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RELAXATION OSCILLATION GENERATOR

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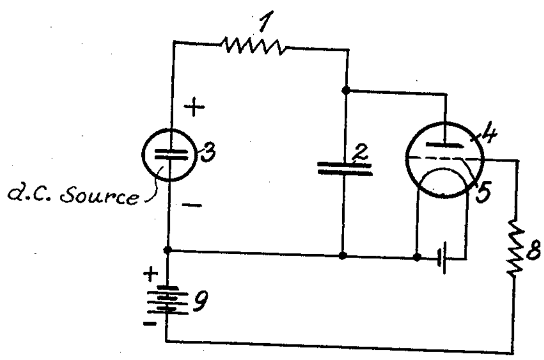

Fig. 1.

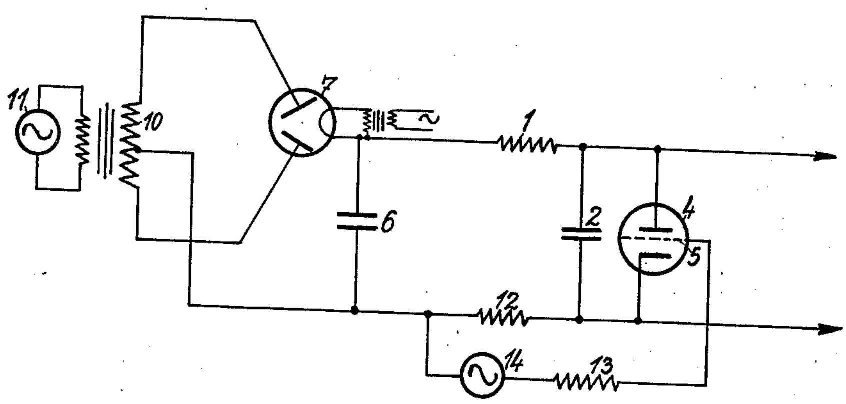

Fig. 2.

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RELAXATION OSCILLATION GENERATOR

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3 Claims. (Cl. 250—36)

The relaxation circuit systems hitherto known possess the disadvantage that the relaxation frequency upon variations in the feeding potential also varies, so that the generation of absolutely stable relaxation potentials of constant frequency is only possible by the use of absolutely stable potential sources, which as well known are not capable of being obtained in practice, or only with an exceptional amount of trouble.

The operation of an arrangement of this description is explained with the assistance of the circuit system according to Fig. 1—which has already been proposed previously by the applicant.

A form of embodiment of the invention is illustrated diagrammatically by way of example in Fig. 2.

In particulars referring to Fig. 1, **2** is the relaxation condenser, which is charged by the potential source **3** through the resistance **1**, and is discharged through the discharge valve **4** (preferably a hot-cathode, grid glow lamp filled with a gas of low pressure). The ignition potential of the discharge valve may be varied in wide limits by means of a suitable negative bias, which is taken for example from the potential source **9**, and which is applied to the grid **5** of the discharge valve through the medium of the highly ohmic resistance **8**. This negative grid potential will be referred to in the following as blocking potential.

In the arrangement as shown the blocking potential and accordingly also the anode ignition potential, remain constant, whilst the feed potential practically always reveals detrimental fluctuations. In consequence the frequency of the system differs relatively strongly in accordance with the variations in the working potential, i. e., the same becomes greater when the working potential, and accordingly the strength of charging current, increases, and vice versa.

Since now, particularly in the case of apparatus for linking up with house circuit systems, strong fluctuations in the working potential are to be reckoned with in practice, the relaxation frequency generated by known arrangements discloses appreciable variations in frequency, so that synchronism of the relaxation generator with any given frequency (television transmitter, or alternating potential requiring measurement, or the like) is not fully ensured.

The subject matter of the invention is a method of and an apparatus for producing relaxation oscillations, the frequency of which remains constant, even when the feed potential varies within relatively wide limits (for example ±20%). The essence of the invention resides in the fact that the ignition potential of the discharge valve is varied to the same extent as the working potential and accordingly the charging current of the condenser. The variation in the ignition potential may preferably take place automatically with the use of suitable means.

In this manner it is accomplished that the time of oscillation of a relaxation period remains constant even upon fluctuations in the working potential. The slight variation in the relaxation oscillation amplitude is practically wholly without importance for all purposes of use (for example in television systems) as the slight variations in size, which moreover are distributed over relatively long periods, do not cause any appreciable disturbance of the image.

For the practical performance of the method there may be employed, for example, in accordance with the invention a grid-controlled discharge valve, the blocking potential (negative grid bias) of which is derived in such fashion from the working potential that the blocking potential varies in proportion to the working potential.

In Fig. 2, **2** is a condenser, which is charged through the medium of the charging resistance **1**, with intermediate connection of the steadying condenser **6**, over the rectifier **7** and the transformer **10** by the house circuit **11**. Naturally in place of the house circuit it is also possible to employ any other suitable potential source. **4** is the discharge valve. For this purpose it is possible in accordance with the invention to employ all types of grid glow lamps, and more particularly those having a cold cathode. It has been found, however, particularly suitable to employ hot-cathode, gas-filled grid glow lamps, for example having a filling of mercury vapour or neon of suitable low pressure.

The blocking potential regulating the ignition potential and linked up with the grid **5** of the discharge valve **4** is obtained from the feed potential by feed-back; **12** is the feed-back resistance necessary for this purpose, and **13** a ballast resistance, the size of which may be selected, for example, at .5 megohm.

It will be readily apparent that the blocking potential will be all the more negative the more the working potential, and accordingly the charging current, increases.

The synchonizing potential necessary for obtaining synchronization, for example in the case of television receivers, is also applied to the grid **5** of the discharge valve in the manner known per se. In the drawing this synchronizing potential is indicated by the A. C. generator **14**.

Since in the case of incorrect calculation of the blocking potential both under-compensation as well as over-compensation of the error may take place, proper selection of the resistance **12** is of considerable importance as regards proper operation of the arrangement.

The size of the feed-back resistance is dependent both on the remaining values in the circuit as well as the characteristic of the discharge valve, and may be determined by use of the following equations:

$$mfCR_g=1$$

$$m\frac{E}{e_z}-1=\frac{R_a}{R_g}$$

In the equations m is the slope of the blocking potential/anode potential characteristic. (The blocking potential characteristic is practically a straight line with the ordinate e_z, the ignition potential of the discharge valve and the abscissa e_g, the grid bias of this valve. In similar fashion to ionic tubes the slope approximately corresponds with the reciprocal of the amplification factor of the anode by the control grid). C is the capacity of the tilting condenser, R_a the charging resitance, R_g the feed-back resistance, the extent of which is to be determined; f is the relaxation frequency, E the variable potential at the condenser, and e_z the maximum ignition potential. Since only the exactly linear portion of the exponential charging curve is useful, only one-tenth of the D. C. potential of the charging potential source can be utilized.

If, for example, the relaxation condenser C is selected at one mf., the charging resistance, when employing a discharge valve with the ascent $m=15$ for producing a relaxation frequency of 25 periods, requires to be approximately 300,000 ohms and the feed-back resistance approximately 2,500 ohms, if the ignition potential is selected at, say, 10% of the working potential.

Naturally it is also possible in the arrangement according to the invention to employ as potential source a glow tube stabilizer. The provision, thereof is, however, unnecessary from a practical standpoint in the very large majority of cases, as the arrangement according to the invention fully ensures constancy of the relaxation frequency, even in the case of the greatest fluctuations which occur in the general way in practice.

I claim:

1. A device for producing relaxation oscillations comprising a charging condenser having terminals, a circuit for charging said condenser comprising a variable direct potential source having a positive and a negative pole and a charging resistance connected in series across said condenser, a second resistor connected in said charging circuit between said negative pole and a condenser terminal, a gas filled discharge valve for discharging said condenser having a grid, a cathode, and an anode, a synchronizing potential source, means for connecting said anode and cathode across said condenser and means for connecting said second resistor and said synchronizing potential source in series between said cathode and grid, whereby constant frequency relaxation oscillations occur despite variations in said source.

2. A device for producing relaxation oscillations comprising a charging condenser having terminals, a circuit for charging said condenser comprising a variable direct potential source having a positive and a negative pole and a charging resistance connected in series across said condenser, a second resistor connected in said charging circuit between said negative pole and a condenser terminal, a gas filled discharge valve for discharging said condenser having a grid, a cathode, and an anode, means for connecting said anode and cathode across said condenser and means for connecting said second resistor between said cathode and grid, said second resistor having a value equal to the reciprocal of the product of said slope of the discharge valve and the frequency of said relaxation oscillation and the capacity of said charging condenser, whereby constant frequency relaxation oscillations occur despite variations in said source.

3. A device for producing relaxation oscillations comprising a charging condenser having terminals, a circuit for charging said condenser comprising a variable direct potential source having a positive and a negative pole and a charging resistance connected in series across said condenser, a second resistor connected in said charging circuit between said negative pole and a condenser terminal, a gas filled discharge valve for discharging said condenser having a grid, a cathode, and an anode, means for connecting said second resistor between said cathode and grid, whereby constant frequency relaxation oscillations occur despite variations in said source, said charging resistor having a value of substantially

$$R_g.\left(m.\frac{E}{e_z}-1\right)$$

R_g being the resistance of said second resistor, m being said slope of said discharge valve, E being the potential of said D. C. potential source, and e_z being the maximum ignition potential of said discharge valve.

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