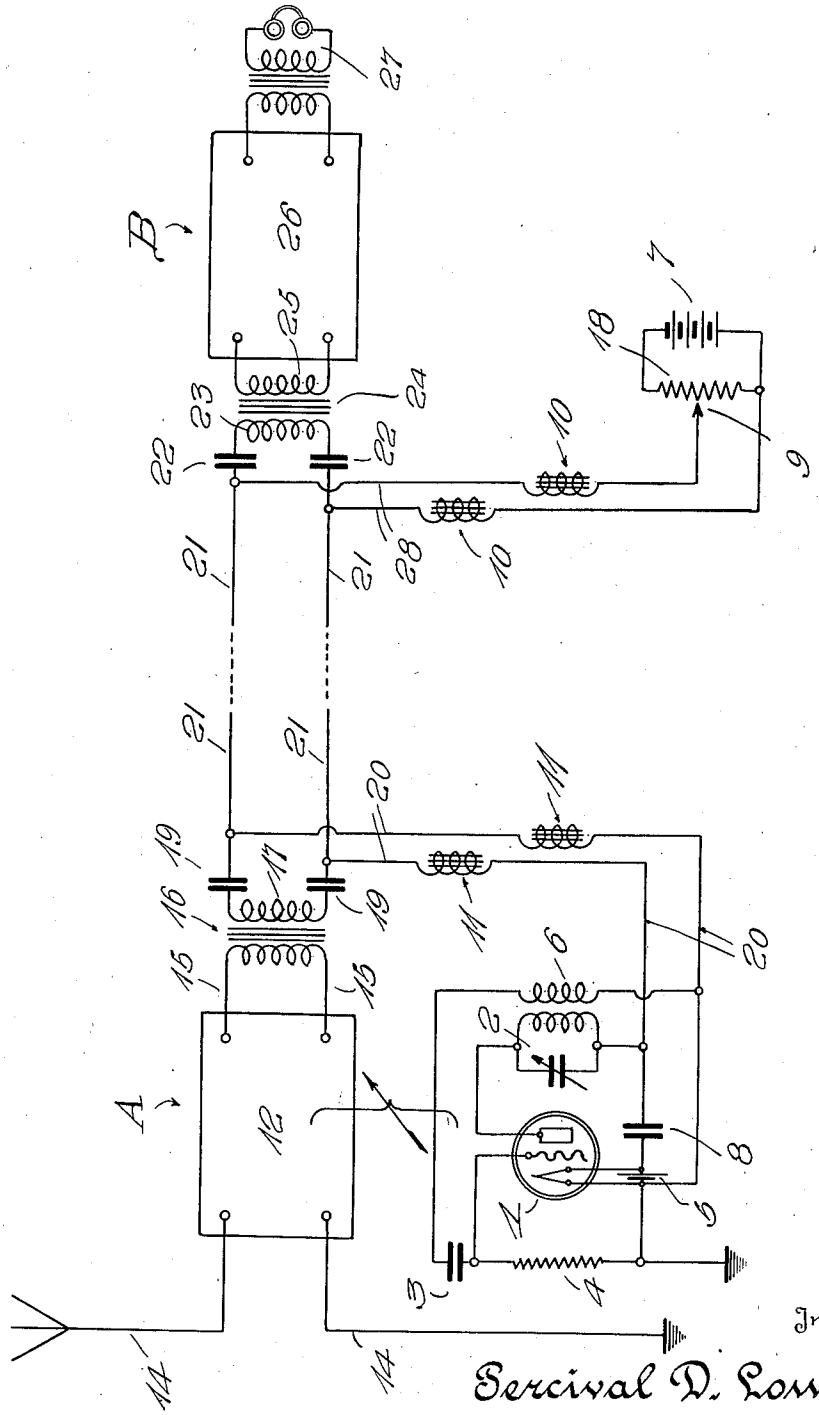
Sept. 29, 1936. P. D. LOWELL 2,056,011

SYSTEM FOR REMOTELY CONTROLLING THE FREQUENCY OF AN OSCILLATOR CIRCUIT

Filed July 25, 1933



Inventor

Percival D. Lowell

By John O. Brody

Attorney

Patented Sept. 29, 1936

2,056,011

UNITED STATES PATENT OFFICE

2,056,011

SYSTEM FOR REMOTELY CONTROLLING THE FREQUENCY OF AN OSCILLATOR CIRCUIT

Percival D. Lowell, Chevy Chase, Md., assignor to Radio Corporation of America, New York, N. Y., a corporation of Delaware

Application July 25, 1933, Serial No. 682,131

6 Claims. (Cl. 250—20)

My invention relates broadly to improvements in radio receiving circuits and more particularly to a means for controlling the frequency of an oscillator circuit from a remote control position.

One of the objects of my invention is to provide a system for remotely controlling the frequency of an oscillator circuit for effecting a shift in the frequency of such oscillator circuit within predetermined limits.

Another object of my invention is to provide a circuit arrangement for remotely controlled radio receiving stations in which the operator at the remote control station may readily control the beat note frequency of the incoming signaling energy from the remote control station.

Still another object of my invention is to provide a circuit arrangement in a radio receiving system for controlling the operating frequency of an oscillator located at the signal receiving station by line wire from a remote point wherein potential for the operation of the oscillator is supplied from a source located at the remote point over the same wires which conduct the signal energy from the receiving station to the remote control station.

A further object of my invention is to provide an arrangement of signal receiving system including a radio receiving station and a remote control station interconnected by line wire over which the received radio signals are transmitted to the control station and wherein the oscillator at the receiving station has the frequency thereof controlled directly from the remote control station over the same wires which transmit the signaling energy to the remote control station.

A still further object of my invention is to provide a system for remotely controlling the frequency of an oscillator circuit by adjusting the plate potential supplied to the oscillator circuit for correspondingly shifting the frequency of the oscillator circuit within predetermined limits.

Other and further objects of my invention reside in a circuit arrangement for a remote control system employing a high frequency oscillator with means at the control point for adjusting the frequency of the oscillator as set forth more fully in the specification hereinafter following by reference to the accompanying drawing which diagrammatically and schematically illustrates my invention.

My invention is particularly useful, for example, when it is desired that a radio receiver be used for the reception of continuous wave radio telegraphic code signals. In this case, it is most desirable to employ an electron tube oscillator for obtaining the audio frequency beat note. To obtain the proper pitch of this beat note it is necessary to provide a means for varying the frequency of the oscillator over a limited range, this means being commonly called a "vernier adjustment." It is the purpose of my invention to provide a simple and suitable means of obtaining this "vernier adjustment" either from a position close to the receiver or from a position located a substantial distance away from the receiver.

My invention makes use of the fact that the frequency of an electron tube oscillator changes when the voltage impressed on the plate of the electron tube is changed. This is due to the fact that the change in plate voltage causes a change in the plate impedance which in turn reflects back into the grid or input circuit, causing a change in the input capacity, the latter causing the frequency of the oscillations to change. My invention provides a method of deliberately varying the plate voltage of the oscillator thereby indirectly causing a variation of the frequency emitted by the oscillator over a limited range sufficient to selectively adjust the pitch of the beat note frequency to the desired degree. My invention provides means for effecting the vernier distant tuning control of a superheterodyne receiver, in which the frequency converting oscillator is provided with means for changing the oscillator frequency by varying the plate voltage from a distant position.

Referring to the drawing which diagrammatically shows my invention, A represents the location of the receiving apparatus, a portion of which includes an electron tube oscillating circuit comprising electron tube 1, inductance and capacity 2, grid condenser 3, leak 4, source of heater voltage 5, grid circuit feedback coil 6 and the bypass condenser 8 connected across the leads 20 which extend to the remote control station through the signal conductors 21 to the source of potential 7. At the distant control position B, a potentiometer 18 is provided in shunt to the source of potential 7 for controlling the effective potential impressed upon the plate circuit of the oscillator 1 at station A. By moving the slider or adjustable tap 9 of potentiometer 18, the voltage impressed on the plate of the oscillator is caused to vary, thereby causing the oscillation frequency to correspondingly vary within predetermined limits as desired. The direct current supplied by the potential source 7 is selected by potentiometer 18 and passed through leads 28 and audio frequency choke coils 10 to the line conductors 21 adjacent the entrance

of the conductors into distant control station B. At the opposite end of the line adjacent the station A, the leads 20 connect to conductors 21 through audio frequency choke coils 11. The receiving apparatus at station A has been schematically shown at 12 connected with the antenna ground system indicated at 14. The output of the audio frequency signal channel is represented at 15 connected to the primary winding of audio frequency transformer 16 having a secondary winding 17 connected through blocking condensers 19 to line conductors 21. The opposite end of the line conductors 21 connect through blocking condensers 22 interposed between line 21 and the primary winding 23 of audio frequency transformer 24. The secondary winding 25 of transformer 24 connects to the input of audio frequency amplifier 26, the output of which connects to the signal indicating means such as telephone headset 27. The condensers 19 and 22 in the line conductors block the passage of direct current from source 7 but permit the audio frequency signal current to pass therethrough from station A to station B. The choke coils 10 and 11 in leads 28 and 20 prevent the passage of audio frequency signal currents from the signal line to the plate circuit of the oscillator or to the direct current supply system. The arrangement permits the use of the same line wire system for both the audio frequency signal impulses from the receiver and the plate supply potential for the oscillator.

While I have illustrated the source of potential for controlling the frequency of the oscillator as located at the control station B, I desire that it be understood that the source of potential may be located at station A and the effect thereof upon oscillator 1 regulated by the adjustment of potentiometer 18. It will be observed that the radio frequency path through the oscillator is completed at station A through bypass condenser 8 and under no circumstances will the high frequency energy tend to pass through leads 20. The direct current is conducted through leads 20 independently of the high frequency oscillations which are confined to the immediate circuits of the oscillator 1.

It is understood, of course, that the oscillator can be used for many other purposes than those here disclosed either in conjunction with radio receivers or transmitters or any other purposes where a remotely controlled vernier tuning of an oscillator is required. While I have described my invention in one of its preferred embodiments I desire that it be understood that modifications may be made and that no limitations upon my invention are intended other than those which 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. In a remote control system, a receiving station, a remote control station, a line wire circuit extending therebetween for transmitting audio frequency signals from said receiving station to said remote control station, signal indicating means at said remote station connected with said line wire circuit for reproducing the signals transmitted from said receiving station, a beat frequency oscillator at said receiving station, connections between said oscillator and said line wire circuit, variable control means including a source of potential at said remote control station, connections between said variable control means and said line wire circuit, and elements in each of the aforesaid connections for preventing the passage of audio frequency signal energy into said beat frequency oscillator at said receiving station or into said variable control means at said remote control station.

2. In a remote control system, a receiving station, a remote control station, a line wire circuit extending therebetween for transmitting audio frequency signals from said receiving station to said remote control station, signal indicating means at said remote station connected with said line wire circuit for reproducing the signals transmitted from said receiving station, a beat frequency oscillator at said receiving station, connections between said oscillator and said line wire circuit, variable control means including a source of potential at said remote control station, connections between said variable control means and said line wire circuit, and audio frequency choke coils disposed in each of the aforesaid connections for preventing the passage of audio frequency signal energy into said beat frequency oscillator at said receiving station or into said variable control means at said remote control station.

3. In a remote control system, a receiving station, a remote control station, a line wire circuit, connections between one end of said line wire circuit and said receiving station, connections between the other end of said line wire circuit and said remote control station, signal indicating means at said remote control station electrically connected with said line wire circuit, a beat frequency oscillator at said receiving station connected with said line wire circuit, a source of plate potential at said remote station for said oscillator, means located at said remote control station and connected with said line wire circuit for controlling the effective plate potential supplied to said oscillator, and means in each of the aforesaid connections for excluding said plate potential therefrom.

4. In a remote control system, a receiving station, a remote control station, a line wire circuit, connections between one end of said line wire circuit and said receiving station, connections between the other end of said line wire circuit and said remote control station, audio frequency signal indicating means located at said remote control station and responsive to audio frequency signals transmitted over said line wire circuit, a beat frequency oscillator located at said receiving station, connections between said beat frequency oscillator and said line wire circuit, a source of plate potential at said remote station for said oscillator, means located at said remote control station for controlling the effect of said plate potential upon said oscillator, connections between said means and said line wire circuit, means in the first two of the aforesaid connections for preventing the passage of plate potential, and means in the last two of the aforesaid connections for preventing the passage of audio frequency signal energy.

5. In a remote control system, a receiving station, a remote control station, a line wire circuit extending therebetween for transmitting audio frequency signals from said receiving station to said remote control station, signal indicating means connected with said line wire circuit for reproducing the signals transmitted from said receiving station, a beat frequency oscillator at said receiving station, connections between said oscillator and said line wire circuit, a plate circuit for said oscillator including a source of potential at said remote station, and a poten-

tiometer at said remote control station connected with said line wire circuit for controlling the effective impedance of said plate circuit for correspondingly controlling the frequency of operation thereof.

6. In a system for remotely controlling the frequency of an oscillator circuit at a receiving station, the method of operation which includes transmitting from said receiving station to the remote control point audio frequency signalling energy and simultaneously transmitting in the opposite direction from the remote control point to said receiving station direct current for controlling the frequency of oscillations generated by said oscillator.

PERCIVAL D. LOWELL.