

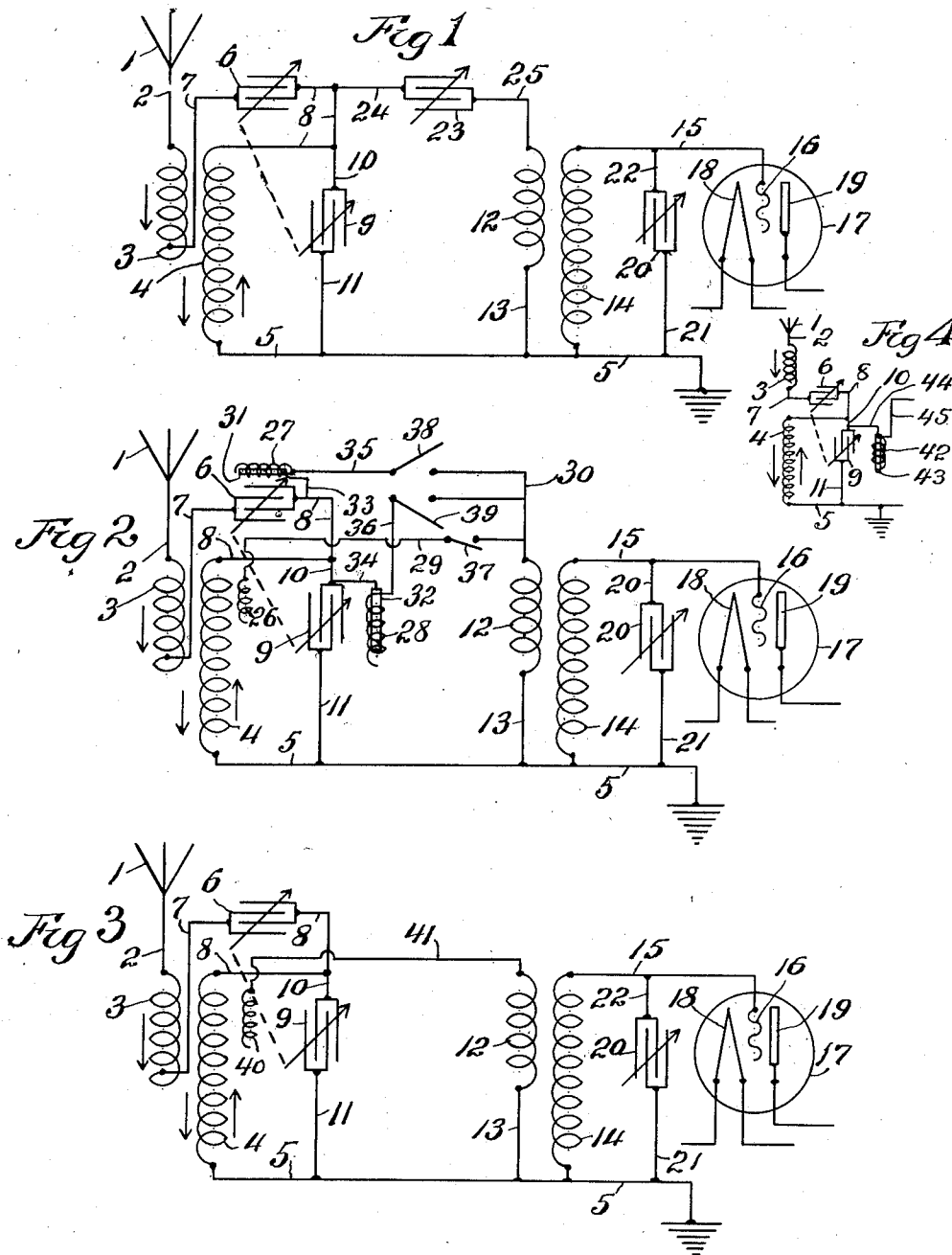
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P. K. GIDDENS

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RADIO RECEIVING SYSTEM

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Witness
H. S. Olson

INVENTOR
Paul K. Giddens
BY Warren K. House
His ATTORNEY

UNITED STATES PATENT OFFICE

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RADIO RECEIVING SYSTEM

Paul K. Giddens, Kansas City, Mo., assignor to
Pagenhart Research Corporation, Kansas City,
Mo., a corporation of Missouri

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My invention relates to improvements in radio receiving systems.

One of the objects of my invention is to provide a novel antenna system adapted for use with or as a part of a usual radio receiving set, which is simple, greatly increases the strength of signals given out, and improves the selectivity and tonal qualities of the set with which it is employed, and which is efficiently used for wave lengths and frequencies which widely vary.

The novel features of my invention are herein-after fully described and claimed.

In the accompanying drawing, which illustrates my invention,

Fig. 1 is a diagrammatic view of a circuit embodying one form of my invention.

Fig. 2 is a diagrammatic view of a circuit embodying another form of my invention.

Fig. 3 is a diagrammatic view of a circuit embodying still another form of my invention.

Fig. 4 is a diagrammatic view of one form of my antenna circuit in which the primary and secondary induction coil windings are alined and one above the other.

Referring to Figs. 1 to 4, the circuits shown are alike in all of the forms, excepting as to the output connections thereof respectively. In each form of my invention the following described parts are embodied.

1 designates a usual antenna which is connected in series by an aerial connection 2 with one end, being the upper end, as shown, of a primary winding or inductance 3. 4 designates an element comprising a secondary winding or inductance which is inductively related to the primary winding 3.

In Figs. 1, 2 and 3, the windings 3 and 4 are shown in the conventional manner, disposed side by side, while in Fig. 4, the windings are shown alined with the primary winding 3 above the secondary winding 4, as they are commonly disposed in ordinary types of induction coils. In both forms, however, the windings are inductively related in a like manner.

The lower end of the secondary winding 4 is connected to ground by a conductor 5. Conducting means, including an element comprising a condenser 6, connects the lower end of the primary winding 3 with such end, being the upper end, as shown, of the secondary winding 4 that a received impulse passing downwardly through the aerial connection 2 and the primary winding 3, will also pass downwardly through the secondary winding 4, as indicated by the arrows respectively at the left of the windings 3 and 4.

The conducting means, which includes the condenser 6, includes a conductor 7 connected at one end to the lower end of the primary winding 3, its other end being connected to the rotor, preferably, of the condenser 6, which, as shown may be a variable one, the stator of which is connected by a conductor 8, as shown, with the upper end of the secondary winding 4. In each form of my invention, as shown in Figs. 1 to 4, the windings 3 and 4 are vertically disposed, and the upper end of the primary winding 3, being connected to the aerial, is the high potential end. The lower and low potential end of the primary winding 3 is connected to the upper end of the secondary winding 4, which end, due to the inductive relationship between the windings, is the high potential end of the secondary winding 4, the lower end of which, being nearest to ground, is the low potential end thereof.

Conducting means, including an element comprising a variable condenser 9 is shunted across the secondary winding 4, said conducting means including a conductor 10, is connected to the conductor 8 and to the stator of the condenser 9 the rotor of which is connected by a conductor 11 to the conductor 5.

A second circuit to be supplied by the antenna circuit, just described, comprises a primary winding 12 one end, the lower one as shown being connected by a conductor 13 with the grounded conductor 5. Inductively related to the primary winding 12 is a secondary winding 14, one end, the lower one, as shown, being connected to the grounded conductor 5. The upper end of the winding 14 is connected by a conductor 15 to grid 16 of a radio tube 17.

The tube 17 is of the usual radio vacuum tube provided with the usual filament 18 and plate 19.

Conducting means including a variable condenser 20 connected by a conductor 21 to the grounded conductor 5, and by a conductor 22 to the conductor 15 is shunted across the secondary winding 14.

In Fig. 4 the second circuit, just described, is omitted, but as will be hereinafter described, the antenna circuit shown in Fig. 4 may be used in connection with the second circuit for supplying the latter with energy.

The condensers 6 and 9 preferably have their rotors oscillative with each other, as indicated by the dotted line connecting them in the different figures, thereby requiring but one controlling member for the antenna circuit.

Referring to Fig. 1, the output connection for conveying energy from the antenna circuit to the

second circuit comprises conducting means including a variable condenser 23 which is connected by a conductor 24 to the conductor 8, said condenser 23 being connected by a conductor 25 to the upper end of the primary winding 12. The output connection just described is thus connected capacitively with the condensers 6 and 9.

In Fig. 2, the output connection shown includes three small windings 26, 27 and 28. The winding 26 is disposed closely adjacent to the upper portion of the secondary winding 4 so as to be inductively related thereto. One end of the winding 26 is connected by a conductor 29 to a conductor 30 connected to the upper end of the primary winding 12 of the second circuit.

The windings 27 and 28 are respectively capacitively related to the condensers 6 and 9, preferably by respectively encircling and being spaced from and insulated from two conductive cores 31 and 32 respectively connected by conductors 33 and 34 to the conductor 8.

Conductors 35 and 36 respectively connect the windings 27 and 28 with the conductor 30.

The conductors 29, 35 and 36 are respectively provided with circuit closers 37, 38 and 39, by which these branches of the output connection may be separately or simultaneously employed.

In the form shown in Fig. 3, a winding 40 inductively related to the upper portion of the secondary winding 4 is connected by a conductor 41 to the upper end of the primary winding 12, and forms with said conductor the output connection.

In Fig. 4, the antenna circuit shown, corresponds to the antenna circuits in Figs. 1, 2 and 3, excepting for the disposition, as has been stated, of the primary winding 3 above and aligned with the secondary winding 4, and with the exception of the output connection. The latter comprises, in Fig. 4 a winding 42 capacitively related to the condenser 9 by encircling and being spaced from and insulated from a conductive core 43 connected by a conductor 44 to the stator of the condenser 9. Connected to the winding 42 is a conductor 45 adapted to be connected to the upper end of the primary winding 12 of the second circuit.

As in the other forms, the form shown in Fig. 4 has the lower end of the primary winding 3 connected by a conductor 7 to the rotor of the condenser 6, the stator of which is connected by a conductor 8 to the upper end of the secondary winding 4, the lower end of which is connected by a conductor 5 to ground. The condenser 9 is connected at its stator by a conductor 10 to the conductor 8, and the rotor of the condenser 9 is connected by a conductor 11 to the conductor 5, as in the other forms shown.

In the operation of each form of my invention, impulses traveling in one direction through the windings 3 and 4, as downwardly as indicated by the arrows at the left of the windings 3 and 4, will induce impulses which will travel in the opposite directions through the secondary winding 4, or upwardly as indicated by the arrow at the right of the winding 4.

This reversal of phase of the secondary winding 4 effects a notable increase in the strength of the signals discharged into the receiving set through the output connections, as the parts 23, 24 and 25, in Fig. 1; the elements 27, 33, 35, 38 and 30, when the switch 38 is closed, Fig. 2; the elements 26, 29, 37 and 30, Fig. 2, when the switch 37 is closed; the elements 28, 34, 36, 39 and 30, Fig. 2, when the switch 39 is closed; the elements

40 and 41, Fig. 3; and the elements 42, 45 and 44, Fig. 4.

In Fig. 1, an impulse traveling downwardly from the aerial connection 2 will pass downwardly through the primary coil 3 thence through the conductor 7, condenser 6 and conductor 8 to the upper end of the secondary winding 4 through which the impulse will tend to travel downwardly, but will be opposed by the induced impulse tending to travel upwardly in the winding 4.

This will direct a large amount of the energy received to the output connection and it will pass therethrough by the conductors 24 and 25 and condenser 23 to and through the primary winding 12, and thence to ground through the conductor 5. The impulses induced in the secondary winding 14 will pass upwardly therethrough to the grid 16 through the conductor 15. The two condensers 9 and 20 which respectively are shunted across the secondary windings 4 and 14, respectively, attune the two circuits in which said windings are respectively located.

The impulses passing downwardly from the aerial connection 2 in the other forms, Figs. 2, 3 and 4, will travel, as has been described with reference to the form shown in Fig. 1, through the antenna circuit and through the receiving set circuit, with the exception as to the output connections in the several forms.

In Fig. 2, the windings 26, 27 and 28 are respectively influentially related to the winding 4 and the condensers 6 and 9. The winding 26 is inductively related to the winding 4, and the windings 27 and 28 are capacitively related, through the conductor 33 and core 31, and the conductor 34 and core 32 respectively with the condensers 6 and 9. Thus the impulses received in the coils 26, 27 and 28 will, when the switches 37, 38 and 39 are closed, travel to the primary winding 12 through the paths connected therewith, as hereinbefore described.

In Fig. 3, the impulses induced in the winding 40 will travel through the conductor 41 to the winding 14.

In Fig. 4, the impulses received in the winding 42, by its capacitive relationship to the condenser 9 through the core 43 and the conductor 44, will travel through the conductor 45 to the input of the receiving set, as the primary winding 12, when the conductor 45 is connected thereto, as are the conductors 25, 30 and 41, in Figs. 1, 2 and 3 respectively.

The term "influentially related", as herein employed, is intended to designate generically the electrical relationship specifically designated herein as "inductively" and "capacitively" related.

In each form of my invention, shown in Figs. 1 to 4, the output connection of the antenna circuit is influentially related, capacitively or inductively, to that portion of the circuit which includes the high potential end of the secondary winding 4. This construction subjects the output connection to the direct action of the received impulses, in addition to the inductive action thereof. By non-grounding the primary winding 3, by the insertion between it and the secondary winding 4 of the condenser 6, the direct action of the received impulses upon the output connection is greatly augmented, and the combined effect of the direct and the inductive actions upon the output connection is much more pronounced than would be the inductive action alone.

By shunting the variable capacity coupling 9

across the secondary winding 4, in the different forms of my invention, the secondary circuit thus formed may be made to resonate at the same frequencies as the primary circuit tuned by the variable capacity coupling 6, thus building up the voltage, setting up a high rejection to undesired frequencies and greatly increasing selectivity. Shunt tuning of the secondary winding 4 also permits of alining or tracking when the antenna circuit is used in connection with succeeding shunt tuned circuits, enabling the use of a single tuning control of the multiple tuned circuits.

By having the output connection capacitively related to one of the variable capacity couplings 6 or 9, as shown in Figs. 1 and 2, or inductively related to the tuned secondary winding or conductor 4, as shown in Figs. 2 and 3, the antenna circuit may be used as an auxiliary to a shunt tuned completed receiving set already in use, and may have its output connection coupled directly to the intake terminal of such set.

This application is a continuation in part of my application No. 463,090, filed June 23, 1930, for an improvement in radio antenna systems.

I do not limit my invention to the structures shown and described, as many other modifications, within the scope of the appended claims, may be made without departing from the spirit of my invention.

What I claim is:—

1. In a radio antenna circuit, an aerial conductor, a primary inductance connected at one end to said aerial conductor, a variable condenser

connected to the other end of said primary inductance, a second variable condenser connected to ground and in series with said primary inductance through said first named condenser, a secondary inductance inductively related to said primary inductance and shunted across said second condenser only, and an output capacity coupling connected to said first named condenser.

2. In a radio antenna circuit, an aerial conductor, a primary inductance connected at one end to said aerial conductor, a variable condenser connected to the other end of said primary inductance, a second variable condenser connected to ground and in series with said primary inductance through said first named condenser, a secondary inductance inductively related to said primary inductance and shunted across said secondary condenser only, and an output connection inductively related to said secondary inductance.

3. In a radio antenna circuit, an aerial conductor, a primary inductance connected at one end to said aerial conductor, a variable condenser connected to the other end of said primary inductance, a second variable condenser connected to ground and in series with said primary inductance through said first named condenser, a secondary inductance inductively related to said primary inductance and shunted across said secondary condenser only, and an output capacity coupling connected to said second named condenser.

PAUL K. GIDDENS.