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2,139,467

SERRATED WAVE FORM GENERATOR

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Fig. 1

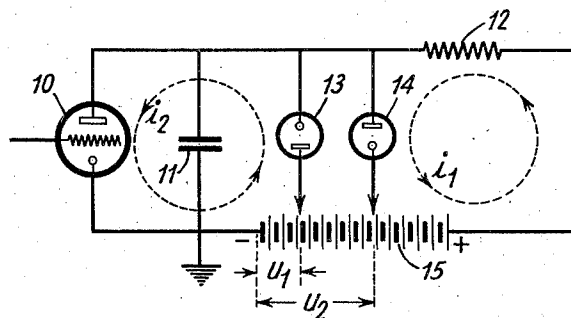


Fig. 2

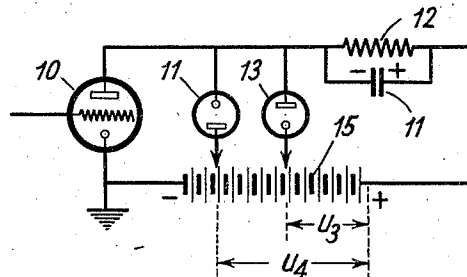


Fig. 3

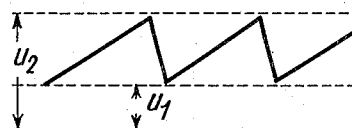
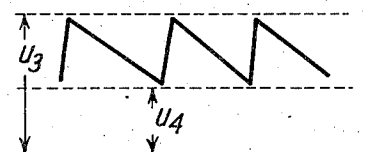


Fig. 4



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SERRATED WAVE FORM GENERATOR

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9 Claims. (Cl. 250—36)

This invention relates broadly to electrical ap-
paratus for generating a wave of a saw-tooth or
serrated wave form and more particularly to an
apparatus by means of which the upper and
lower voltage or current limits of the generated
wave may be pre-established and definitely con-
trolled.

In the prior art it has been customary to gen-
erate a saw-tooth wave which is particularly
adaptable for use with deflection apparatus in
cathode ray tubes as particularly applied to their
use in oscillographic or television arrangements.
The common practice has been to linearly charge
a condenser in one direction for the purpose of
moving the cathode ray beam across a fluorescent
screen to a definite point, and then rapidly dis-
charging the condenser for the purpose of re-
turning the beam rapidly to its initial point.
The speed with which the beam was moved in
either direction, that is to say, moving for the
purposes of recording and return to the initial
point, is dependent on the steepness of the wave
front in each direction. It has been common
practice to provide a discharge path which could
be blocked until the condenser was charged and
then rapidly unblocked forming a condition
which approached a short circuit across the con-
denser. As a result it has been common practice
to employ a thermionic tube for this purpose.

The unblocking of the discharge path has usu-
ally been occasioned by impulses received from
the transmitter, termed synchronizing impulses,
and these impulses are sent at the end of one
line of scanning and also at the end of a com-
plete frame of scanning and hence have been
known by the terms line and frame synchronizing
impulses. The prior art arrangements, as out-
lined above, have had the serious drawback when
one or several of the aforementioned synchroniz-
ing impulses failed, the condenser voltage either
exceeded or remained below the limits assigned
to the highest and lowest desirable value of the
saw-tooth curve, and following the reappearance
of the impulses the charge on the condenser had
not returned to its desired value. Such complete
failure, or distortion of the impulses, may occur
not only on account of disturbances in television,
for instance, but the circuit arrangement utilized
for the production of the line deflection voltages,
may be subject to spurious disturbances which
tend to charge the condenser either past the limit
desired or discharge it to a level lower than the
lower level desired.

It is, therefore, the chief object of my inven-
tion to provide a control arrangement for the

line or frame deflection generator in which the
control is of such a nature that a smooth saw-
tooth shaped wave of predetermined upper and
lower limits is definitely produced and main-
tained.

My invention will best be understood by refer-
ence to the accompanying figures in which:—

Figure 1 shows one embodiment of my in-
vention.

Figure 2 shows another embodiment of my in-
vention; and

Figures 3 and 4 are a set of explanatory curves.

Referring to Fig. 1, 10 is a thermionic discharge
tube containing the usual control grid and anode
and cathode and connected in parallel to the
anode, cathode path is a condenser 11.

Joined in parallel with the condenser is a
series circuit comprising a resistor 12 of com-
paratively high value and plate potential supply
15. Joined in parallel also with the condenser
are two rectifiers 13 and 14 respectively, one of
whose electrodes may be joined to one terminal
of the condenser directly and the other electrode
in each case is joined to a portion of the plate
potential supply 15 so that the rectifiers are
biased by an amount as indicated as U_1 and U_2
in the figure. Both of these rectifiers are uni-
directionally conducting devices and while the
broad term rectifier has been used, it is under-
stood, of course, that this term may embrace a
common type of oxide rectifier or saturated
diode or a tetrode or pentode, for instance.

Referring to Figure 2, a thermionic tube 10,
in this case a triode, has joined in its plate cir-
cuit oppositely poled rectifiers 11 and 13. Also
connected to the plate is a resistor 12 which has
shunted thereto a condenser 11, the terminal of
the resistor opposite to that connected to the
plate for the tube 10 being joined to the plate
energizing battery 15. Also joined to the bat-
tery 15 are the two rectifiers 11 and 13 which
are shown as biased by voltages U_3 and U_4 .

In Fig. 2, the position of the condenser 11 has
been changed so that it is joined in parallel with
resistor 12 rather than in series. The two bias-
ing voltages for the rectifiers are indicated as
 U_3 and U_4 respectively and reference should be
had to Figs. 3 and 4 for showing what these
values indicate with respect to the upper and
lower limits of the generated saw-tooth wave.

The action of the circuit is as follows. Assum-
ing that the tube 10 be blocked, for instance,
biased to a cut off value, the condenser 11 will
be linearly charged in accordance with the poten-
tial drop across the resistor 12 occasioned by the

plate potential supply 15. The steepness of the wave front depends upon the value of the resistance 12 and the value of the condenser 11. Shortly before the value U_2 (see Fig. 3) is attained, the tube 10 is rendered conducting by the arrival of a synchronizing impulse or other type of voltage impulse supplied to the grid. The tube being conducting, the condenser will discharge through the tube due to the low internal resistance thereof and the speed of discharge, which determines the steepness of the wave front, will depend upon internal resistance of the tube at this time. Shortly before the voltage U_1 is reached by the condenser discharging, the tube 10 is blocked again so that an inner charging of the condenser takes place. Charging of the condenser 11 in the case of a television arrangement corresponds to the duration of a line or frame and its discharge corresponds to the time of the return stroke.

Now if a synchronizing impulse fails to arrive, due to fading, for instance, or spurious disturbances, the voltage value U_2 to which the condenser is charged will be exceeded and the value of the triggering voltage across one of the rectifiers is exceeded and the rectifier becomes conducting, thus dissipating any voltage or current in excess of the value U_2 and hence limiting the upper limit of the curve to that value.

Similar action occurs if, owing to any disturbance, the tube 10 remains conducting too long so that the condenser would tend to discharge below the lower limit U_1 . In this case the rectifier 13 would become conducting and would build back up the charge on condenser 11 so that it was of a value equal to the triggering voltage on rectifier 13 which is selected as U_1 .

The curve illustrated in Fig. 4 shows the increase and decrease in the charge and discharge pulses on condenser 11 when the condenser is joined in parallel to the resistor 12, as shown in Fig. 2, rather than in series, as shown in Fig. 1. The action is the same in Fig. 2 as that shown in Fig. 1.

What I claim is:—

1. An apparatus for producing a serrated wave form comprising a condenser, means for linearly charging said condenser, a normally blocked discharge path for said condenser, means for unblocking said discharge path upon receipt of triggering impulses, and a plurality of biased rectifiers connected in parallel with said condenser.

2. An apparatus for producing a serrated wave form comprising a condenser, means for linearly charging said condenser, a normally blocked discharge path for said condenser comprising a thermionic discharge tube, means for unblocking said discharge path upon receipt of triggering impulses, and a plurality of biased rectifiers connected in parallel with said condenser.

3. An apparatus for producing a serrated wave form comprising a condenser, means for linearly charging said condenser comprising a resistance

and a source of voltage joined in series with said condenser, a normally blocked discharge path for said condenser, means for unblocking said discharge path upon receipt of triggering impulses, and a plurality of biased rectifiers connected in parallel with said condenser.

4. An apparatus for producing a serrated wave form comprising a condenser, means for linearly charging said condenser comprising a resistance joined in parallel to said condenser and a source of voltage joined in series to the aforesaid parallel connection, a normally blocked discharge path for said condenser, means for unblocking said discharge path upon receipt of triggering impulses, and a plurality of biased rectifiers connected in parallel with said condenser.

5. In the method of developing serrated wave formations by charging and discharging a storage element the steps of controlling the maximum and minimum level of the stored energy comprising storing an electric charge of a value subject to exceed the pre-established maximum level, unilaterally conducting and dissipating the charge exceeding said maximum level, discharging said stored energy, and unilaterally reinforcing said energy of discharge upon attainment of a value equal to the minimum level, in a direction of conduction opposite to that of the aforementioned unilateral conduction.

6. An apparatus for producing a serrated wave form comprising a condenser, means for linearly charging said condenser, a normally blocked discharge path for said condenser, means for unblocking said discharge path upon receipt of triggering impulses, and a plurality of rectifiers connected in parallel with said condenser.

7. An apparatus for producing a serrated wave form comprising a condenser, means for linearly charging said condenser, a normally blocked discharge path for said condenser comprising a thermionic discharge tube, means for unblocking said discharge path upon receipt of triggering impulses, and a plurality of rectifiers connected in parallel with said condenser.

8. An apparatus for producing a serrated wave form comprising a condenser, means for linearly charging said condenser comprising a resistance and a source of voltage joined in series with said condenser, a normally blocked discharge path for said condenser, means for unblocking said discharge path upon receipt of triggering impulses, and a plurality of rectifiers connected in parallel with said condenser.

9. An apparatus for producing a serrated wave form comprising a condenser, means for linearly charging said condenser comprising a resistance joined in parallel to said condenser and a source of voltage joined in series to the aforesaid parallel connection, a normally blocked discharge path for said condenser, means for unblocking said discharge path upon receipt of triggering impulses, and a plurality of rectifiers connected in parallel with said condenser.

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