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2,709,759

TIME MARKER GENERATOR

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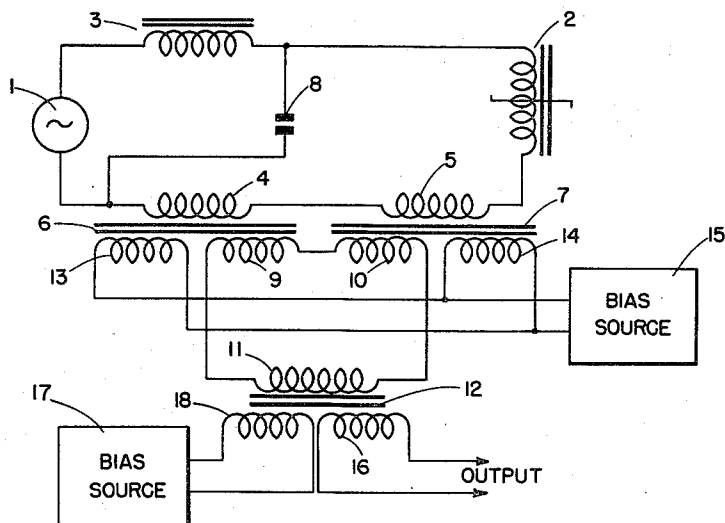


FIG. 1

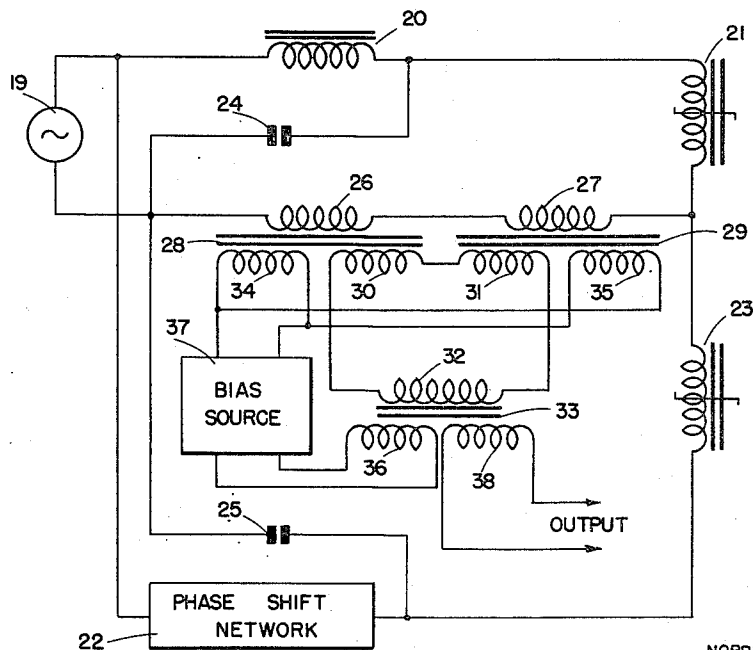


FIG. 2

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TIME MARKER GENERATOR

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3 Claims. (Cl. 307—106)

This invention relates to a magnetic timing device, and in particular to means for providing time markers on a cathode ray tube sweep without the use of vacuum tubes.

The sweep on the cathode ray tube of a radar receiver is synchronized at a frequency which is a multiple of the frequency of the alternating current power source which supplies the receiver. At submultiples of the sweep frequency it is required to provide markers consisting of very short time duration pulses which show as lines or pips perpendicular to the time base of the receiver presentation. In the past, this function has been performed by the use of vacuum tubes. This invention contemplates a time marker generator utilizing no vacuum tubes or crystal devices, with only capacitors and magnetic components.

It is therefore an object of this invention to provide a time marker generator of improved reliability.

It is another object of this invention to provide a time marker generator involving the use of no vacuum tubes.

It is another object of this invention to provide a time marker generator of increased accuracy.

Other objects of invention will become apparent from the following description taken in connection with the accompanying drawings, in which

Fig. 1 is a circuit diagram of the invention;

And Fig. 2 is a circuit diagram of a somewhat modified form of the invention.

Referring to the drawings, and in particular to Fig. 1, alternating current is supplied from source 1 to saturable core reactor 2 through isolating inductance 3 and primary windings 4 and 5 of transformers 6 and 7. Transformers 6 and 7 are preferably wound on special core material such as Deltamax or some other special material chosen for its magnetic properties. The capacitor 8 is connected in parallel with the saturable reactor as shown. Secondary windings 9 and 10 of transformers 6 and 7 are in turn connected to primary 11 of transformer 12, while bias windings 13 and 14 of transformers 6 and 7 are supplied by bias source 15. Output from the device is taken from secondary winding 16 of transformer 12, while bias is supplied from bias source 17 to bias winding 18 of transformer 12.

Saturable reactor 2 is designed with a firing voltage such that it fires twice for each cycle of source 1, i. e., it fires once during the positive going half cycle of source 1 and once during the negative going cycle of source 1. The width of the resulting pulses is governed by the size of capacitor 8. This pulse is conducted to primary windings 4 and 5 of transformers 6 and 7 which are biased in opposite directions so that while one is sensitive to positive pulses the other is sensitive to negative pulses. Biasing is accomplished by means of windings 13 and 14 connected as shown to bias source 15 which supplies direct current. All the various bias windings shown are determined by the amount of bias current available. The associated cores must be biased to saturation. Secondary windings 9 and 10 of transformers 6 and 7 are connected in an additive sense to primary 11 of transformer 12

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which is biased to cut off overshoot due to differentiation in transformers 6 and 7. The output is taken from secondary winding 16 of transformer 12 and consists of either positive or negative pulses spaced at twice the frequency of alternating current source 1. With the arrangement of the device shown in Fig. 1, two pulses are produced for each cycle of the supply frequency.

If a larger number of pulses per cycle of the supply frequency is required, a circuit based upon the arrangement shown in Fig. 2 may be utilized. In Fig. 2 alternating current source 19 supplies alternating current through isolating inductance 20 to saturable reactor 21 and through phase shift network 22 to saturable reactor 23. Capacitors 24 and 25 complete the input circuit as shown. Primary windings 26 and 27 of transformers 28 and 29 are connected at one end to alternating current source 19 and at the other to the junction between saturable reactors 21 and 23. The secondary windings 30 and 31 of transformers 28 and 29 supply current to the primary winding 32 of transformer 33, the secondary of which supplies the output of the device. Bias to windings 34, 35, and 36 is furnished by source 37. In this embodiment of the invention a phase shift network 22 is utilized to shift the firing point of saturable reactor 23 away from that of saturable reactor 21. Each of the saturable reactors still fires twice during each cycle of source 19, but if phase shift network 22 supplies a 90° phase shift, for example, the resulting wave form supplied by transformer primary windings 26 and 27 consists of two positive pulses 90° displaced and two negative pulses 90° displaced. In this case, the two sets of pulses are also separated by 90°. Of course, the phase shift need not be 90°, but may be less than 90°, for example, 60°; and additional saturable reactors may be employed so that separation of the sets of pulses may be 60°, 45°, 30°, or any number of degrees referred to the cycle of source 19. As in the case shown in Fig. 1, the width of the pulses is determined by the size of capacitors 24 and 25, and the functioning of transformers 28, 29, and 33 is similar to the functioning of transformers 6, 7, and 12 shown in Fig. 1. Bias source 37 supplies bias both to bias windings 34 and 35 of transformers 28 and 29, and to bias winding 36 of transformer 33.

There is thus provided a circuit useful in connection with radar for obtaining accurate time markings upon a cathode ray oscilloscope. The circuit involves the use of no vacuum tubes and hence is of indefinitely long life and is highly dependable.

We claim:

1. Means for generating short duration electrical pulses comprising in series and in order a source of alternating current, an isolating inductance, a saturable core reactor, and a load impedance, and a capacitor connected from the source side of said load impedance to the saturable reactor side of said inductance to thereby supply electrical pulses to said load impedance of duration determined by said capacitor.

2. A device as recited in claim 1 in which said load impedance comprises the primary windings of two transformers the secondaries of which are connected in additive fashion, and further comprising means for biasing said transformers to thereby produce unipolar pulses at the output of said transformers.

3. Means for producing unipolar electrical pulses of short duration comprising a pair of current transformers having their primaries connected in series, a source of alternating current connected at one terminal to said transformer primaries, an isolating inductance, and a saturable core reactor connecting the other terminal of said alternating current source to the unconnected terminal of said transformer primary windings, a capacitor connected between the saturable reactor side of said iso-

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lating inductance and the alternating current source side of said transformer primaries, a third transformer having its primary winding connected to the secondary windings of said pair of transformers, and means for predeterminately biasing said transformers whereby the secondary winding of said third transformer produces unipolar short

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duration electrical pulses at predetermined uniform intervals.

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