July 11, 1939. H. E. RHEA 2,165,815

GENERATOR FOR TELEVISION

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FIG. 1.

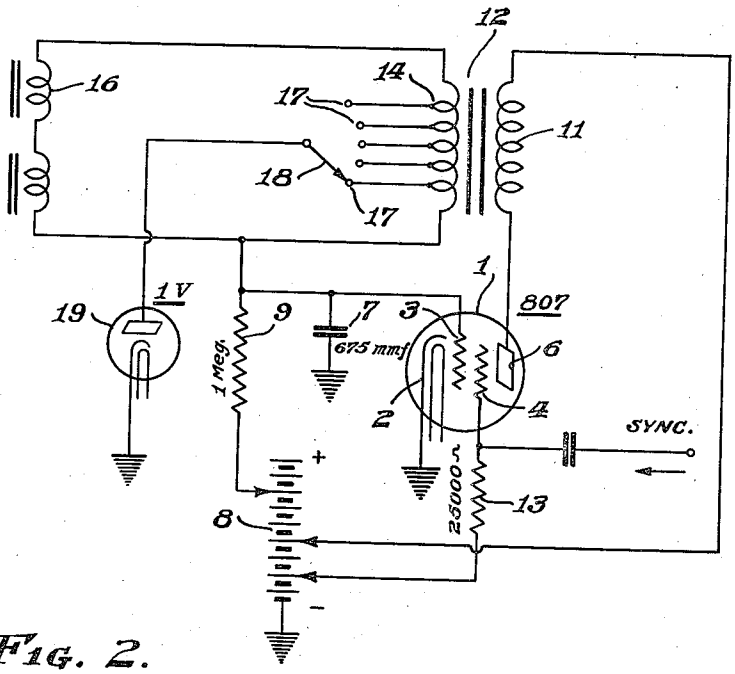
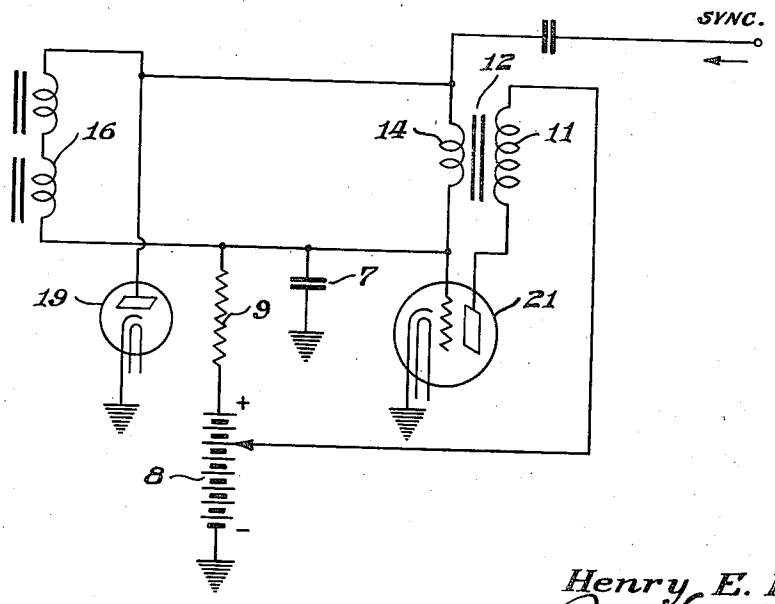


FIG. 2.



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GENERATOR FOR TELEVISION

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4 Claims. (Cl. 250—36)

My invention relates to electronic oscillators and particularly to oscillators for producing saw-tooth waves.

An object of my invention is to provide an improved saw-tooth oscillator which is economical to manufacture.

A further object of my invention is to provide a saw-tooth oscillator which has a comparatively small number of circuit elements but which produces a saw-tooth wave which is substantially linear.

In a preferred embodiment of my invention, I utilize a diode or other suitable rectifier or valve in combination with an amplifier tube having a feed-back transformer which also functions as an output transformer for supplying saw-tooth current to a pair of deflecting coils. A condenser is included in the circuit which is prevented from discharging through the diode for a certain period while being charged due to a negative voltage being fed back on the diode plate through the transformer. After the condenser has been charged above a certain value, however, it discharges rapidly through the diode.

The invention will be better understood by referring to the following description taken in connection with the accompanying drawing in which

Figure 1 is a circuit diagram of an oscillator embodying my invention, and

Figure 2 is another embodiment of my invention.

Referring to Fig. 1, the oscillator comprises an amplifier tube 1 which preferably is of the screen grid type such as a tetrode or pentode. The tube illustrated is a tetrode having an indirectly heated cathode 2, a control grid 3, a screen grid 4, and a plate 6.

A condenser 7 is connected between the grid 3 and cathode 2 whereby the flow of plate current depends upon the charge on condenser 7. The condenser is charged from a suitable voltage source such as a battery 8 through a resistor 9.

An operating voltage is supplied to the plate 6 from the voltage source 8 through the primary 11 of a transformer 12. A suitable voltage is supplied to the screen grid 4 through a resistor 13.

The secondary 14 of the transformer 12 has the lower end connected to the grid end of condenser 7 and also to one end of a pair of deflecting coils 16. The other end of secondary 14 is connected to the other end of the deflecting coils 16.

The secondary 14 may be provided with taps 17 and a switch 18 for connecting the plate of a diode 19 to a suitable point on the secondary. The cathode of the diode 19 is connected to ground whereby the diode and a section of secondary 14 in series are connected across the condenser 7.

The above-described circuit operates to produce recurrent saw-tooth current waves through the deflecting coils 16 as follows:

Assume a cycle of operation beginning when condenser 7 is discharged. It now is gradually charged through resistor 9 whereby the grid 3 becomes more positive, thus causing a gradual increase of plate current through the primary 11. Meanwhile, the condenser 7 cannot discharge through the diode 19 because the transformer secondary 14 is so connected that the voltage induced therein by the increasing plate current maintains the plate of diode 19 negative.

During this period, the gradually sloping or useful portion of a saw-tooth current wave is produced through the deflecting coils 16.

Finally, condenser 7 is charged to a value where the voltage thereacross is equal to the voltage impressed upon the diode 19 by the transformer. At this point, condenser 7 begins to discharge through diode 19 whereby the voltage across condenser 7 begins to decrease. As a result, the plate current begins to decrease and the voltage applied to the plate of diode 19 through the transformer is now positive rather than negative, thus increasing the speed of the condenser discharge.

During this period, the steep slope or return line portion of the saw-tooth current wave is produced through the deflecting coils. At the end of this period, the condenser 7 has been completely discharged and the cycle is then repeated.

The saw-tooth oscillator may be pulled into synchronism with a control oscillator or the like by impressing synchronizing impulses upon the screen grid 4 as indicated, the oscillator being adjusted to oscillate uncontrolled at a slightly lower frequency than that of the synchronizing impulses. The synchronizing impulses preferably are of negative polarity.

The oscillator shown in Fig. 2 is substantially the same as the one shown in Fig. 1 except that a three element amplifier tube 21 is utilized in place of a screen grid tube. In the two figures, like parts are indicated by the same reference numerals. In Fig. 2, the oscillator is pulled into synchronism by impressing negative synchronizing impulses upon the control grid of the amplifier tube 21, either directly or through the transformer secondary 14, as shown.

In Fig. 1, the types of tubes and the values of various circuit elements have been indicated, merely by way of example, for an oscillator producing saw-tooth current waves at the rate of 13,230 per second. The transformer **12** in this example has a step down ratio of 4.5 to 1 from primary winding to full secondary winding. The step down ratio from the primary to the last tap on the secondary to which the diode is connected is 45 to 1. The deflecting coils **16** have an inductance of 1½ millihenries. The electrodes **3**, **4** and **6** each have 300 volts applied to them. A saw-tooth voltage wave of 22 volts peak to peak appears on the grid electrode **3**.

It will be seen that in Figs. 1 and 2 the transformer performs a double function; it functions as a feedback transformer for the oscillator and it functions as a step-down transformer for supplying saw-tooth current efficiently to the low impedance deflecting coils **16**.

From the foregoing description, it will be apparent that various modifications may be made in my invention without departing from the spirit and scope thereof, and I desire, therefore, that only such limitations shall be placed thereon as are necessitated by the prior art and art set forth in the appended claims.

I claim as my invention:

1. A saw-tooth generator comprising an amplifier tube having an input circuit and an output circuit, a transformer coupling said output circuit to said input circuit, said transformer having a primary and a secondary, a condenser across said input circuit, a rectifier connected in series with at least a portion of said secondary, said series combination of rectifier and secondary being connected across said condenser, said transformer being connected to oppose the voltage across said condenser during the time it is charging, and a pair of deflecting coils connected across said secondary.

2. An oscillator comprising an amplifier tube having an input circuit and an output circuit, a condenser connected across said input circuit, means for applying a substantially steady charging voltage to said condenser, a rectifier, a transformer having a primary and a secondary, said primary being in said output circuit, said secondary having at least a portion thereof connected in series with said rectifier, said series combination of rectifier and secondary being connected across said condenser, the connections of said transformer being such as to apply a voltage to said rectifier with the polarity in the direction in which the rectifier is non-conducting during the period said condenser is charging, and a pair of deflecting coils connected across said secondary.

3. An oscillator comprising a vacuum tube having input electrodes and having an output circuit, a transformer having a primary and a secondary, said primary being in said output circuit, a condenser connected across said input electrodes, a resistive element, a voltage source connected across said condenser through said element, a rectifier device connected in series with at least a portion of said secondary to form a series discharge circuit for said condenser, said series discharge circuit being connected across said condenser, the transformer connections being such as to impress a voltage across said rectifier with the polarity in the direction in which the rectifier is non-conducting during the time said condenser is being charged, and a pair of deflecting coils connected across said secondary.

4. A saw-tooth oscillator comprising an electric discharge tube having an input circuit and an output circuit, a transformer coupling said circuits, said transformer having a primary in said output circuit and having a tapped secondary, a pair of deflecting coils connected across said secondary, a condenser connected across said input circuit, a source of voltage connected to charge said condenser, a diode and a section of said secondary being connected in series, said diode and said section in series being connected across said condenser, the plate of said diode being connected to the positive terminal of said voltage source through said secondary section, and said transformer being connected to supply a negative potential to the plate of said diode during the charging period of said condenser.

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