May 1, 1934. H. C. ATKINS 1,956,705

WIRELESS RECEIVER

Filed June 21, 1930

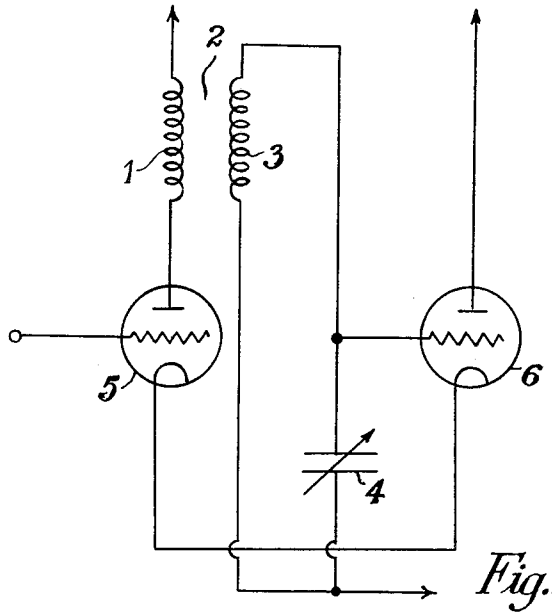


Fig.1.

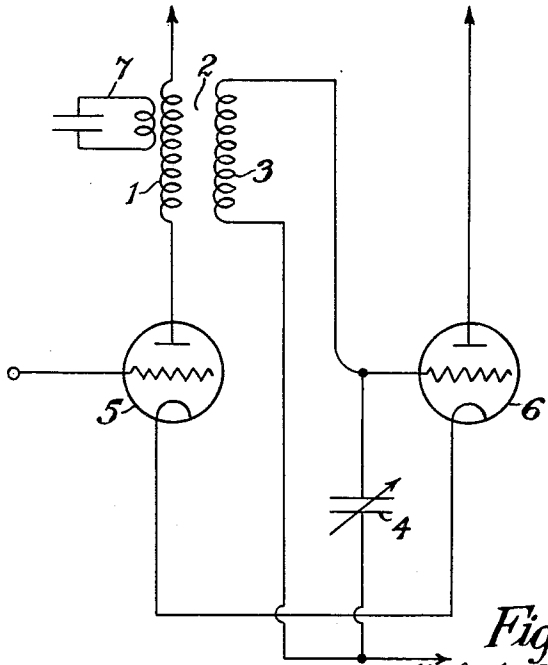


Fig.2.

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WIRELESS RECEIVER

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2 Claims. (Cl. 178—44)

The present invention relates to wireless receivers and in particular to receiving systems employing one or more stages of high frequency amplification with tunable circuits for coupling these stages.

In such receiving systems it is usual for the amplification of the received signals to increase as the frequency to which the coupling circuits are tuned increases. This is due (*a*) to the fact that the voltage developed across a circuit containing capacity and inductance varies inversely as the capacity C and directly as the inductance L and hence the voltage, and consequently the amplification increases as the ratio

$$\frac{L}{C}$$

increases; and (*b*) to the fact that the resonant frequency of an inductance or inductances in the coupling circuit is usually higher than the frequencies covered by the tuning range of the circuit.

It is an object of the present invention to provide in a wireless receiver means for securing substantially constant amplification throughout the tuning range of the receiver.

According to the present invention this object is attained by providing the receiver with a coupling circuit in which the resonant frequency of an inductance in said circuit is arranged to be below the frequency covered by the tuning range of the receiver. The use of such an arrangement will result in a tendency for the amplification to decrease with increase of frequency, and, due to influence (*a*) described above it will simultaneously tend to increase. Thus the combined effect of the two influences will be to produce substantially even amplification throughout the tuning range.

The invention will be described by way of example with reference to the accompanying drawing in which

Fig. 1 shows a circuit employing tuned transformer coupling embodying the invention and

Fig. 2 shows an alternative form of the invention as applied to the circuit of Fig. 1.

Referring to Fig. 1, the incoming oscillations are applied to the grid of the thermionic valve 5, the anode of which is connected through the primary winding 1 of a transformer 2 to a positive potential point of the high tension source. One end of the secondary winding 3 of the transformer is connected to the grid of the succeeding valve 6 the other end being connected to a point on the grid bias source. A variable condenser 4 is connected in parallel with this winding.

The primary winding 1 of the transformer 2 is designed so that its inductance together with its distributed capacity resonate at a frequency below the tuning range, or what amounts to the same thing, its dynamic resistance is arranged to equal the impedance of the valve 5, in whose anode circuit it is connected, at a frequency below the tuning range. Instead of employing a specially designed winding, a separate damped tuned circuit 7 (Fig. 2), resonant at this lower frequency may be coupled to either winding of the transformer.

The last mentioned modification permits of more even amplification of the frequencies lying within the tuning range. This appears to be for the reason that the impedance in the plate circuit of valve 5 can be adjusted very readily to a desired value by fixing the coupling between the damped tuned circuit 7 and the primary winding 1, which is not the case when a single winding resonant below the range is used. If an attempt is made to control the impedance of the single primary winding by variation of the

$$\frac{L}{C}$$

ratio, the attenuation of the high frequencies is often found to be serious. It is also my belief that something of a band-pass effect is obtained since the natural period of the primary winding 1 is much higher than that of the damped tuned circuit 7. Insofar as the damping feature is concerned, this tends to broaden the selectivity characteristic of the system at the low frequency end of the tuning range with beneficial results and, at the same time, it permits of closer approximation to the impedance of the valve.

Although the invention has been described with particular reference to a receiver employing tuned transformer coupling between its stages it can also be applied to the case of a receiver employing tuned anode coupling. In this case the resonant frequency of the inductance in the anode circuit of each valve is arranged to be below the tuning range by means substantially the same as those previously described.

I claim:

1. In a radio apparatus, the combination with a pair of thermionic valves, one of said valves having an anode and the other of said valves having a control grid, of means for coupling said anode with said grid including a circuit having a coupling winding connected with said grid, said circuit being tunable over a predetermined range of frequencies, a second circuit connected with said anode and including a coupling winding asso-

ciated with said first named winding, and a separate damped tuned circuit resonant at a frequency below said range of frequencies coupled to the last named winding to adjust the impedance of said anode circuit to that of the valve therein, at the frequency to which the damped circuit is resonant.

2. In an amplifier, two thermionic valves connected in cascade, the coupling means between the said valves being constituted by a primary winding in the output circuit of the first valve and a tunable secondary winding constituting the input circuit of the second valve, the said tunable circuit being adapted to cover a predetermined range of frequencies, and a separate damped tuned circuit inductively coupled to the primary winding and being resonant at a frequency lower than the lowest frequency in said predetermined range, whereby the impedance introduced into said output circuit at the resonant frequency of the damped tuned circuit may be adjusted to a value comparable to the impedance of the first valve and all frequencies within the said range may be amplified to substantially the same degree.

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