July 7, 1931. J. N. NORDLUND 1,813,194

RADIO APPARATUS

Filed May 4, 1925

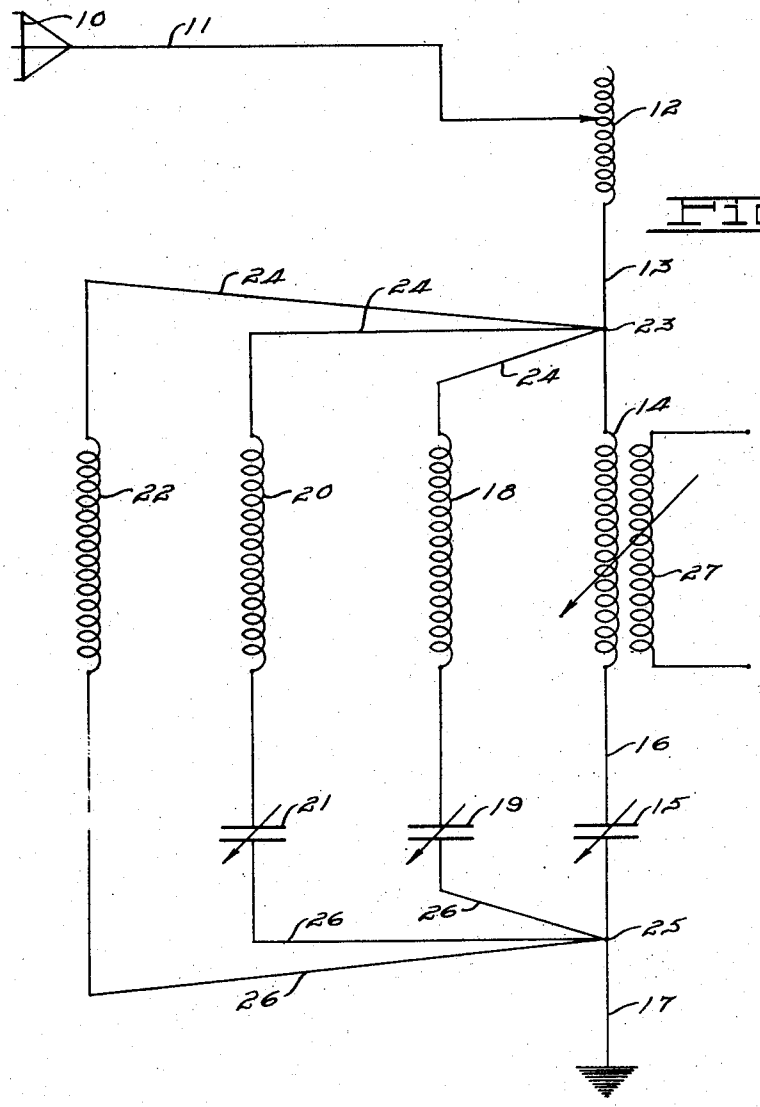


Fig. 1.

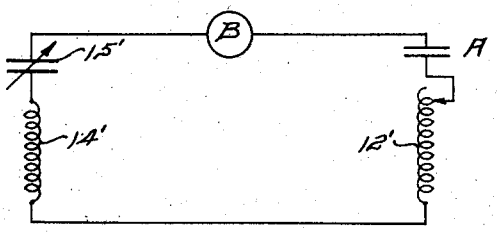


Fig. 2.

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RADIO APPARATUS

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The primary object of my invention is to provide an improved antenna tuning means for increasing the selectivity in radio reception wherein the inductances and capacities are so connected, arranged and varied that interfering signals and other disturbances are shunted around the coupling elements, thereby eliminating the same from the receiving apparatus.

Another object of my improved device provides what may be called a re-tuning apparatus, which may be adjusted so as to be in resonance with the undesired signals for providing a natural and easy path for them to pass to the ground instead of through the receiving apparatus, the parts being so correlated that adjustment of the auxiliary tuning means will not throw out or interfere with the adjustment of the main tuning unit.

A further object of my invention is to provide my improved device with means of low inductance whereby low frequency currents or hums such as come from power lines, trolley wires, etc., are by-passed and at the same time radio frequency currents are not permitted to pass through said low inductance.

It is a further object of my improved device to provide interference eliminating means in a radio apparatus which will be simple and inexpensive to manufacture and install, easy to adjust, positive in action and efficient in service.

With the above and other objects in view, my invention consists in the arrangement, combination and construction of the various parts of my improved device as described in the specification, claimed in my claims and shown in the accompanying drawings, in which:

Fig. 1 is a diagrammatical view of my improved device.

Fig. 2 is a diagram to illustrate the theory of operation of the device illustrated in Fig. 1.

I have shown an antenna 10 and a conductor 11 leading to the variable inductance 12. A fixed inductance 14 and the capacity 15, either variable or fixed, are connected in series with the inductance 12 and with each other by the conductors 13 and 16. The ground wire 17 connects the capacity 15 with the ground.

The by-pass units consisting of the inductance 18 and the capacity 19, the inductance 20 and the capacity 21 and the low inductance 22 are separately connected, by means of the conductors 24, at point 23 to the conductor 13, and at point 25 to the ground wire 17 by means of the conductors 26. These units are placed in parallel relation with each other and with the inductance 14 and the capacity 15.

A conventional type receiving set is connected with the inductance 14 by means of either a conductive or inductive coupling 27.

In the practical operation of my improved device, the main unit consisting of the inductance 12, the conductor 13, the inductance 14, the conductor 16 and the capacity 15 are tuned to resonance with the frequency of the desired signal by the aid of variable tuning elements so that the inductance 14 and the capacity 15 are individually tuned. Thus, these elements are in resonance with the frequency corresponding with the wave length desired. In other words, if the inductance 14 and the capacity 15 were removed, the ground wire 17 brought up to the lower side of inductance 12, there would still be a tuned circuit consisting of the antenna 11, the inductance 12 and the ground connection 17. If these elements are in tune or in resonance individually, they may as a matter of course be in resonance collectively. This being the case, the resistance through inductance 14 and capacity 15 is low because the impedance of inductance 14 and capacity 15 tends to neutralize each other.

This may be illustrated by reference to Fig. 2 which may be likened to applicant's invention, differing only in fact that the antenna ground capacity is represented by the condenser A, B being a device to emit a high frequency current and having a negligible impedance through it. Now supposing that the capacity 15′ and the inductance 14′ are brought to resonance with some particular high frequency current emitted by B, and, likewise, the capacity A and inductance 12′ is brought to resonance with the same fre-

quency, then a condition arises where the inductances 14′, 12′ and capacities A, 15′ are in tune to that particular frequency collectively, or as a whole, and where also the capacity 15′ and inductance 14′ are in tune individually. Therefore, this series tuned circuit can be regarded as having two individually tuned sections, a condition which applicant's invention employs.

Thus, the by-pass units 18—19 and 20—21 connected in parallel with the individually tuned section and providing the said units are not tuned to the wavelength of desired signals, will have much greater impedance to the current of desired signals than the part 14—15 in antenna unit across which said units are connected, and this being the case, the desired signals will follow the path of low resistance into the receiving set. On the other hand, each of these by-pass units, if tuned to the frequency of some interfering signal, will readily by-pass the same on account of its resistance to the interfering signals being much less than through the coupling element in a receiving apparatus. Therefore, these interfering signals will not be recorded in the receiving apparatus.

By inserting the low inductance coil 22, low frequency currents that are caused by power lines, etc., are readily by-passed from the receiving unit and at the same time the radio currents are not disturbed.

I desire it to be understood that my improved by-pass units can be used with a variable inductance or capacity, or both connected in series or in parallel with a fixed inductance and a capacity in series, the entire device being placed between the antenna and ground connections of a radio circuit.

It is obvious that various changes may be made in the arrangement, combination and construction of the various parts of my improved device without departing from the spirit of my invention and it is my intention to cover by my claims such changes as may be reasonably included within the scope thereof.

What I claim is:

1. In combination, a tuning unit consisting of a variable inductance connected in series with a fixed inductance and a variable capacity interposed between the antenna and ground connections of a radio circuit, low resistance by-pass units for eliminating interfering frequencies, each of said by-pass units comprising an inductance and a variable capacity in series connected in parallel relation with said fixed inductance and variable capacity and a low inductance also connected in parallel relation with said fixed inductance and variable capacity for by-passing low frequency currents.

2. In combination, a variable inductance having an antenna connection, an individually tuned section, a conductor connecting in series said section to said variable inductance, said section comprising a fixed inductance and a capacity in series, a ground connection leading from said capacity, low resistance by-pass units for eliminating interfering frequencies placed in parallel relation with said section, said units comprising an inductance and a capacity one or the other of which is variable, and wires connecting separately at one point each of said by-pass units with said conductor and said ground connection.

3. In combination, a radio tuning unit comprising a variable tuning means connected in series with an individually tuned section having a fixed inductance and a capacity in series, said unit interposed between the antenna and ground connection of a radio circuit and a plurality of individually tuned unimpeded by-pass units for eliminating interfering frequencies connected in parallel relation with said section, one or more of said by-pass units comprising a fixed inductance and a variable capacity in series and one of said by-pass units consisting of a low inductance coil for low frequencies.

4. In a radio receiving circuit consisting of a main tuning unit having an inductance and an individually tuned section, the combination therewith of selectively tunable low resistance tuning units and a low inductance connected in parallel relation with said section for providing paths for undesired signals, low frequencies and other disturbances to pass around said tuned section to the ground, thereby allowing a clear passage through said section for only the desired signals, said selectively tunable units comprising an inductance and a capacity connected in series.

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