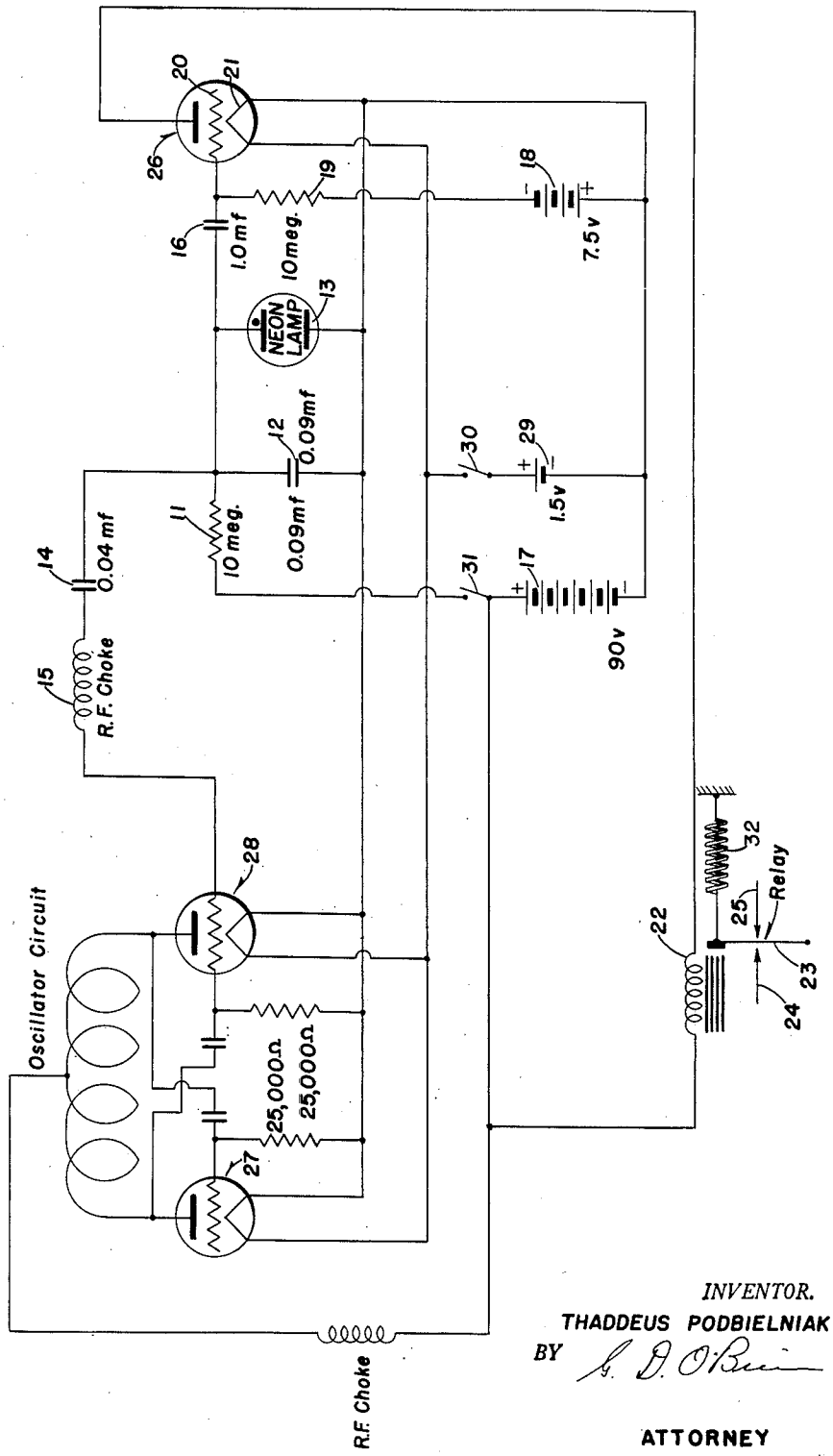
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CIRCUIT FOR PROVIDING TIMED ELECTRICAL IMPULSES

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INVENTOR.
THADDEUS PODBIELNIAK
BY S. D. O'Brien

ATTORNEY

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CIRCUIT FOR PROVIDING TIMED ELECTRICAL IMPULSES

Thaddeus Podbielniak, Buffalo, N. Y., assignor to the United States of America as represented by the Secretary of the Navy

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2 Claims. (Cl. 250—36)

1

The present invention relates to a process and circuit for providing electrical impulses, which are timed to occur at desired intervals, each impulse moreover being of a desired duration.

An object of the invention is to secure the desired initial timed electrical impulses by means having no movable parts, including a relaxation oscillator and a thermionic tube controlled thereby.

Still more specifically, it is an object of the invention to provide intervals each of the order of one-half second duration, under the control of a relaxation oscillator of twice such period, which, however, itself yields extremely short pulses.

A particular purpose of the invention is to provide a device of this type, that is compact and of relatively small size, to make it suitable for use in a test projectile, to emit, during the travel of the projectile, modulated radio frequency signals, that may be received at a suitable location, and from which the characteristics of projectile performance may be determined. Such devices are commonly called sondes.

While the principles underlying the invention are such that the invention may be utilized in many different circuits, a preferred form is shown by way of example in the accompanying drawing and described in this specification.

The single figure constituting the drawing is the circuit diagram of a timing device intended for a sonde, and embodying the invention.

In said drawing, 13 is a neon glow-lamp or similar gas-filled discharge tube which has a capacitor 12 connected across its terminals, as shown. This constitutes a relaxation oscillator circuit wherein the capacitor may discharge through the neon lamp. In order to charge the capacitor, a resistor 11 of suitable value is provided in series relation to the capacitor with respect to the energy source, such as battery 17, through an optional switch 31, to determine the rate of charge.

A thermionic tube 26, shown as a triode, has its cathode 21 connected directly to one terminal of the neon lamp 13 and its grid 20 connected to the other terminal thereof through the capacitor 16. A resistor 19 connects the grid 20 to the negative terminal of the bias voltage source 18. The switch 30 controls the parallel-connected cathode-heating circuits of the tubes 26, 27 and 28, which are connected to the battery 29, through said switch. The switch 31 may be provided, to disconnect the battery 17 from the neon lamp circuit, when not in use.

2

The operation of the circuit above described, certain values of the electrical constants that have been found suitable in practice being assumed, is as follows:

The capacitor 12 of .09 mfd., with the 10 megohm resistor 11 in series therewith, will be charged by the source 17 of 90 volts in such way that the neon lamp will flash at intervals of approximately 1 second, the exact time being determined by RC, the resistance-capacitance value, in conjunction with the applied voltage and the characteristics of the neon lamp.

As the charge of the capacitor builds up, the voltage at its terminals increases in the well known way. This voltage, in effect, is transmitted through the 1 mfd. capacitor 16 and causes the grid 20, connected to the other side thereof, to build up a positive potential, anasmuch as the grid resistor 19, of 10 megohms, is sufficiently high to prevent too-rapid readjustment of the grid potential to its normal bias value.

Consequently, when capacitor 12 has charged to about one-half the breakdown voltage of the lamp 13, the grid 20 usually will be sufficiently positive to allow a large anode current to flow in the thermionic tube. This condition of large anode current continues until the moment the neon lamp fires, when a sudden negative pulse substantially cuts off the anode current by reason of a momentary abnormally high negative bias, followed by the restoration of normal negative potential to the grid.

The winding 22 of a relay is inserted in the anode circuit. This relay may have the tension of its spring 32 preferably so adjusted that the magnetism produced by the anode current will overcome it at such times that the armature 23 thereof is swung from contact 24 to contact 25 and back at equal intervals, remaining on each for approximately ½-second. This relay may then control any desired mechanical or electrical action in the sonde.

It will be noted that an oscillator, including the thermionic tubes 27 and 28 and the circuits connected thereto, is also provided and has the grid of its tube 28 connected through capacitor 14 of .04 mf., and the radio frequency choke 15, to one side of capacitor 12, which has its other side connected to the cathodes of tubes 27 and 28 as shown. This oscillator is in other respects entirely independent of the circuits previously described, and its purpose is continuously to emit radio frequency radiation, which constitutes the radio signal of the sonde.

However, a potential pulse is applied to the grid of tube 28 each time the glow-lamp 13 fires, and thus a timing signal is impressed on the oscillator output, in synchronism with the operation of the relay 22, and may be received by a properly adjusted radio receiver, and used to observe and/or check the operation of the relay from a remote point.

While values have been assigned to the electrical magnitudes of certain of the circuit components illustrated, it will be clear that these values are given in a purely suggestive sense, and not in any way as limitations. Moreover, equivalents may be substituted for practically any or all the components, for example, the gas in the glow-lamp 13 may be other than neon, if desired, power supplies of any other preferred type may replace the batteries, and so on, without in any manner sacrificing any of the advantages of the invention.

Therefore, it should be understood that the invention is defined solely in and by the following claims.

I claim:

1. A timing system for a periodically controlled load circuit, comprising a source of substantially constant potential, a capacitor connected to be charged from said source, a series circuit including in series circuit relation an impedance, said capacitor and said source of potential, the constants of said series circuit controlling the charging interval of said capacitor, a grid controlled electric valve in said load circuit having a control grid, a source of biasing potential connected to said grid, said biasing potential tending to maintain said valve non-conducting circuit means impressing the potential of said capacitor on said grid in opposition to said bias potential, said bias potential and said capacitor potential being so proportioned that a charge of the order of half charge of said capacitor produces a potential sufficient to overcome said bias potential to render said valve conducting, a cold electrode discharge device connected across the terminals of said capacitor, said discharge device being operative in response to the application of full potential of said capacitor to discharge the capacitor and render said valve non-conducting.

2. In an old combination of a resonant circuit

oscillator having a plurality of grid controlled tubes and a relaxation oscillator wherein the latter is used to pulse the former; the improvement, comprising a source of substantially constant potential, a capacitor connected to be charged from said source, a series circuit including in series circuit relation an impedance, said capacitor and said source of potential, the constants of said series circuit controlling the charging interval of said capacitor, a grid controlled electric valve in said load circuit having a controlled grid, a source of biasing potential connected to said grid, said biasing potential tending to maintain said valve non-conducting, circuit means impressing the potential of said capacitor on said grid in opposition to said bias potential, said bias potential and said capacitor potential being so proportioned that a charge of the order of half charge of said capacitor produces a potential sufficient to overcome said bias potential to render said valve conducting, a cold electrode discharge device connected across the terminals of said capacitor, said discharge device being operative in response to the application of full potential of said capacitor to discharge the capacitor and render said valve non-conducting, and a connection impressing the potential of said capacitor on the grid of at least one of said grid controlled tubes of said resonant circuit oscillator.

THADDEUS PODBIELNIAK.

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