

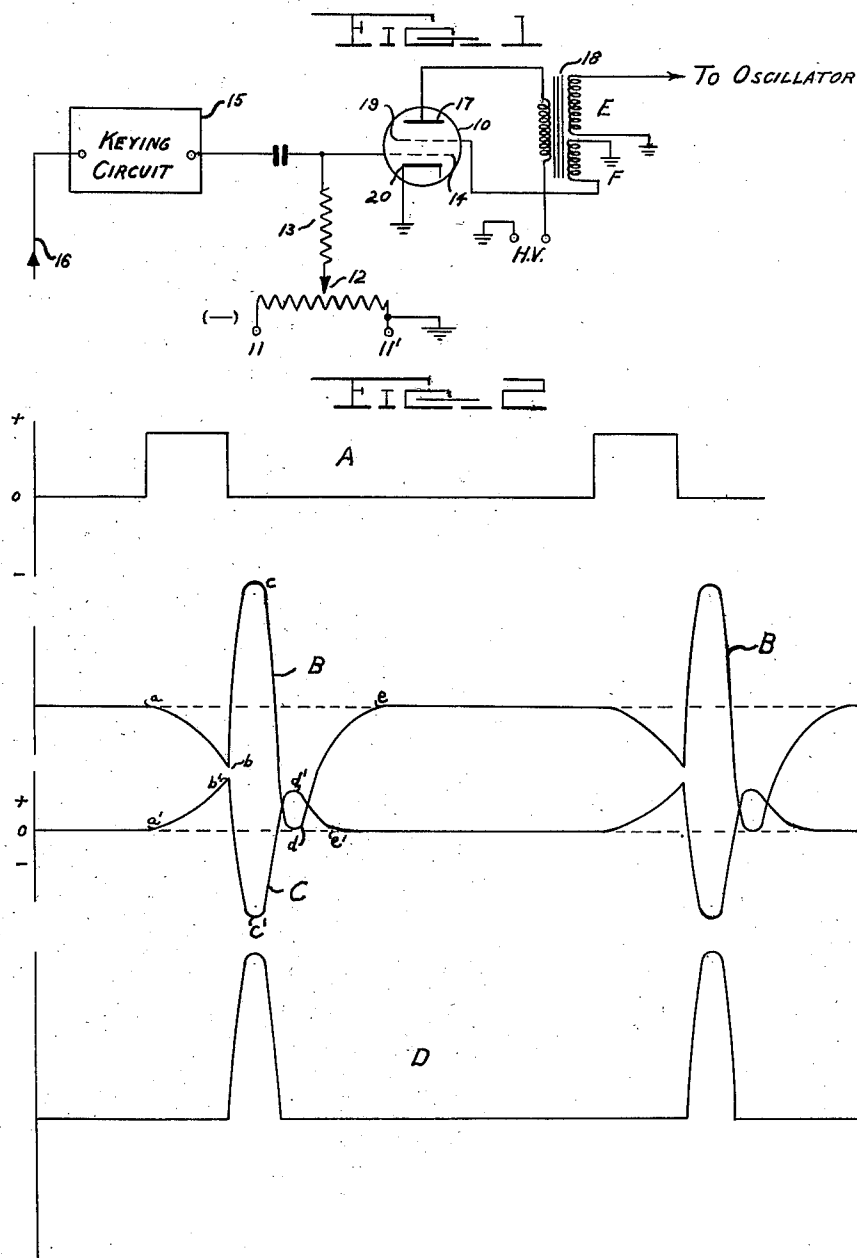
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PLATE KEYS FOR RADAR TRANSMITTERS

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PLATE KEYS FOR RADAR TRANSMITTERS

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1 This invention relates to a means for producing a sequential series of high voltage pulses and more particularly to a means for pulse keying an oscillator.

As is well known to those skilled in the art, numerous methods of and means for keying a pulse oscillator have been proposed by the prior art. This invention, however, relates primarily to a means for plate keying, incorporating a transformer and utilizing the inductive swing of the secondary thereof, caused by an abrupt interruption of current through the primary, to key the oscillator. More particularly this invention, for a given transformer, will produce pulses of greater peak power than heretofore available.

It is an object of this invention to produce a sequential series of high voltage impulses.

It is another object of this invention to provide a novel means for pulse keying an oscillator.

It is another object of this invention to provide a novel means incorporating a transformer for plate keying a pulse oscillator.

Other objects and features of the present invention will become apparent upon a careful consideration of the following description when taken together with the accompanying drawings, the figures of which are designed for the express purpose of illustration and not as a definition of the limits of the invention. Reference for the latter purpose is to be had to the appended claims.

Fig. 1 is a schematic diagram partly in block of a preferred embodiment of the present invention, and

Fig. 2 is a series of curves drawn to represent the various voltage wave forms developed at points along the circuit in Fig. 1 during a normal operating cycle.

It is contemplated by the present invention to provide a means, incorporating a transformer, for producing a sequential series of high voltage impulses across the secondary thereof, by intermittently interrupting the current flow through the primary winding thereof. More particularly to provide an electronic switch or "keyer" connected to the primary winding of the transformer and having a means for augmenting the current flow through the primary prior to the interruption of the current.

Reference is had more particularly to Fig. 1 wherein there is shown a preferred embodiment of the present invention, comprising the thermionic vacuum tube 10 of the four electrode type which is normally biased to cut-off by way of a fixed bias supply, for example, connected across

2 the terminals 11 and 11' of the potentiometer 12 which in turn has the variable arm thereof tied to the control electrode 14 through a serially connected resistance 13. Tube 10 is sequentially rendered conducting through the application of a positive pulse to the control electrode 14, produced by the keying circuit 15 which may be, for instance, a multivibrator or any other suitable pulse generator, synchronized with a source of alternating input potential applied at lead 16. The coupling between the keying circuit 15 and tube 10 is shown in the figure as a resistance capacitance coupling circuit, but may be direct coupled if desired. The output or plate 17 of tube 10 is connected to a suitable source of high voltage supply by way of the primary winding of an output transformer 18. The secondary of this transformer contains two separate windings, one of which F is loosely coupled to the primary 20 and the other E, which is nearly as possible a duplicate of the primary, is tightly coupled to the primary. The loose coupled winding F is grounded at one end and connected to the screen grid 19 at the other end, while the output of the tight coupled winding E is tied to the plate, for example, of a suitable oscillator, not shown here.

A more complete understanding of the operation of the present invention may be had upon a careful consideration of the ensuing discussion. It must be remembered, however, that tube 10 is normally maintained blocked and that no current passes through the primary winding of transformer 18 during this period. Let it be assumed that the keying circuit 15 is designed, for example, to produce square wave pulses of the desired time length and sequence and are synchronized with a given source of alternating potential, say 60 cycles for example, tied to lead 16. Thus upon application of a positive pulse to control electrode 14, tube 10 is rendered conducting and current commences to flow through the primary winding of the transformer 18. The keying pulses produced by the keying circuit 15 and applied to the control electrode 14 are shown more clearly in curve A of Fig. 2. Thus as tube 10 passes current the plate voltage is driven negative on an exponential curve during the charging of the primary winding as shown in curve B as extending from points a to b. The output of the secondary winding E is connected in phase with the primary and is, therefore, simultaneously driven negative in a like manner and amount with the primary. The output of the loose coupled secondary F, however, is connected 180 degrees out of phase and, therefore, drives the

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screen grid positive as shown in curve C as extending from points *a'* to *b'*. By driving the screen grid 19 positive tube 10 is forced to draw more current than normally possible by maintaining a constant potential on the screen grid and, therefore, results in a corresponding increase in the amplitude of the inductive swing caused by the abrupt interruption of primary current. Upon the termination of the input pulse tube 10 is again blocked, which results in an abrupt cessation of primary current thereby causing both the primary and the secondary E to undergo a high positive inductive swing as shown in curve B as extending from points *b* to *c*. The loose coupled secondary F, however, swings oppositely as shown extending from points *b'* to *c'* in curve C. Thus as the secondary F drives the screen grid 19 positive from points *c'* to *d'* tube 10 is rendered conducting between the screen grid 19 and cathode 20 to dissipate the energy in the secondary F and therefore damp oscillations as shown from points *d'* to *e'*. During this time the secondary F also absorbs energy from the primary winding and secondary winding E to damp their oscillations as shown from points *d* to *e*.

It must be remembered that the voltage wave forms shown in curve B apply to both the primary and secondary E swinging about the high voltage supply in the primary and ground in the secondary. Thus the effective voltage applied to the plate of the oscillator, not shown here, is a single high voltage pulse shown in curve D and having a time length equal to the natural period of the secondary E. It therefore becomes obvious that the pulse length can be varied by simply using a variable tap transformer for regulating the natural period. It also becomes obvious that by driving the screen grid 19 positive during the negative excursion of the plate 17 thereby causing tube 10 to draw more current allows the use of a smaller transformer for a given power output than heretofore possible.

Although I have shown and described only a certain and specific embodiment of the present invention I am fully aware of the many modifications possible thereof. Therefore this invention is not to be restricted, except, insofar as is necessitated by the prior art and the spirit of the appended claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. A means for producing a series of high voltage impulses comprising, a transformer having a primary winding, a first secondary winding, a second secondary winding, and an output circuit tied across said second secondary, a thermionic vacuum tube having an electron emitting cathode, an anode, a control electrode, and a screen grid, a source of direct current voltage, said primary winding connecting said anode to said direct current voltage, bias means for blocking plate current flow in said tube, an impulse source coupled to the control electrode of said tube for periodically rendering said tube conducting thereby causing intermittent current to flow through said primary winding, and means connecting the output of said first secondary to said screen grid, the connection of said circuit secondary to said screen grid being poled as to augment said primary current during the unblocked period of said

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tube and subsequently damp to one cycle the inductive oscillation caused by the abrupt cessation of said primary current upon reblocking said tube.

2. Means for producing high voltage impulse comprising a transformer having a primary winding and at least two secondary windings, one of said secondary windings being relatively tightly coupled to the primary winding and the other relatively loosely coupled to the primary winding, said one of said secondary windings serving to provide an output connection across which an output pulse may be derived, a normally non-conducting electron discharge device including anode, cathode, control and screen electrodes, the space discharge path provided by the anode and cathode electrodes of said tube being connected in series with the primary winding of said transformer, a source of direct current potential connected across said series connection, means operative to momentarily render said electron discharge device conducting to thereby establish and terminate a current flow through said primary winding whereby inductive oscillations are produced in said transformer, and means coupling the output of the other of said secondary windings to the screen electrode of said tube, said other secondary winding being poled to augment current flow through said discharge device during the conduction of said tube and to dissipate the energy stored in said transformer at the conclusion of the first half cycle of said inductive oscillations.

3. An impulse generator comprising an inductive winding, an electron discharge device having anode, cathode, control and screen grid electrodes, a source of plate supply voltage connected to said winding and the anode cathode discharge path of said device in series, bias means connected between the control and cathode electrodes of said device for holding said device non-conducting, an impulse source coupled to the control electrode to establish momentary conduction in said device to thereby produce an inductive oscillation in said winding, and means coupling said inductive oscillation to the screen grid of said device in such phase as to augment the current flow through said device during conduction thereof.

4. An impulse generator comprising an inductive winding, an electron discharge device having anode, cathode, control and screen grid electrodes, a source of plate supply voltage connected to said winding and the anode cathode discharge path of said device in series, bias means connected between the control and cathode electrodes of said device for holding said device non-conducting, means coupled to the control electrode to establish momentary conduction in said device to thereby produce an inductive oscillation in said winding, and means coupling said inductive oscillation to the screen grid of said device in such phase as to augment the current flow through said device during conduction thereof.

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