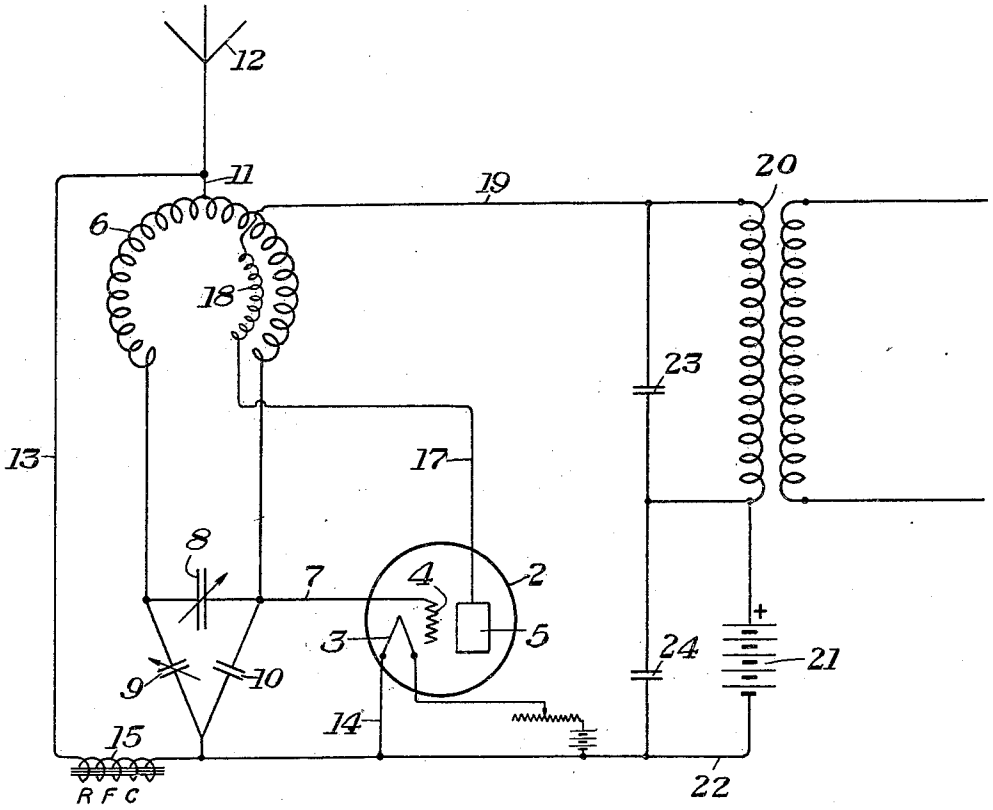
Aug. 11, 1931. M. M. PHILLIPS 1,818,157

RADIO RECEIVING CIRCUITS

Filed April 17, 1929



INVENTOR

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by his attorneys

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RADIO RECEIVING CIRCUITS

Application filed April 17, 1929. Serial No. 355,949.

This invention relates to the art of radio signalling and is for a receiving circuit for use in radio communication. The invention constitutes an improvement on the invention disclosed in my prior Patent No. 1,674,448, and my application Serial No. 319,806, filed November 16, 1928.

The present invention is particularly applicable to receiving circuits wherein a balancing circuit is used in the grid circuit of the detector tube in place of the usual devices for effecting rectification, as for instance, a grid leak and grid condenser or a biasing voltage on the grid.

In my said application Serial No. 319,806, I have disclosed a neutralized oscillator detector wherein detection is effected without resorting to the use of a grid leak or a grid condenser, or any of the other means commonly resorted to in causing a three-element tube to function as a detector. In the said application, I have also disclosed a stage of tuned radio frequency amplification disposed in advance of the oscillator detector with a common means for tuning both the amplifying circuit and the detecting circuit, provision being made for impressing the output of the amplifying circuit on the grid of the oscillating detector tube.

Such a system as disclosed in my said application secured the sensitivity of a tuned radio frequency amplification circuit with the highly selective properties of a heterodyne circuit, while rendering the operation of the circuit less critical.

According to the present invention, I have found that highly satisfactory results can be obtained by using a neutralized inductance in the grid circuit of an oscillating detector, connecting a midpoint of the inductance to an aerial. Connection is made also from the aerial to one side of the filament or cathode circuit of the tube through a radio frequency choke. Such an arrangement has proved to be both highly selective and highly sensitive without being critical, as is the usual heterodyne circuit. It therefore lends itself to ease of tuning and ease of control.

I have found, furthermore, that particularly high sensitivity is secured where the plate voltage on the oscillator detector is in the vicinity of fifteen volts, voltages much higher than this having heretofore been employed.

The invention may be readily understood by reference to the accompanying drawings, which shows diagrammatically a receiving circuit embodying my invention, the figure being a conventional diagram.

In the drawing, 2 designates a three-element electron tube which may be of either the direct current or alternating current type, the tube having a cathode 3, a grid 4 and a plate 5.

At 6 is an inductance, which is preferably in the form of a toroidal coil. One end of the coil 6 is directly connected with the grid through a wire 7. Connected across the two ends of the coil is a tuning condenser 8. Shunted around the condenser 8 is a bridge circuit containing a variable capacity 9 and a fixed capacity 10.

Tapped into the midpoint of the coil 6 is a lead wire 11 which connects with an aerial 12.

Bridged around the inductance 6 is a wire 13 having one end connected to the lead 11 and having its other end connected to the cathode circuit at 14, the bridge circuit 13 including a radio frequency choke 15. The provision of a radio frequency choke of some type in the bridge circuit 13 appears to be quite important to the successful operation of the circuit.

Connected with the plate 5 is a wire 17 leading to a feed back inductance 18 inductively disposed adjacent one side of the neutralized coil 6. The other end of the feed back coil 18 connects through a wire 19 and the primary winding 20 of a radio frequency transformer to the positive side of a source of plate voltage 21. The other side of the source of plate voltage is connected to the cathode of the tube through a wire 22 in the usual manner. The transformer winding 20 may be bridged by a by-pass condenser 23 in the customary fashion, and a by-pass condenser 24 may also be

provided around the source of plate current voltage 21.

In the operation of the circuit, the source of plate voltage 21 is preferably about fifteen volts, the greatest sensitivity and selectivity being obtained with this as the approximate maximum voltage. Where the plate voltage is considerably in excess of fifteen, I have found that the circuit is less selective and tunes more broadly. The variable capacity 9 is adjusted according to the characteristics of the circuit to secure neutralization. The circuit is operated through the tuning condenser 8, the tuning being much the same as that of any ordinary superheterodyne circuit.

By the use of the counterpoise or aerial 12 connected to the midpoint of the inductance 6, and by the provision of the bridge circuit 13 including the radio frequency choke coil 15, the circuit is much more sensitive than the usual heterodyne circuit and at the same time is just as selective. Furthermore, it is very stable and easy to control, so that it can be satisfactorily used in commercial radio receiving sets, where highly critical characteristics are objectionable. Much of the desirable characteristics of the circuit disclosed in my said patent and the improvement thereon disclosed in my said application is retained in the present circuit with the elimination of the stage of tuned radio frequency amplification with the consequent elimination of parts and the simplification of the circuit.

The apparatus following the primary winding 20 of the transformer in the plate circuit may be of any preferred or conventional apparatus.

While I have illustrated and described a preferred embodiment of the invention, it will be understood that the invention is not restricted to the particular construction and arrangement of parts specifically described, but contemplates the provision of the electrical equivalents of the parts shown, and the invention may be otherwise embodied within the scope and contemplation of the following claims.

I claim:

1. In a radio receiving circuit, an oscillator detector tube having a cathode, a grid and a plate, a neutralized inductance in the grid circuit of the tube, an antenna connected to the midpoint of said inductance, and a shunt circuit connecting the midpoint of the inductance and the cathode of the tube and having a radio frequency choke therein.

2. In a radio receiving circuit, an oscillator detector circuit including a tube having a cathode, a grid and a plate, means for neutralizing the oscillating detector circuit against self-oscillation comprising a grid circuit having inductance arms and capacity arms and further characterized by the fact that said neutralizing means takes the place of a grid leak and grid condenser, a signal input lead wire connected to a point in the bridge circuit, and a shunt circuit around the neutralized detector circuit connecting the input lead and the cathode of the detector tube and having a radio frequency choke therein.

3. In a radio receiving circuit, an oscillator detector circuit including a tube having a grid, cathode and a plate, means including an inductance in the grid circuit for neutralizing the oscillator detector circuit against self-oscillation, an aerial connection at the midpoint of the inductance, and a shunt circuit from the aerial connection to the cathode of the tube having a radio frequency choke therein.

4. In a radio receiving circuit, an oscillator detector circuit including a tube having a grid, cathode and a plate, means including an inductance in the grid circuit for neutralizing the oscillator detector circuit against self-oscillation, an aerial connection at the midpoint of the inductance, and a shunt circuit from the aerial connection to the cathode of the tube having a radio frequency choke therein, said neutralizing means serving also in the place of a grid capacity for the tube.

In testimony whereof I have hereunto set my hand.

MAURICE M. PHILLIPS.