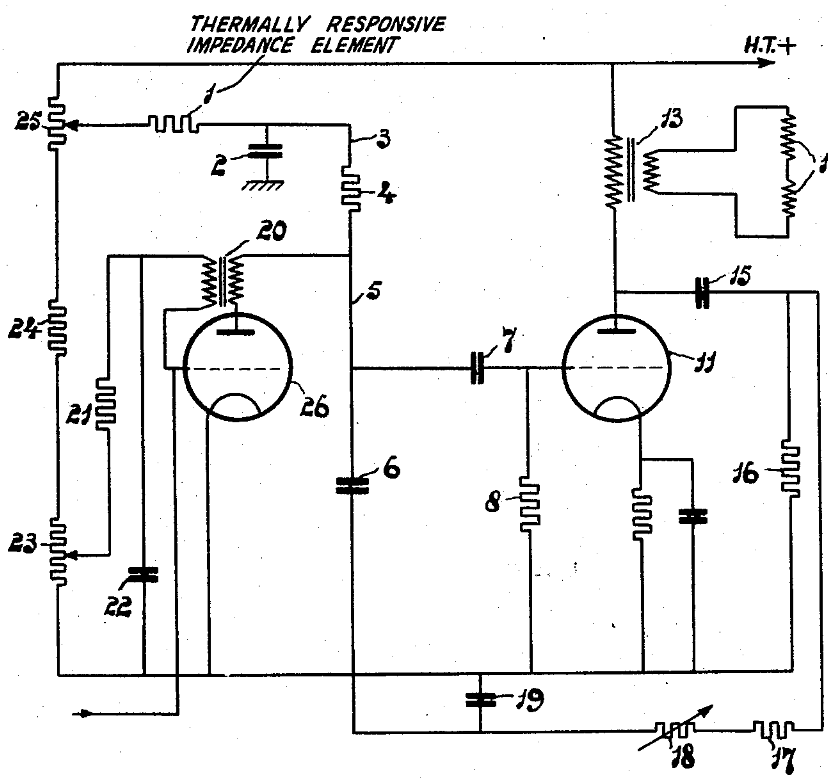

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TELEVISION TIME BASE CIRCUIT

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7 Claims. (Cl. 315—27)

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This invention relates to arrangements for producing a sawtooth shaped current waveform in cathode ray tube deflector coils such as are employed in television transmitting and receiving equipment and, more particularly, to systems in which the deflector coils are fed through a transformer or a resistance-capacitance coupling from a thermionic valve of the triode type or other low impedance source.

In known arrangements thermionic valves having a high impedance for example, pentode output stages have been widely used. With these arrangements the output is practically independent of the load. Thus any increase in the resistance of the deflector coils due to temperature rise does not affect the amplitude of the sawtooth current waveform. Such high impedance output stages either directly feed (resistance-capacitance coupling) the deflector coils or employ transformer coupling. With transformer coupling the inductance of the primary winding shunts the reflected impedance of the deflector coils and the output valve has to supply the extra current which flows in this primary winding. The anode current of the output valve is then not a sawtooth waveform; the rate of change of current during the scan increases instead of remaining constant. The drive for the output valve is normally obtained from a resistance, capacitance network which gives an exponential increase of potential during the scan so that the rate of change of potential decreases during this period.

With a high impedance device such as a pentode the input potential (grid) waveform and the output (anode) current waveform are substantially identical and this presents the problem of changing the curvature of the input waveform to obtain a linear scanning current.

The use of an output transformer has certain advantages in manufacture but this difficulty of obtaining correction of the input waveform has to be balanced against the cheapness of the output transformer. The smaller and, therefore the cheaper the transformer the smaller is the primary inductance and hence its shunting effect and the extra current are greater.

When a low impedance output stage using a triode is employed the input (grid) potential waveform more nearly approaches the output potential wave form and not the output current waveform. Assuming that a certain degree of input waveform compensation is possible this automatically enables a smaller output transformer to be employed.

One of the most effective an convenient methods of correction for the input waveform is achieved by a type of negative voltage feedback which further reduces the valve impedance and gives all the other well-known advantages of negative feedback. This method is equally applicable with pentodes when they become effectively low impedance sources.

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The use of triodes has further advantages as two triode valves are frequently contained in one envelope so saving space and the cost of certain accessories such as valveholders, etc., besides cheapening the valves complement of an apparatus.

All these low impedance output stages suffer from one serious disadvantage which arises from the fact that the output potential waveform tends to remain constant independent of the load. This is distinct from a constant output current waveform as in the case of high impedance output stages. As a result the scan amplitude is affected by temperature changes as the deflector coil resistance changes. In television equipment in enclosed cabinets the temperature rise of the coils may be as much as 30° C. and the scan reduced by 8% (leaving a 1/4″ gap at the top and bottom of a 6″ high picture). The "form" of the raster is thus seriously distorted and since the "height" control is normally a "preset" potentiometer not accessible to the user he has no ready means of adjustment available. Even when this control is accessible it requires continual adjustment throughout the warming-up period which may be as long as twenty minutes to half an hour.

In the arrangement according to the invention this disadvantage is obviated by providing an automatic height control which adjusts the amplitude of the vertical scan as the temperature of the deflector coils changes.

In order that the invention may be more clearly understood and readily carried into effect it will now be explained more fully with reference to the accompanying drawing in which the single figure is a complete circuit diagram of a frame time base according to the invention.

In this figure the valve **26** functions as a blocking oscillator with transformer **20**. Incoming synchronising pulses being fed for example onto the grid. The free-running frequency of the blocking oscillator is determined by the time constant of the resistor **21** and the capacitor **22** and by the potential set on the potentiometer **23**, which forms the "frame hold" control and is connected in a potential divider chain including resistor **24** and potentiometer **25**.

The capacitor **6**, which is discharged by the blocking oscillator and charges through the resistor 4 has one end connected through the R. C. coupling components 7 and 8 to the grid of the output valve 11 and its other end to the junction of a capacitor 19 and a potentiometer 18. The components 15, 16, 17, 18 and 19 form a negative-feedback network to maintain the linearity of the current waveform in the deflector coils 14. These deflector coils are connected in the anode circuit of the valve 11 by a transformer 13.

The network to affect automatic maintenance of raster height comprises the components 1 and 2.

The resistor 1 is of a type which exhibits a negative temperature coefficient i. e. the resistance decreases with rise in temperature.

The resistor potentiometer 25 is the normal "pre-set" amplitude control which operates by changing the potential to which the capacitor 6 is charging.

The capacitor 2 has a large value (e. g. 1/μf.) so that the point 3 is substantially at a steady potential while the correct input waveform appears at point 5. Thus the value of resistor 1 will also affect the potential to which the capacitor 6 is charging due to the potential drop in the resistor 1. According to the invention the material composing the resistor 1 and its spacial relationship to hot parts of the instrument embodying the invention are so adjusted that as the deflector coils 14 rise in temperature the resistor 1 drops in resistance value, increasing the input to the output valve 11 and so substantially compensating for the increase in resistance of the coils and the consequent reduction in scan would otherwise occur.

The remainder of the circuit in Fig. 1 is a known arrangement for frame time base and illustrates the incorporation of the invention in a practical device.

Clearly the automatic temperature compensation element shown as resistor 1 in Fig. 1 could equally well be placed between the resistor potentiometer 25 and the H. T. line. In such an arrangement it may be necessary to supply the "hold" or frequency control from a separate resistor chain from the H. T. line.

What I claim is:

1. A time base circuit for a cathode ray tube, comprising a magnetic deflection coil for said tube having a given resistance-temperature coefficient, means coupled to said coil to generate therein a deflection current having an amplitude proportional to the voltage across said coil and to the resistance thereof, and a thermally responsive variable impedance element coupled to said generating means to vary the amplitude of said voltage proportional to variations of said resistance produced by ambient temperature variations.

2. A time base circuit for a cathode ray tube, comprising a magnetic deflection coil for said tube having a given resistance-temperature coefficient, means coupled to said coil to generate therein a deflection current having an amplitude proportional to the voltage across said coil and to the resistance thereof, and a thermally responsive variable resistance element having a resistance-temperature coefficient opposite in sign to the resistance-temperature coefficient of said coil and being coupled to said generating means to vary the amplitude of said voltage proportional to variations of the resistance of said coil produced by ambient temperature variations.

3. In a television receiver including a cathode ray tube provided with magnetic deflection coils having a given resistance-temperature coefficient, a deflection current generator comprising a capacitive element, means including a thermally responsive impedance element to charge said capacitive element, means periodically to discharge said capacitive element, and an electron discharge tube having an input circuit coupled to said capacitive element and having an output circuit coupled to said deflection coils, said thermally responsive impedance element having a resistance-temperature coefficient opposite in sign to the resistance-temperature coefficient of said deflection coils thereby to maintain the maximum amplitude of the deflection current substantially constant despite variations in resistance of said deflection coils with ambient temperature variations.

4. In a television receiver including a cathode ray tube provided with magnetic deflection coils having a given resistance-temperature coefficient, a deflection current generator comprising a capacitive element, means including a thermally responsive resistance element to charge said capacitive element, means periodically to discharge said capacitive element, an electron discharge tube having an input circuit coupled to said capacitive element and having an output circuit coupled to said deflection coils, said thermally responsive resistance element having a resistance-temperature coefficient opposite in sign to the resistance-temperature coefficient of said deflection coils thereby to maintain the maximum amplitude of the deflection current substantially constant despite variations in resistance of said deflection coils with ambient temperature variations.

5. In a television receiver including a cathode ray tube provided with magnetic deflection coils having a given resistance-temperature coefficient, a deflection current generator comprising a capacitive element, means including a thermally responsive resistance element to charge said capacitive element, means including a blocking oscillator periodically to discharge said capacitive element, an electron discharge tube having an input circuit coupled to said capacitive element and having a low impedance output circuit coupled to said deflection coils, said thermally responsive resistance element having a resistance-temperature coefficient opposite in sign to the resistance temperature coefficient of said deflection coils thereby to maintain the maximum amplitude of the deflection current substantially constant despite variations in resistance of said deflection coils with ambient temperature variations.

6. In a television receiver including a cathode ray tube provided with magnetic deflection coils having a positive resistance-temperature coefficient, a deflection current generator comprising a capacitive element, means including a thermally responsive resistance element coupled in series with said capacitive element to charge said capacitive element, means periodically to discharge said capacitive element, an electron discharge tube having an input circuit coupled to said capacitive element and having an output circuit coupled to said deflection coils, said thermally responsive resistance element having a negative resistance-temperature coefficient thereby to maintain the maximum amplitude of the deflection current substantially constant despite variations in resistance of said deflection coils with ambient temperature variations.

7. In a television receiver including a cathode ray tube provided with magnetic deflection coils having a given positive resistance-temperature coefficient, a deflection current generator comprising a capacitive element, means including a thermally responsive resistive element to charge said capacitive element, means periodically to discharge said capacitive element, an electron discharge tube having an input circuit coupled to said capacitive element and having an output circuit coupled to said deflection coils, said thermally responsive resistive element being positioned adjacent to said deflection coils and having a negative resistance-temperature coefficient thereby to maintain the maximum amplitude of

the deflection current substantially constant despite variations in resistance of said deflection coils with ambient temperature variations.

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