

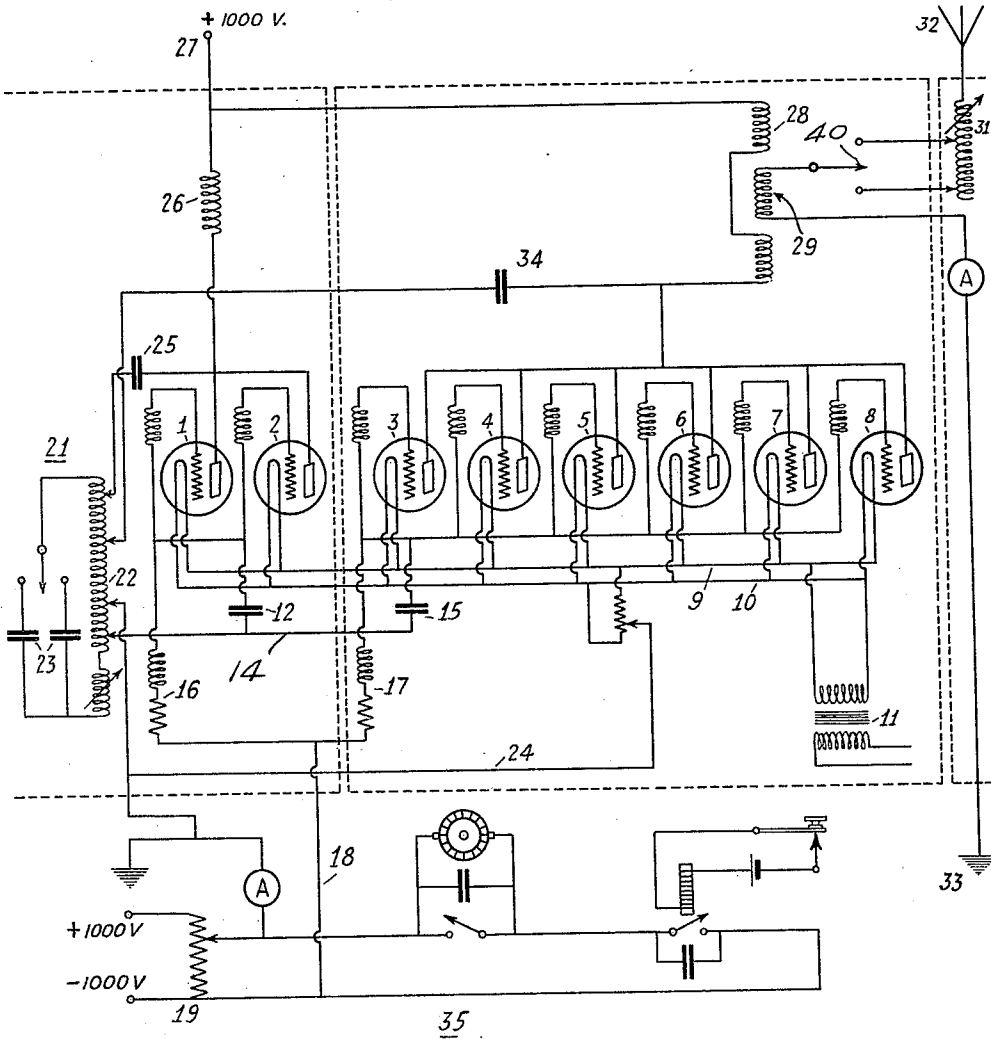
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RADIO SIGNALING SYSTEM

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## UNITED STATES PATENT OFFICE

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## RADIO SIGNALING SYSTEM

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My invention relates to radio transmission systems, and particularly to means for stabilizing the frequency thereof.

5 An object of my invention is to provide a radio signaling system having means for maintaining superior accuracy of radiation frequency therefrom.

10 An object of my invention is to provide a radio frequency generator having a master oscillator and means for maintaining the frequency of generation thereof constant.

15 Another object of my invention is to provide a radio frequency generating system having a master oscillator, a power amplifier, an antenna system and means for maintaining the frequency of the master oscillator constant.

20 Another object of my invention is to provide a radio frequency oscillation generating system having a master oscillator, an antenna and means for preventing change in the antenna constants from influencing the frequency of the master oscillator.

25 Another object of my invention is to provide a master oscillator and power amplifier in combination with reverse feed-back means therebetween.

30 Another object of my invention is to provide a system comprising a plurality of triode vacuum tubes, means for maintaining self oscillation of some thereof, and means for preventing any oscillatory tendency in others thereof.

35 Another object of my invention is to provide means in combination with a group of parallel connected triode vacuum tubes for segregating various portions of the group to various respective functions thereof.

40 In the prior art of the development of radio frequency oscillations by means of triode vacuum tube generators, attempts have been made to provide a master oscillator to determine the frequency of oscillation, a power amplifier to supply the necessary energy and  
45 an antenna to radiate the oscillations. Difficulty has been experienced, however, in maintaining a constant frequency in the master oscillator, because of the tendency for electrical reaction to occur from the power amplifier to the master oscillator, either at frequen-

cies determined by its own constants or at frequencies determined by the antenna. Various attempts have been made to construct a satisfactory system of this general type, but, so far as I am aware, all of the attempts to  
55 avoid such reaction, and to produce a master oscillator in combination with a power amplifier have lead to very complicated, unstable, and unsatisfactory systems.

My invention provides a very simple circuit in which all of the triodes of the system may be connected substantially in parallel, particularly with respect to the filaments and grids thereof and in addition means for segregating a part of the group to the function  
60 of the production of oscillations and the others of the group to the function of amplification at the generated frequency.

My invention further provides means for preventing reaction from the amplifier group  
65 to the oscillator group.

Other objects and structural details of my invention will be apparent from the following description when read in connection with the accompanying drawing, wherein:

70 The single figure is a diagrammatic representation of circuits and apparatus embodying my invention;

In the figure a group of triodes 1 to 8 inclusive are provided. The filaments thereof are connected in parallel by the conductors 9 and 10, which are connected to a transformer 11, which in turn is connected to a source of energy not shown. The grids of the triodes 1 and 2 are connected directly in parallel and through a condenser 12 to a lead 14. The grids of the triodes 3 to 8 inclusive are likewise connected directly in parallel and through a condenser 15 to the same lead 14 thus bringing all the grids substantially in parallel. Inductive grid leak combinations 16 and 17 are likewise provided and connected through the lead 18 to a grid biasing means 19.  
85

90 A "tank circuit" 21 is provided comprising a variable inductance 22 and capacitance 23. A conductor 24 is connected to a mid point tap upon the inductance 22 and to the filament circuit conductors 9 and 10. The  
95 100

grid conductor 14 is likewise connected to a tap near one end of the inductance 22.

The plates of the triodes 1 and 2 are connected in parallel and through a condenser 25, to a tap upon the opposite end of the inductance 22. The anodes of the triodes 1 and 2 are supplied with current through a choke coil 26 from a source (not shown), connected to terminal 27.

This assemblage of elements with triodes 1 and 2 produces an oscillation generator according to the well known "Hartley" system.

The plates of triodes 3 to 8 inclusive are likewise connected together in parallel, and through an inductance 28 to the terminal 27 and the plate current supply. The inductance 28 is coupled to an inductance 29 which in turn may be connected in the aerial circuit by means of a suitable switching arrangement 40, which may comprise, as shown, an auxiliary inductance 31, an aerial 32 and ground 33 with the usual antenna meters in circuit. The plate circuit of the triodes 3 to 8 inclusive is likewise connected through a condenser 34 to another tap upon the inductance 22.

Grid biasing means, audio frequency interrupting means, and keying means well known in the art may be provided as indicated at 35 but need not be described here in detail.

In the operation of my device the triodes 1 and 2, in combination with the inductance 22 and capacitance 23 and the circuit connections shown, function as the typical Hartley oscillation system according to the broad system disclosed by Armstrong. Oscillatory energy is also transferred from the inductance 22 through the conductor 14 and the condenser 15 to the grids of the triodes 3 to 8 inclusive, causing the customary effect upon the electron streams therethrough, and the repeating and amplifying of those oscillations in the usual manner. The amplified oscillations, then are transmitted to the aerial circuit in the usual fashion by the coupling between the coils 28 and 29.

The system so far described would, in the absence of other elements for stabilizing it be subject to the serious disadvantage that the amplifying triodes 3 to 8 inclusive are subject to reaction from the antenna circuit which may vary with swinging of the antenna lead, or, in ship service, with rolling of the ship. This reaction may be transmitted through the grid circuits of the tubes 3 to 8 inclusive to the inductance 22 causing a change in oscillation frequency therein which may be extremely troublesome when the signals are received at a remote point.

My invention provides in combination with the previously described structure a neutralizing condenser 34, connected between the anode circuits of the power amplifying

anodes 3 to 8 and the inductance 22, whereby oscillatory voltage transmitted to the inductance 22 by way of the grid and filament circuit conductors 14 and 24 is neutralized by voltage in reverse phase transmitted through it. By this means, the frequency of the local oscillator is maintained free from influence by other parts of the circuits, and thereby, a very constant frequency maintained therein.

While I have shown but one embodiment of my invention in the foregoing drawing and description it is capable of various modifications therefrom without departing from the spirit thereof, and it is desired therefore that only such limitations shall be imposed thereon as are required by the prior art or indicated by the appended claims.

I claim as my invention:

1. A radio signaling system comprising an oscillation generator, an oscillation amplifier amplifying oscillations generated by said generator, and, an oscillation neutralizing circuit connecting the output circuit of said amplifier to a cold electrode of said generator for preventing the generation of energy of undesired frequencies.

2. A radio signaling system comprising a triode, an oscillatory circuit comprising inductance and capacitance and energy supply means for said triode and said oscillatory circuit, whereby oscillations are generated, an additional triode connected to said oscillatory circuit, means for supplying energy to said second triode, an output circuit for said second triode, and means comprising a capacity connecting the output of said second triode to said oscillatory circuit for preventing self oscillation of said second triode.

3. A radio signaling system comprising, an oscillation generating means, an oscillation amplifying means for amplifying oscillations generated by said oscillation generating means, an oscillatory circuit forming a part of said oscillation generating means and a neutralizing capacity connecting the output of said oscillation amplifying means and said oscillatory circuit for preventing self-oscillation in said oscillation amplifying means.

4. A radio signaling system comprising, an oscillation generating means, an oscillation amplifying means for amplifying oscillations generated by said oscillation generating means, a closed oscillatory circuit forming a part of said oscillation generating means, and a capacity connection from the output of said oscillation amplifying means to said closed oscillatory circuit for preventing self-oscillation in said oscillation amplifying means.

5. A radio signaling system comprising, a group of triodes, means for causing oscillations to be produced in a portion of said group of triodes, an oscillatory tank circuit connected with said portion of said group of

triodes, a second portion of said group of triodes for amplifying the oscillations produced in said first named portion, and means associated with said oscillatory tank circuit for causing a neutralizing potential difference between the second portion of said group of triodes and said oscillatory tank circuit, for preventing self-oscillation in said second portion of said group of triodes.

6. A radio signaling system comprising, a group of triodes, means for causing oscillations to be produced in a portion of said group of triodes, an oscillatory circuit associated with said portion of said group of triodes, means for amplifying the oscillations produced in said first portion of said group of triodes, said amplifying means including the second portion of said group of triodes, and a capacity connecting said oscillatory circuit and the output of said second portion of said group of triodes for preventing self-oscillation in said second portion of said group of triodes.

7. A radio signaling system comprising, an oscillation generating means, an oscillation amplifying means for amplifying oscillations generated by said oscillation generating means, an oscillatory circuit forming a part of said oscillation generating means, and means connecting the output of said oscillation amplifying means and said oscillatory circuit for preventing feed-back, whereby self-oscillation in said oscillation amplifying means is avoided.

8. In a radio signaling system, an oscillation generating means including a closed oscillatory tank circuit and a plurality of parallelly connected vacuum tube generators, an oscillation amplifying system including a plurality of parallelly connected vacuum tube amplifiers for amplifying oscillations produced in said oscillation generating system, and a connection including a capacity element connecting the output of said oscillation amplifying system and said oscillatory circuit for preventing self-oscillation in said oscillation amplifying system.

9. In a radio signaling system, a plurality of vacuum tube amplifiers each having their grid and filament members connected in parallel, said amplifiers being divided into a plurality of groups and having the plate members of the tubes associated with each of said groups connected in parallel, one of said groups of tubes forming an oscillation generating means, a closed oscillatory tank circuit associated with said oscillation generating means, the second of said groups of said vacuum tubes forming an oscillation amplifying means for amplifying the oscillations produced in said oscillation generating means, and a capacity means between the output of said oscillation amplifying means and said closed oscillatory circuit for preventing

self-oscillation in said oscillation amplifying means.

10. The combination in an amplifying system comprising an electron discharge oscillation generator and an electron discharge grid control amplifier having its input circuit supplied with oscillations derived from the oscillator, of means for preventing the amplifier from generating oscillations comprising a coupling through a capacity from the output circuit of the amplifier to a point in the oscillation circuit of the generator, said capacity being so chosen with respect to natural capacity coupling between the output and input circuits of the amplifier and the point in the oscillation circuit to which it is connected as to impress upon the grid of the amplifier a potential substantially equal and opposite to that impressed thereon by reason of the natural capacity coupling between the output and input circuits of the amplifier.

11. The combination in an amplifying system comprising an electron discharge oscillation generator and an electron discharge grid control amplifier having its input circuit supplied with oscillations derived from the oscillator, of means for preventing the amplifier from generating oscillations comprising a coupling through a capacity from the output circuit of the amplifier to a point in the oscillation circuit of the generator.

12. The combination in an amplifying system comprising an electron discharge oscillation generator and an electron discharge grid control amplifier having its input circuit supplied with oscillations derived from the oscillator, of means for preventing the amplifier from generating oscillations comprising a coupling through a capacity from the output circuit of the amplifier to a point in the oscillation circuit of the generator, said coupling being made to a point in the oscillation circuit at which the potential is substantially one hundred and eighty degrees out of phase with the potential supplied to the grid of the amplifier.

13. In radio signaling apparatus, an electron discharge device oscillator, an amplifier for amplifying oscillations fed thereto by said device, and, an oscillation neutralizing circuit connecting the output circuit of said amplifier to a circuit of said electron discharge device for preventing the generation of energy of undesired frequencies.

14. An amplifying system comprising an electron discharge device oscillator having associated input and output circuits, an amplifier for amplifying oscillations fed thereto by said device, said amplifier having associated input and output circuits, and, capacity coupling means coupling one of the circuits of said amplifier with one of the circuits of said electron discharge device oscillator for preventing the generation of undesired oscillations.

15. In an amplifying system an electron  
discharge device oscillator having a tunable  
input circuit, an amplifier coupled to said de-  
vice for amplifying the output of said device,  
and, capacity coupling means coupling the  
output circuit of said amplifier with the tun-  
able input circuit of said electron discharge  
device oscillator for preventing the genera-  
tion of spurious oscillations.

16. In combination, a plurality of paral-  
leled electron discharge devices producing  
oscillations of a desired frequency, input and  
output circuits for said paralleled electron  
discharge devices, a plurality of paralleled  
amplifiers for amplifying the output of said  
paralleled electron discharge devices, and  
means coupling the amplifiers and devices  
for preventing the generation of undesired  
oscillations.

17. In combination, a plurality of paral-  
leled electron discharge devices producing  
oscillations of a desired frequency, a tunable  
input circuit for said paralleled devices, a  
plurality of paralleled amplifiers for ampli-  
fying the output of said devices, and, a neu-  
tralizing capacity connection coupling the  
output circuit of said amplifiers to the tunable  
input circuit of said devices for preventing  
the generation of spurious oscillations.

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