

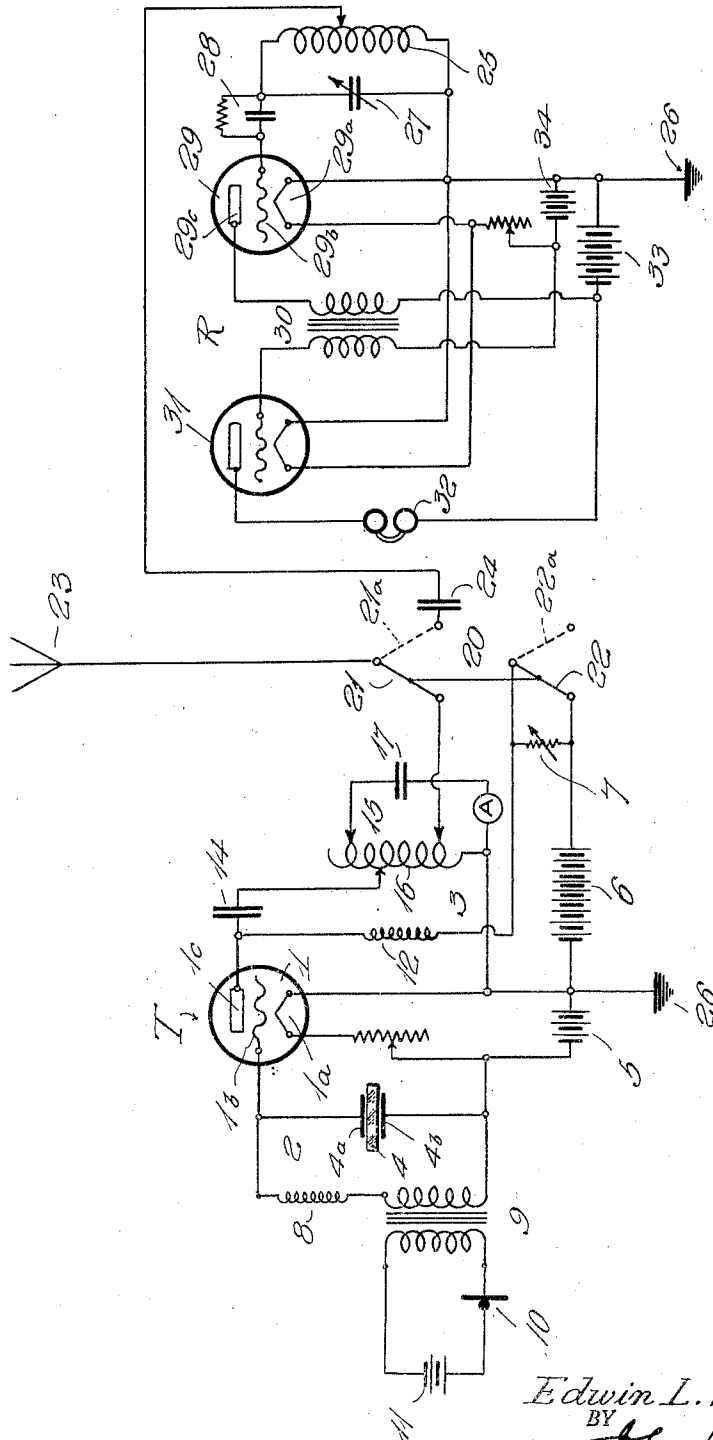
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DUPLEX RADIO COMMUNICATION SYSTEM

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DUPLEX RADIO COMMUNICATION SYSTEM

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My invention relates broadly to high frequency signaling systems and more particularly to a circuit arrangement for a transmission and receiving system.

One of the objects of my invention is to provide a compact high frequency signal transmission and receiving apparatus wherein a crystal controlled oscillator employed in the transmission system may be utilized as a part of the receiving system when the transmitter is not in use, with means for limiting the amplitude of the oscillations for heterodyne reception in the receiving system.

Another object of my invention is to provide a frequency control system for signal transmission which may also be employed in signal receiving circuits for the reception of signals of a predetermined frequency allowing duplex operation of the signaling system with a correspondingly arranged transmitting and receiving apparatus.

Other and further objects of my invention reside in the circuit arrangement described in the following specification by reference to the accompanying drawings which diagrammatically show the transmission and receiving apparatus connected in accordance with the principles of my invention.

Referring to the drawings in detail, reference character 1 designates an electron tube arranged in an oscillator circuit, the electron tube having filament electrodes 1^a, grid electrode 1^b and plate electrode 1^c arranged in the input circuit 2 and in the output circuit 3. The input circuit 2 includes the piezo electrical crystal element 4 arranged between the electrodes 4^a and 4^b. A radio frequency choke coil 8 is provided in circuit with the secondary winding of a modulation transformer 9, the choke coil 8 and the secondary winding of the modulation transformer 9 being arranged in shunt with the piezo electric crystal element 4 in the input circuit. The primary winding of the transformer 9 includes microphone 10, and the source of potential 11. A cathode heating battery 5 is provided for energizing the cathode 1^a. The output circuit 3 of the oscillator 1 includes the high potential battery 6 in circuit with choke coil 12. The oscillator circuit is repre-

sented at 15 including inductance 16 and capacity 17, the oscillator circuit being connected through condenser 14 with the output circuit of the electron tube oscillator 1. The output circuit of the electron tube 1 includes a variable resistance 7 in series with the high potential battery 6, which resistance may be shunted during periods of transmission by means of switch blade 22 of the anti-capacity switch 20. The switching system 20 comprises switch blades 21 and 22 which may be moved to either of two positions, that is a transmitting position illustrated in full line or to a receiving position illustrated in dotted line at 21^a and 22^a. The antenna system is shown at 23 connected with switch blade 21, and the ground is indicated at 26 connected with the opposite side of the oscillator 1. The receiving system is represented as including detector tube 29 and an amplifier tube 31. It will be understood that any number of electron tube circuits may be provided and that the purpose of showing the detector and single amplifier system is merely to indicate the principle of the transmission and receiving system. The indicator tube 29 includes cathode 29^a, grid electrode 29^b and plate electrode 29^c. The input circuit of the receiver is represented at 25—27 with grid leak 28 in the input circuit. The output of the detector tube 29 is coupled to the input circuit of the amplifier tube 31 through coupling transformer 30. The cathodes are heated from battery 34, while the plate potential is supplied from battery 33. The telephones are represented at 32.

The transmitting and receiving system of my invention is very compact as the transmitting oscillator functions as part of the receiving system when the transmitter is not in operation. The oscillator is positioned in close relation with respect to the electron tube detector 29 and connected to one side thereof through the common ground connection 26, so that the constant frequency oscillations of piezo electric crystal element 4 which are sustained by the electron tube 1 operate to combine with the incoming signaling oscillations of predetermined frequency for deriving a beat note in the detector circuit which finally

operates the responsive device 32. Upon disconnecting the receiving apparatus by moving the switch system 20 from dotted line position 21^a and 22^a to full line position 21 and 22 the oscillator is restored to its connection with the antenna 23 again enabling the modulation system to be operated for the transmission of signals. The apparatus is intended for short range operation and the compact size of the equipment renders the apparatus extremely practical. It will be observed that the resistance element 7 is inserted when the oscillator 1 is heterodyning with the received signaling energy, whereas the resistance 7 is cut out when the receiving apparatus is disconnected from the antenna system and connections restored between the antenna system and the oscillator for reestablishing the transmitting condition.

The oscillator continues to function at constant frequency independently of the position of the switching system 20, the differences in the transmitting and receiving conditions being that when the switching system is in transmitting position the oscillations developed by the oscillator are of relatively large amplitude while with the switching system in receiving position the oscillations developed by the oscillator are of smaller amplitude.

While I have described my invention in a certain preferred embodiment, I desire that it be understood that no limitations upon my invention are intended other than are imposed by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. A transmission and receiving system comprising an antenna ground system, an electron tube oscillator, a radio receiving circuit including an electron tube detector and a responsive device, switching mechanism for alternately establishing connection between said antenna ground circuit and said oscillator or with said radio receiving circuit, and means rendered effective simultaneously with the actuation of said switching mechanism for changing the amplitude of the oscillations developed by said oscillator when said oscillator is connected in circuit with said antenna ground system or when said antenna ground system is connected with said receiving circuit.

2. A transmission and receiving system comprising a radio frequency energy transmitting and collecting circuit, a transmitter including an electron tube oscillator having an input circuit and an output circuit, means for limiting the amplitude of the oscillations developed by said electron tube oscillator, a radio receiving system, and means for alternately establishing connection between said radio frequency energy collecting or radiating circuit and said oscillator and said receiving circuit, said means operating to simultaneously control said aforementioned means for reducing the amplitude of oscillations developed by said oscillator when said radio frequency energy collecting or radiating circuit is connected with said receiving circuit.

3. A signal transmission and reception system comprising a radio frequency energy collecting or radiating circuit, an electron tube system having input and output circuits arranged for the production of high frequency oscillations, a resistor arranged in the output circuit of said electron tube system, a signal receiving circuit, means for alternately establishing connections between said radio frequency energy collecting or radiating circuit, said oscillator and said receiving circuit, said means operating to shunt said resistor when said radio frequency energy collecting or radiating circuit is connected with said receiving circuit.

4. A signal transmission and reception system comprising a signal transmitting and receiving circuit, an electron tube oscillator having input and output circuits, a piezo electric crystal element ground to a predetermined frequency and connected in said input circuit, said output circuit being arranged to sustain the oscillations of said piezo electric crystal element, a resistor included in said output circuit, switching mechanism for establishing connection between said first mentioned circuit and the output circuit of said oscillator and simultaneously shunting said resistor for impressing high frequency oscillations at relatively large amplitude upon said first mentioned circuit, a signal receiving circuit, said switching means being arranged to disconnect said first mentioned circuit from said oscillator and establish connections between said signal receiving circuit and said first mentioned circuit while reducing the amplitude of the oscillations sustained by said piezo electric crystal element for combination with incoming signaling energy for actuating said signal receiving circuit.

EDWIN L. WHITE.

DISCLAIMER

1,735,344.—*Edwin L. White*, Honolulu, Territory of Hawaii. DUPLEX RADIO COMMUNICATION SYSTEM. Patent dated November 12, 1929. Disclaimer filed October 1, 1932, by the assignee, *Wired Radio, Inc.*

Hereby enters a disclaimer to claims 1, 2, and 3 of said patent, which are in the following words, to wit:

"1. A transmission and receiving system comprising an antenna ground system, an electron tube oscillator, a radio receiving circuit including an electron tube detector and a responsive device, switching mechanism for alternately establishing connection between said antenna ground circuit and said oscillator or with said radio receiving circuit, and means rendered effective simultaneously with the actuation of said switching mechanism for changing the amplitude of the oscillations developed by said oscillator when said oscillator is connected in circuit with said antenna ground system or when said antenna ground system is connected with said receiving circuit.

"2. A transmission and receiving system comprising a radio frequency energy transmitting and collecting circuit, a transmitter including an electron tube oscillator having an input circuit and an output circuit, means for limiting the amplitude of the oscillations developed by said electron tube oscillator, a radio receiving system, and means for alternately establishing connection between said radio frequency energy collecting or radiating circuit and said oscillator and said receiving circuit, said means operating to simultaneously control said aforementioned means for reducing the amplitude of oscillations developed by said oscillator when said radio frequency energy collecting or radiating circuit is connected with said receiving circuit.

"3. A signal transmission and reception system comprising a radio frequency energy collecting or radiating circuit, an electron tube system having input and output circuits arranged for the production of high frequency oscillations, a resistor arranged in the output circuit of said electron tube system, a signal receiving circuit, means for alternately establishing connections between said radio frequency energy collecting or radiating circuit, said oscillator and said receiving circuit, said means operating to shunt said resistor when said radio frequency energy collecting or radiating circuit is connected with said receiving circuit."

[*Official Gazette October 25, 1932.*]