

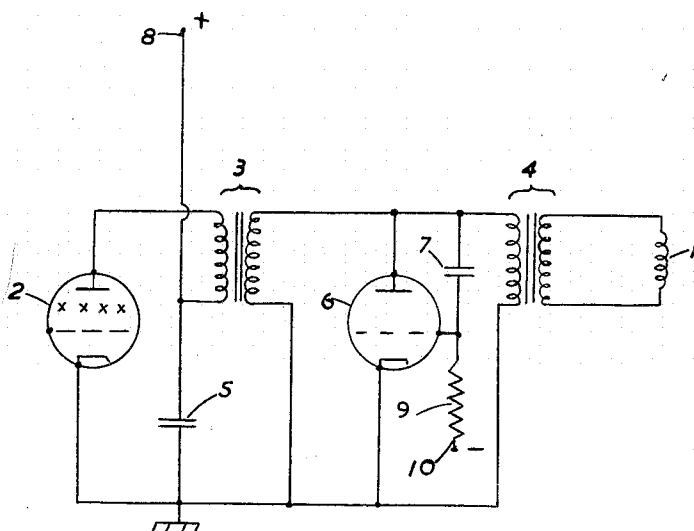
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CIRCUITS FOR GENERATING SAW TOOTH OSCILLATIONS

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CIRCUITS FOR GENERATING SAW TOOTH
OSCILLATIONS

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This invention relates to circuits for the generation of electrical sawtooth oscillations in an inductive load and it relates particularly but not exclusively to circuits for generating sawtooth oscillations in the scanning coils of a cathode ray tube incorporated, for example, in television apparatus.

In one form of circuit for this purpose an electron discharge tube (hereinafter referred to for convenience as the power tube) is arranged to apply a voltage periodically to the load, for example the scanning coils of a cathode ray tube, to develop the long flanks of sawtooth current oscillations, the tube being rendered nonconducting periodically at times corresponding to the ends of the long flanks, whereupon a half cycle of free oscillation in said coils produces the short flanks of the sawtooth current oscillations. Undesirable free oscillations tend to persist after the ends of said short flanks, and accordingly a further electron discharge tube (hereinafter referred to for convenience as the damper tube) is associated with the load, the damper tube being non-conducting during the half cycle of free oscillation corresponding to the short flank of the sawtooth oscillation and becoming conducting at the end of the half cycle so as to damp the free oscillations.

It is frequently required to employ a load having a relatively low inductance, this being the case, for example, when the load comprises scanning coils, since these are difficulties associated with the use of high inductance coils. However, when a low inductance load is employed the damper tube cannot be connected directly across the load since its impedance relative to that of the load is too great for effective operation of the damper tube. It has been proposed to overcome this difficulty by connecting the damper tube across a tertiary winding of a transformer via which the power tube is coupled to the load, so that a suitably high impedance is presented to the damper tube, but such an arrangement has the disadvantage that when the damper tube becomes conducting the energy which at this time is stored in the field of the transformer sets up ringing oscillations in the circuit comprising the leakage inductance of the primary and tertiary windings and the stray capacities associated therewith, and said ringing oscillations are transferred to the load due to the leakage inductance of the tertiary winding in series with the damper tube serving to couple the scanning coils with the circuit in which the ringing oscillations occur.

The object of the invention is to provide a cir-

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cuit which enables a low inductance scanning coil or other load to be employed whilst avoiding or reducing the transfer of undesirable ringing oscillations as above-mentioned.

According to the invention there is provided a circuit comprising a low inductance load, a power tube which serves to set up sawtooth current oscillations in said load, and a damper tube for reducing undesired oscillations at the ends of the short flanks of said sawtooth oscillations, said power tube being coupled to said load via two transformers connected in cascade and the anode-cathode path of said damper tube being connected across the connected windings of said transformers.

In order that the said invention may be clearly understood and readily carried into effect, the same will now be more fully described with reference to the accompanying drawing, the single figure of which shows one form of circuit according to the invention which is suitable for feeding a sawtooth current to the scanning coils of a cathode ray tube employed in television apparatus.

Referring to the drawing, reference numeral 1 indicates low inductance scanning coils of a cathode ray tube, sawtooth current being fed to said coils from a power tube 2. The power tube 2 is coupled to the coils 1 via two transformers 3 and 4 connected in cascade, the anode of tube 2 being connected to one end of the primary winding of transformer 3, the other end of said winding being connected to the positive H. T. terminal 8 and to ground via a blocking condenser 5. One end of the secondary winding of transformer 3 is connected to one end of the primary winding of transformer 4, and the other ends of said secondary and primary windings are connected to ground, the secondary winding of the transformer 4 being connected to the scanning coils 1. The damper tube is shown at 6, and has its anode-cathode path connected across the secondary winding of the transformer 3 and the primary winding of the transformer 4. Preferably the damper tube 6 is provided with a control electrode as shown, and a negative feedback path to said control electrode is provided via condenser 7, an amplifier being included if desired in the feedback path. The control electrode of the damper tube 6 is connected via a resistor 9 to the negative bias terminal 10.

In the operation of the circuit, the power tube 2 serves to generate sawtooth current oscillations in the load 1, by virtue of a suitable form of control voltage applied between the cathode

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and control electrode of tube 2 by any suitable means. The coils 1 are of low inductance but the voltage ratio of transformer 4 is arranged to be such, having regard to the type of tube employed as the damper tube, that the impedance presented to the damper tube 6 by the transformer 4 is higher than that of the coils 1, and is more suitable than the impedance of coils 1 for effective operation of the damper tube. Negative feedback is applied to the control electrode of damper tube 6 via condenser 7, and serves to reduce the effective resistance of the damper tube, thereby greatly reducing the likelihood of the internal impedance of the damper tube permitting the transfer of ringing oscillations from the leakage inductance circuits of the transformer 3 to the coils 1. Negative feedback may also be applied to the control electrode of power tube 2, the feedback tending to improve the linearity of the sawtooth current oscillations in the coils 1 as described in the United States patent application Serial No. 128,598, filed November 21, 1949 by J. E. Best and R. C. White.

What I claim is:

1. A circuit comprising a low inductance load, a power tube to set up sawtooth current oscillations in said load, a first transformer having its primary winding connected in the output circuit of said power tube, a second transformer having its primary winding connected to the secondary winding of said first transformer and having its secondary winding connected to said low inductance load, and a damper tube having its anode-cathode path connected across the secondary winding of said first transformer and across the primary winding of said second trans-

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former with said second transformer presenting to said damper tube an impedance higher than that of said load.

2. A circuit comprising a low inductance load, a power tube to set up sawtooth current oscillations in said load, a first transformer having its primary winding connected in the output circuit of said power tube, a second transformer having its primary winding connected to the secondary winding of said first transformer and having its secondary winding connected to said low inductance load, a damper tube having its anode-cathode path connected across the secondary winding of said first transformer and across the primary winding of said second transformer with said second transformer presenting to said damper tube an impedance higher than that of said load, said damper tube having a control electrode, and means for applying negative feedback to said control electrode to reduce the effective resistance of said damper tube.

KEITH GORDON HUNTLEY.

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