May 9, 1933. H. MUTH 1,907,653

SHORT WAVE RECEIVER

Filed Feb. 21, 1930

Fig. 1

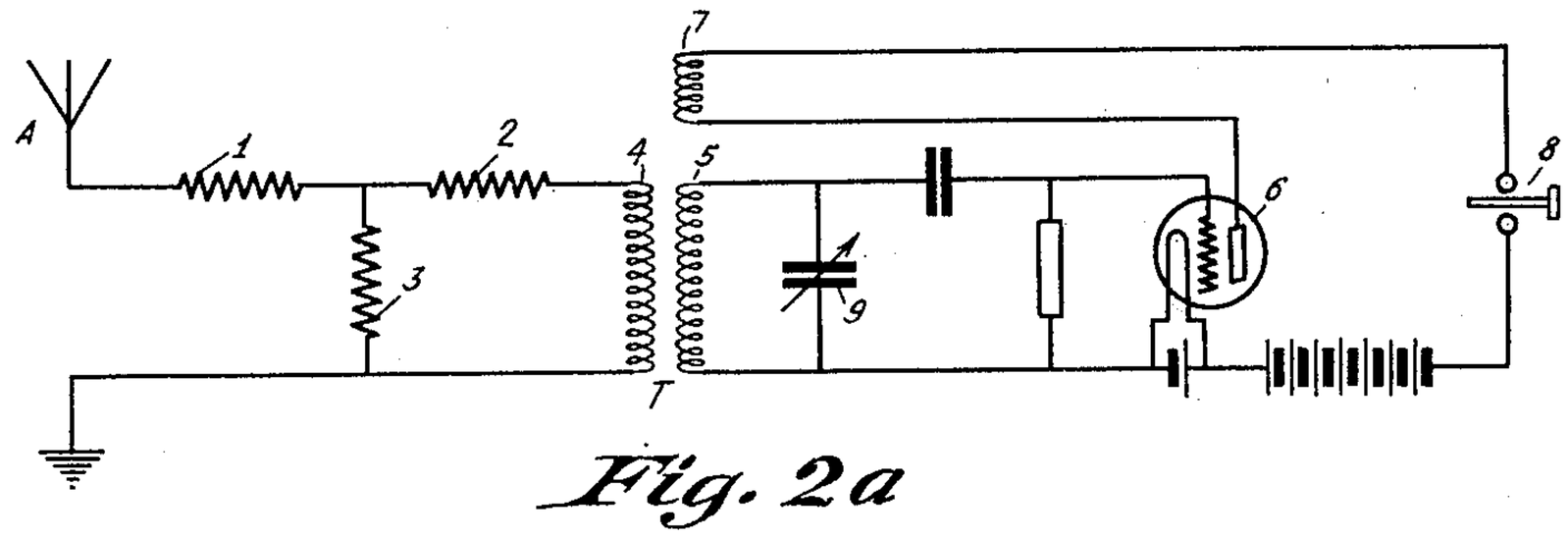


Fig. 2a

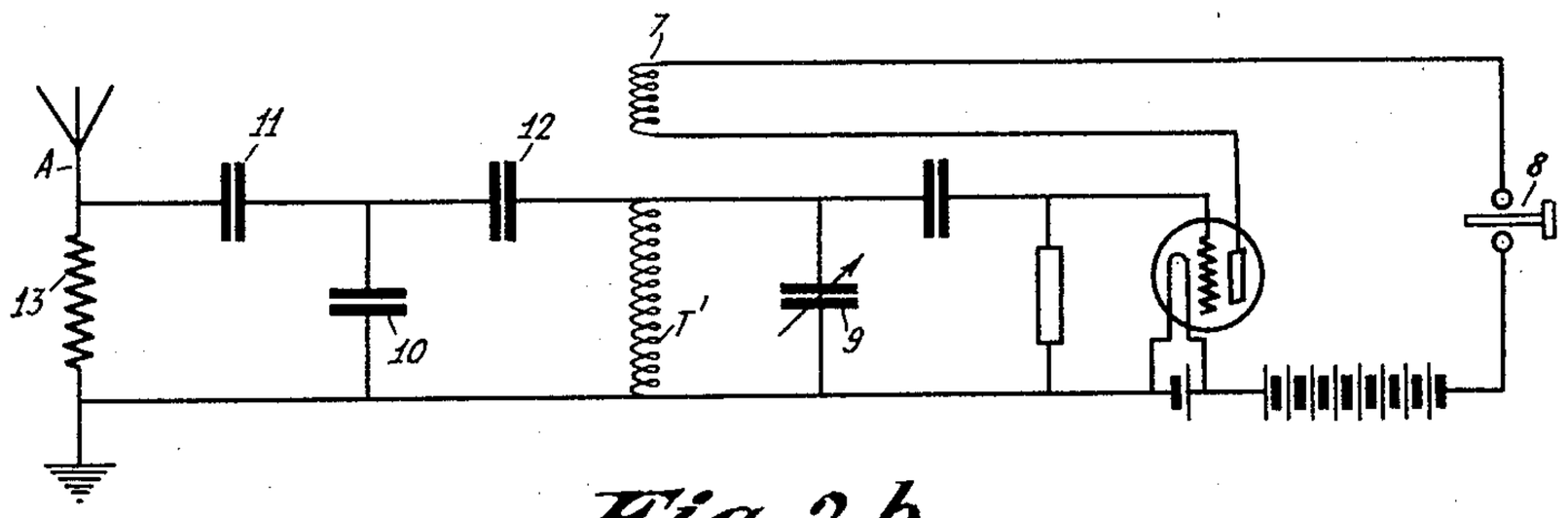
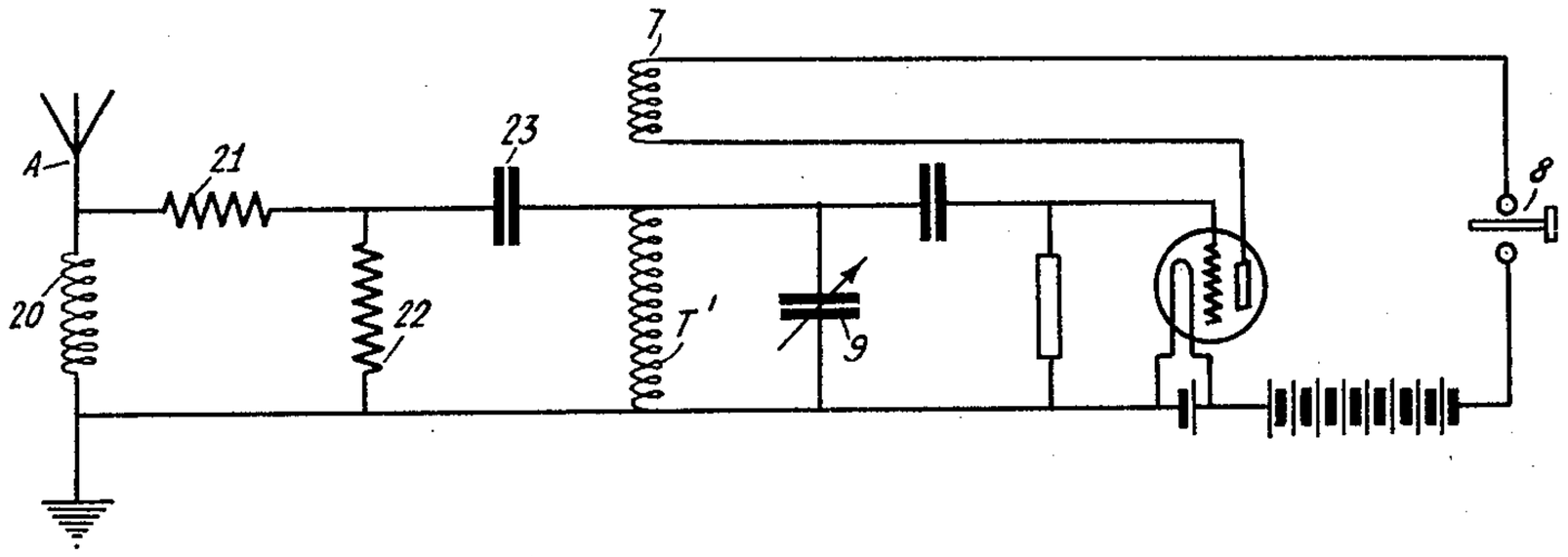


Fig. 2b



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SHORT WAVE RECEIVER

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My present invention relates to radio receivers, and more particularly to circuit arrangements for the reception of radio frequency signals, especially adapted for short wave work.

The use of short wave receiver apparatus in which the antenna is coupled directly with a regeneratively connected audion tube is frequently handicapped by the fact that small swaying of the antenna, for instance caused by wind, results in appreciable detuning of the receiver set, fluctuations in the audible beat note and noises. When the receiver is tuned to a wave at which the antenna is in resonance, this results in a marked absorption of energy in the audion tube oscillatory circuit, and as a consequence the initiation of the regenerative action therein is either made rather difficult or entirely impossible. Indeed, these difficulties are so serious that, with a view to eliminating them, tubes have been provided between the antenna and the regenerative audion tube circuit with the sole aim to preclude disturbances in the receiver set occasioned by swaying and by resonance points of the antenna, and complications in operating the apparatus.

Now, the effects of the swaying of the antenna upon the reception may be minimized to any desired degree by loose coupling of the antenna. However, the influences due to resonance points of the antenna upon the readiness or ability to oscillate of the receiver and the operation of the set are thus not sufficiently reduced. For, if the antenna is coupled so loosely that its resonance points will no longer affect the oscillating ability of the receiver set, this would result in a considerable reduction in volume of the receiver set.

This difficulty, according to the present invention, is obviated by inserting between the antenna and the receiver a system or connection comprising ohmic resistances having a characteristic impedance which is so chosen that it will be as closely adapted as possible to the average antenna impedances arising at the different incoming wave lengths, on the one hand, and to the regenerative audion tube circuit, on the other hand.

The novel features which I believe to be characteristic of my invention are set forth in particularity in the appended claims, the invention itself, however, as to both its organization and method of operation will best be understood by reference to the following description taken in connection with the drawing in which I have indicated diagrammatically several circuit organizations whereby my invention may be carried into effect.

In the drawing,

Fig. 1 shows a receiver embodying my invention,

Figs. 2*a* and 2*b* show receivers embodying modified forms of the invention.

Referring to the accompanying drawing in which like reference characters in the different figures designate the same elements, Fig. 1 illustrates the fundamental principle of the invention. In this figure, a grounded antenna A is connected through ohmic resistances 1, 2, 3, as shown, to the primary 4 of a coupling transformer T.

The secondary 5 is connected to the input circuit of thermionic tube 6, the anode circuit of the tube including a utilization device 8, as a speaker or phones. The anode circuit includes a feed back coil 7 coupled to the secondary 5 for regeneration, the input circuit being tuned by the variable capacity 9. The remainder of the circuit is conventional, and well known to those skilled in the art. As already explained, the invention is particularly adapted to short wave reception.

With such a system between antenna and audion, independently of the antenna dimensions and the tuned wave length present in any given instance, the load of the audion is nearly constant. Antenna swaying and resonance points of the antenna are scarcely noticeable in the receiver even when the resistances are so proportioned that the reduction in signal strength is still inside acceptable limits.

The value which has been found to be most suited for the characteristic impedance

was, for instance, around 1000 ohms, and the damping about 1 "Neper". Reactions of the antenna through this system are not noticeable at all, while the reduction in volume amounts to around 1:3.

While damping means comprising ohmic resistances constitutes the cheapest way of carrying the idea into effect, the same effects, fundamentally speaking, are attainable with systems consisting wholly or partially of reactances. In Figs. 2*a* and 2*b* are shown modified circuits embodying such reactances.

In Fig. 2*a*, a resistance 13 is connected directly in the antenna, a capacity 10 being shunted across the resistance. A pair of capacities 11, 12 are disposed on either side of the capacity 10. Instead of using the transformer T, a common inductance T′, coupled to the feed back coil 7, is employed for coupling the antenna circuit and the tuned tube input circuit.

The antenna circuit A, in Fig. 2*b*, includes an inductance 20, in place of the resistance 13, in shunt with a resistance 22, the coupling coil T′ still being utilized. A resistance 21 is connected in series with coil 20 and resistance 22, while a capacity 23 is connected in series between the resistance 22 and the coil T′.

While I have indicated and described several systems for carrying my invention into effect, it will be apparent to one skilled in the art that my invention is by no means limited to the particular organizations shown and described, but that many modifications in the circuit arrangements, as well as in the apparatus employed, may be made without departing from the scope of my invention as set forth in the appended claims.

What I claim is:—

1. In combination, in a radio receiving system, an antenna circuit, an electron discharge tube having a tunable input circuit and an output circuit, means for aperiodically coupling said antenna circuit and said tunable input circuit, said means consisting of a plurality of resistors arranged in a predetermined manner to render the tuning of said input circuit independent of antenna capacity changes due to swaying of the antenna, the impedance of said resistors being substantially 1000 ohms.

2. In combination with a short wave regenerative receiver having a tunable input circuit and an antenna having sufficient capacity variations when swaying to affect the tuning of the receiver input circuit, an aperiodic coupling network connected between the antenna and said input circuit, said network including at least a resistor in shunt with said input circuit, and the characteristic impedance of said network being substantially 1000 ohms whereby said antenna capacity variations due to swaying have substantially no effect on the tuning of said input circuit.

3. In combination with a short wave receiver having a tunable input circuit and an antenna having sufficient capacity variations when swaying to affect the tuning of the receiver input circuit, an aperiodic coupling network connected between the antenna and said input circuit, said network including at least a resistor in shunt with said input circuit, and the characteristic impedance of said network being such that said antenna capacity variations due to swaying have substantially no effect on the tuning of said input circuit.

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