

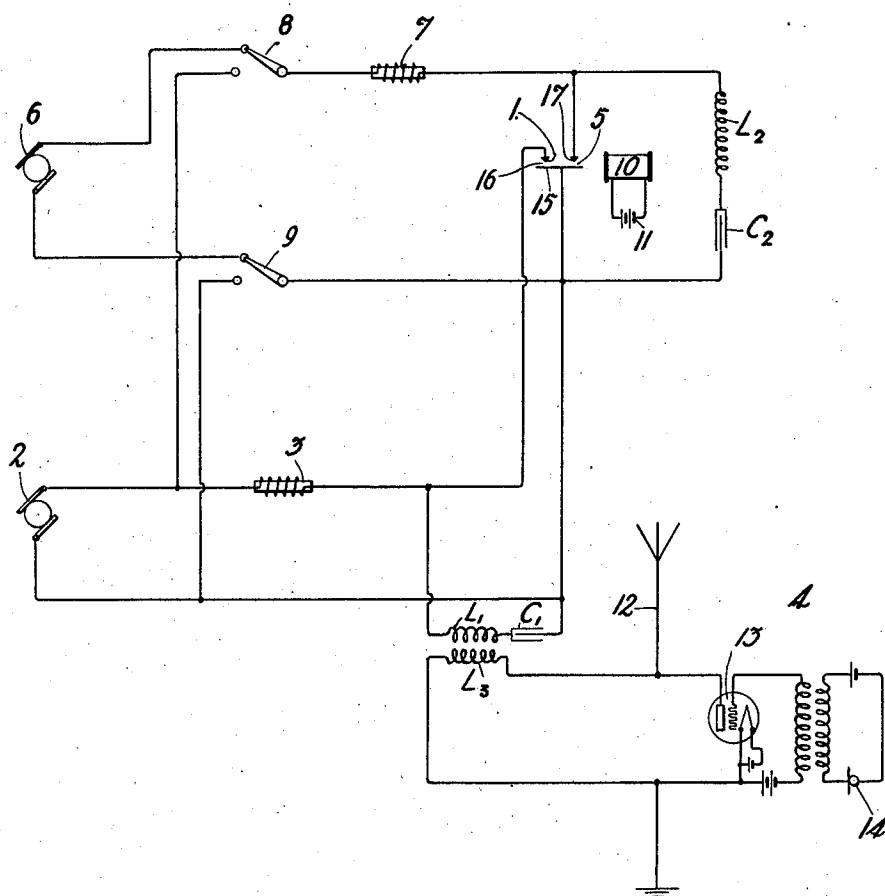
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CONSTANT FREQUENCY SYSTEM

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UNITED STATES PATENT OFFICE.

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CONSTANT FREQUENCY SYSTEM.

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For the generation of carrier frequency currents it has been previously proposed to use an arc or spark to excite an electric circuit into oscillation. The oscillatory currents thus generated may be used as carrier currents in a high frequency signaling system. Such a system is suitable for telegraph signaling in which it is not necessary to generate sustained oscillations of constant frequency, which must, however, be provided in carrier telephone systems. Previous arc or spark oscillating circuits are not capable of delivering constant frequency oscillations into an antenna or load circuit of varying impedance, as the varying resistance in the antenna or load circuit effects variations in the frequency of the oscillations generated.

The present invention has for an object to provide an arc-excited oscillating circuit capable of supplying oscillations of a constant frequency in spite of variations which may occur in the resistance of the load circuit.

From a more general aspect the invention comprises generating oscillations by a principal wave generating device or oscillator and controlling the frequency of the generated oscillations by a control generator so that the action of any influence which tends to change the frequency of the waves produced by the principal generator, as, for example, that of a signaling instrument, is prevented from changing the frequency of the principal oscillator.

In the arrangement herein disclosed the desired object is accomplished by employing two arc oscillating circuits, one a main circuit which supplies the variable load, and the other a trigger circuit in which the resistance remains constant. A spark gap in the main circuit is normally inoperative, i. e., the relation of the sparking distance to the voltage across the gap is such that the voltage is insufficient to jump the spark gap. The normal inoperative spark gap in the main circuit is periodically rendered operative by the constant frequency arc in the trigger circuit. This is done by means of a magnetic field which blows the trigger arc across the spark gap in the main circuit. Both arcs always go out after each cyclic discharge and as only the trigger arc establishes itself again the frequency of the currents in the main oscillating circuit will be

determined by that of the trigger arc. As the resistance in the trigger circuit is constant, the trigger arc will be established at a constant frequency and consequently the current in the main oscillating circuit will have a constant frequency, particularly in view of the fact that the frequency of the trigger arc is preferably the same as the resonant frequency of the main oscillating circuit.

The accompanying drawing shows a modulating system in which is employed a constant frequency arc system embodying the invention. In the drawing the main oscillating circuit L_1, C_1 includes the normally inoperative spark or arc gap 1. This oscillating circuit is energized from a suitable source of current 2 which is connected in series with the impedance 3 and in shunt to the condenser C_1 and inductance L_1 . The sparking distance of gap 1 is such that the voltages generated by the source 2, and the reactions of the impedances 3, C_1 , L_1 and L_2 are insufficient to break down the resistance of this gap. The oscillating circuit C_1, L_1 is adapted to supply oscillations to a variable load, such as the modulating system 4. The specific form of modulating system herein shown forms no part of the present invention, and is only shown by way of illustration to indicate one way in which the constant frequency oscillations generated may be employed. It will also be apparent from what follows that any antenna system with suitable means for modulating the oscillations therein may be substituted for that shown. Furthermore, the application of this invention is not limited to modulation of oscillations existing in an antenna, but may be used to modulate oscillations in any suitable circuit or circuits, which modulated oscillations are thereafter to be applied to an antenna or other signaling conductor. The trigger oscillating circuit C_2, L_2 includes the spark or arc gap 5, which is normally operative. The spark gaps 1 and 5 have a common cathode 15 and separate anodes 16 and 17. The trigger oscillating circuit C_2, L_2 is energized from a suitable source of direct current 6 through the impedance coil 7, or by means of the switches 8 and 9 the trigger oscillating circuit may be supplied from the source 2.

The resistance in the trigger oscillating circuit is constant and, accordingly the trig-

ger arc established at the spark gap 5 will have a constant frequency. In order to render the spark gap 1 operative, the flame at the spark gap 5 is blown, or diverted, to the spark gap 1 by means of the magnetic field produced by the electromagnet 10 energized from a suitable source 11 of direct current. The arcs established at both of the gaps 1 and 5 always go out after each cyclic discharge due to the unilateral conductivity of the spark gaps. This suppression of the arcs is aided by the magnetic field produced by the electromagnet 10. The trigger oscillating circuit $C_2, L_2, 5$ and the main oscillating circuit $C_1, L_1, 1$ are both preferably tuned to the same carrier frequency. This insures that the currents in the main oscillating circuit will have a constant frequency which is the frequency of the trigger circuit.

The modulating circuit 4, herein shown, is supplied with carrier oscillations from the main oscillating circuit by means of the coil L_3 inductively related to the coil, L_1 . The coil L_3 is included in the radiating antenna system 12. The amplitude of the carrier oscillations radiated is varied by means of the thermionic impedance 13 connected in shunt to the coil L_3 , the thermionic impedance 13 being controlled by a microphone 14 or other suitable means for producing signaling currents.

With the arrangement, herein shown, the variation in the resistance of the radiating antenna system will have no effect whatever upon the frequency of the currents generated in the main oscillating circuit $C_1, L_1, 1$ as their frequency is dependent solely upon the constant frequency of the arc established in the trigger circuit $C_2, L_2, 5$.

Having described one form of the invention the novel features thereof will be defined both specifically and broadly in the appended claims.

What is claimed is:

1. In a constant frequency arc system, the combination of an oscillation circuit containing a normally inoperative arc gap, a trigger oscillation circuit containing a normally operative arc gap, means for energizing said circuits, and means for moving the arc from said normally operative gap to said normally inoperative gap.

2. In a constant frequency arc system, the combination of an oscillation circuit including a normally inoperative arc gap, a trigger oscillation circuit including a normally operative arc gap, means for energizing said circuits, each of said circuits including means for tuning said circuits to substantially the same frequency, and means for moving the arc from said normally operative gap to said normally inoperative gap.

3. An electric system comprising a nor-

mally operative arc gap, means for energizing said gap, a normally inoperative arc gap, a translation circuit associated with said normally inoperative arc gap, and means for moving the arc at said normally operative arc gap across said normally inoperative arc gap whereby said translation circuit is completed.

4. In an oscillation generating system, a power generator having a frequency-determining circuit, the frequency-determining effect of which is subject to change by reaction from a load circuit and including an electric discharge device, an oscillation system including an electric discharge device with fixed electrodes and having a constant period, and means for keeping said generator system in frequency synchronism with said oscillating system.

5. In combination, a circuit of variable effective impedance, an oscillator, said oscillator including a discharge device and a tuned circuit in which oscillations are produced, said tuned circuit being coupled with said first-named circuit by a coupling capable of transferring energy from either of said circuits to the other, and means for counteracting the effect of variations of effective impedance in said first-named circuit upon the period of oscillations produced by said oscillator.

6. In combination, a high frequency oscillation generator system including a discharge device whose frequency is influenced by the resistance of any circuit to which it is coupled, a variable resistance circuit coupled to said generator, and automatically acting means for counteracting the effect upon the frequency of said generator of variations of resistance in said circuit.

7. A radio telephone system comprising an oscillating arc circuit, modulating appliances for varying in accordance with speech the waves generated by said circuit, said appliances during operation tending to vary the natural period of said circuit, a control arc circuit substantially uninfluenced by said modulating appliances, and means whereby said control arc circuit tends to maintain constant the frequency of said oscillating arc circuit.

8. In combination, an oscillator including a discharge device and a tuned circuit in which said device produces oscillations, said tuned circuit being coupled to another circuit by a coupling capable of transferring energy from either of said circuits to the other, telephonic apparatus including sound translating means which operates to vary the impedance of said other circuit, and a source of constant frequency periodic energy for controlling the frequency of said oscillator.

9. In an arc generator, a pair of anodes, a cathode, a transmitting path connected in

shunt relation to one of said pair of anodes and said cathode, and means for transferring the arc from one of said anodes to the other.

a pair of normally stationary anode elements cooperating therewith and means for transferring an arc between said elements from one anode to the other while maintaining the continuity of the arc.

In witness whereof, I hereunto subscribe my name this 28th day of December, A. D., 1916.

5 10. In an arc generator, a cathode element, a pair of normally stationary anode elements cooperating therewith and means for transferring an arc between said elements from one anode to the other.

10 11. In an arc generator, a cathode element,

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