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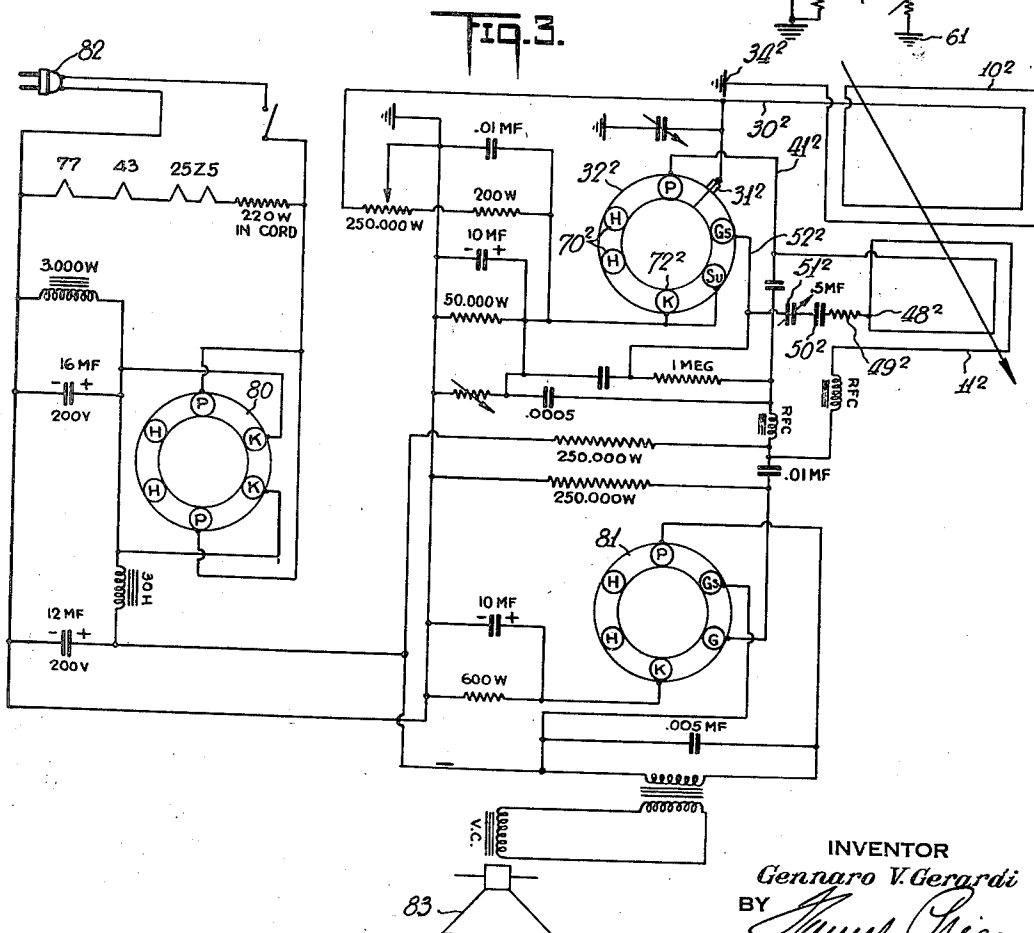
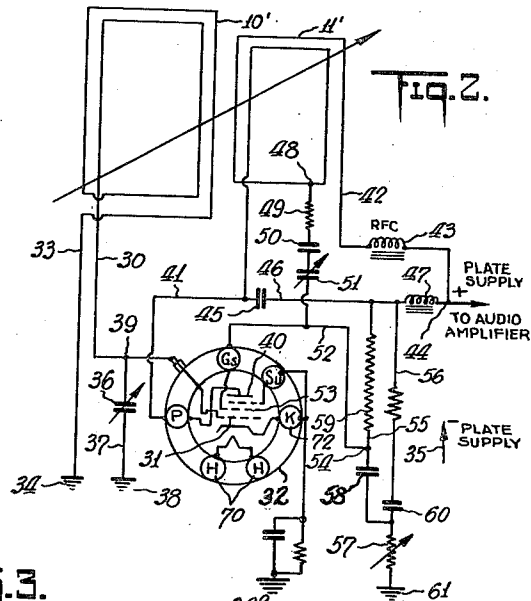
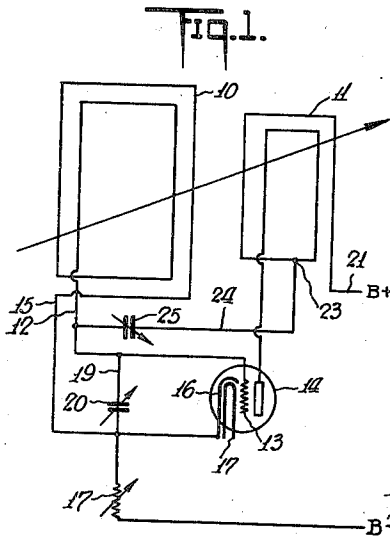
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2,185,336

RADIO RECEIVING SYSTEM

Filed July 8, 1938

2 Sheets-Sheet 1



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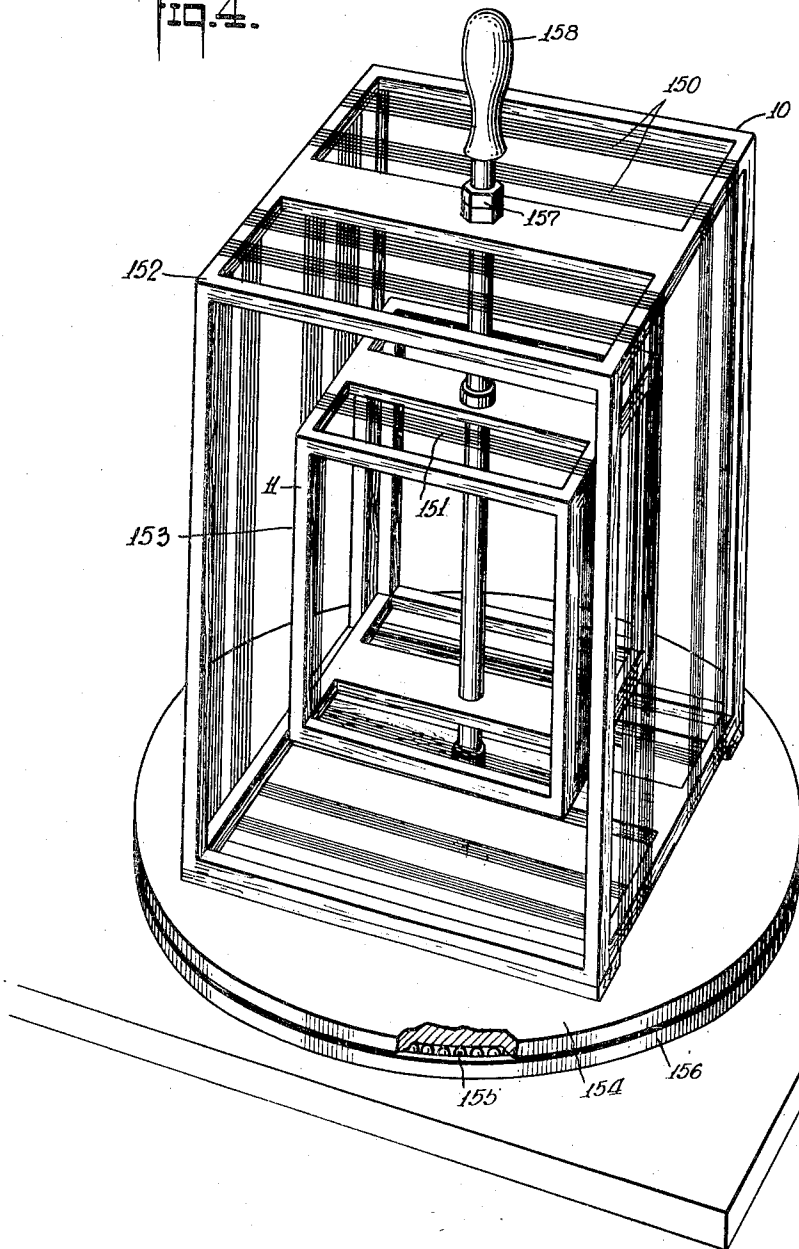
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Fig. 4.



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RADIO RECEIVING SYSTEM

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9 Claims. (Cl. 250—20)

The present invention relates to a radio receiving system and it particularly relates to a radio receiving system having enhanced compactness.

In the usual type of radio receiving system now in utilization it is necessary to use a relatively large number of tubes to obtain satisfactory reception and reproduction and it is also usually necessary to have rather large or elongated outside aerials which either must be strung around within the room or be connected to an extension outside of the building structure.

It is among the particular objects of the present invention to provide an improved and more compact radio receiving set construction in which the entire system may operate with the most satisfactory reception and reproduction with a minimum number of tubes and without the necessity of extensive external aerial constructions.

Other objects will be obvious or will be readily apparent during the course of the following specification.

In accomplishing the above objects it has been found most satisfactory to provide a double loop antenna, the loops of which may be mounted so that both of the loops may be rotated and/or so that one of the loops may be rotated within the other. This double loop antenna may be compactly positioned within the confines of the radio cabinet or radio set casing itself without the necessity of external connections.

In the preferred construction, the external loop, which may be square or rectangular, may act as a pick-up coil or antenna and also as a primary to the inner rectangular or square loop. The inner loop may act also as a secondary or tickler and both loops may be rotated together for directional purposes or at slight angles to one another.

The ends of the external loop preferably are connected to the grid and ground, while the internal loop may be connected in the plate circuit and also tapped to make connection to the grid of the same tube, thereby causing a feed back from the plate to the grid. This connection from the inner loop to the plate circuit may be controlled by resistances and variable condensers if desired.

By the use of this loop construction it is possible wholly or largely to eliminate radio frequency amplification, if desired. Audio frequency amplification systems however may be included in order to get volume.

In the drawings which show several specific embodiments of the present invention by way of illustration, but to the details of which the pres-

ent invention is by no means restricted, since many changes and alterations are possible.

Fig. 1 is a diagrammatic view of one wiring arrangement showing the loops positioned side by side connected to a three-element tube,

Fig. 2 represents another diagram illustrating the connections of the two loops to a multi-element tube,

Fig. 3 is a complete wiring diagram illustrating a complete circuit including the necessary amplification circuits which may be added to the primary circuit of the present invention.

Fig. 4 is a perspective view showing the loop construction.

Referring to Fig. 1, the loop 10, constituting an inductance, may be square or rectangular, if desired, and it may act not only as a pick-up coil and antenna, but also as a primary for the inside loop 11, which if desired may be independently rotatably mounted in respect to the loop 10.

In Fig. 4 is shown the outer loop 10 and the inner loop 11, both of which loops may be wound in groups as indicated at 150 and 151 amounting to anywhere from 2 to 10 turns per group, as indicated at 150 and 151, upon boxlike structures 152 and 153. Both structures 152 and 153 may be positioned on the turn table 154 which may have a ball bearing mount 155 upon the base 156. The loop structure 11 may be rotated to be set at a different position in respect to the loop structure 10 and then the two loop structures may be fixed in position in respect to each other by means of the lock nuts 157, the handle 158 permitting movement or turning of the combined loop structure 10 and 11.

The loop 11 acts as the secondary or tickler. One end 12 of the loop 10 is connected to the grid 13 of the tube 14, while the other end 15 may be connected to the thermionic emitting element 16 which is provided with a heating filament 17.

This same end may also be connected through the condenser 16a and the variable resistance 17 to the minus plate supply 18. A connection between the ends 12 and 15 of the antenna 10 may contain the variable condenser 20.

The inner loop 11 has one end 21 connected to the plus plate supply 22. The loop 11 is also tapped at 23 and connected through the lead 24 and the variable condenser 25 to the end 12 of the outside loop 10.

This circuit, as just described, shows the basic arrangement of the novel circuit herein and with such circuit there is assurance that there will be

maximum reception and high reproduction with great compactness.

In the diagram of Fig. 2 the outer loop 10' and the inner loop 11' are connected in an equivalent manner, as shown in Fig. 1, with the loop 10' constituting the inductance and the loop 11' constituting the secondary or tickler.

One end 30 of the loop 10' is connected to the grid 31 of the tube structure 32 and the other end 10 33 is connected to the ground 34 or to the minus of the plate supply 35 in the same manner as shown in Fig. 1.

The outside loop 10' is preferably tuned by the variable condenser 36 which is placed upon the lead 37 connected to the ground 33.

It will be noticed that the conductor 37 is also connected at 38 to the leg 39 of the outside loop 10', which leg 39 is connected to the grid 31.

If desired, the lead 37 at the ground end could be conducted to the minus plate supply, indicated at 35.

The inside loop 11' is connected in the circuit of the plate 40 by the connection 41. The other end of the loop 11' is connected at 42 to a radio frequency choke 43 and at 44 to the positive plate supply where it may also be connected to a lead to the audio amplifying circuit.

The loop 11' is shunted by the condenser 45 and the radio frequency choke 47 upon the connection 46.

The loop 11' is also tapped at 48 through the resistance 49, the fixed condenser 50 and the variable condenser 51 and this tap then connects to the lead 52. The lead 52 is connected at one side to the auxiliary grid 53 and at the other side at 54 to the connection 55 from the lead 46 to the lead 56.

The tapped connection at 48 primarily controls the regenerative circuit. The variable resistance 40 57 upon the connection 56 controls the feed back through the condenser 58.

It will be noted that the connections 55 and 56 are also provided with a resistance 59 and a condenser 60, respectively. The other side of the variable resistance 57 is connected to the ground at 61.

In the complete layout circuit of Fig. 3, which shows an audio amplifier circuit, to which the present invention is by no means limited, in connection with the structure of the present application, the outside loop 10² and the inside loop 11² may be connected in substantially the same manner as shown in Figs. 1 and 2.

It will be noted that in Fig. 1 the connections 55 are designed for a four element tube having plate voltage supplied by batteries. In Figs. 2 and 3, on the other hand, the connections are for a five element tube which may be operated from an A. C. or D. C. potential source with the plate 60 supply taken from said source.

As indicated in Fig. 3 one end of the coil 10² may be connected to the ground 34² or to the negative plate supply, not shown.

The other end of the coil 10² is connected by 65 the conductor 30² to the grid connection 31².

The connections to the heating filament 70² for the cathode or electron emitter 72² are not shown.

The main tube 32² also has a plate connection 70 41² from one side of the inside loop 11². The tap 48² of the inside loop 11² is connected through the resistance 49², the fixed capacity 50² and the variable capacity 51² to the connection 52² which leads to the secondary grid indicated by the letters Gs.

The connections in Fig. 3 show how the construction of the present application may be utilized in combination with a typical audio amplifier circuit. This circuit includes the tubes 80 and 81, the electrical plug connection 82, and the speaker construction 83.

The invention is not intended to be restricted to any particular construction or arrangement of parts nor to any particular application of any such construction, nor to any specific method of operation or manner of use, or to any of the various details thereof, herein shown and described as the same may be modified in various particulars or be applied in many varied relationships without departing from the spirit and scope of the claimed invention, the practical embodiments herein illustrated and described merely showing some of the various features entering into the application of the invention.

What is claimed is:

1. A radio receiving system comprising an enclosed compact aerial arrangement having an outer loop and an inner loop independently rotatably mounted inside of each other and an electron tube having grid, filament and plate electrodes, the end connections of the outer loop being connected to the grid and filament electrodes and the end connections of the inner loop being connected to the plate and to the positive plate voltage supply, and said inner loop having an intermediate tap connection to the grid, said tap connection being to a portion of the inner loop intermediate of the ends thereof, and said tap connection including a tuning condenser for said inner loop.

2. A radio receiving system comprising an enclosed compact aerial arrangement having an inner loop and an outer loop and a tube connected to said inner and outer loops, said tube having a thermionic emitter, grid and plate elements, one end of said inner loop being connected to the plate and the other end of said same loop being connected to the plate voltage supply and a tap from said inner loop connected to said grid element and the other outer loop being connected to the grid and to the thermionic emitter element, said tap including a condenser and said tap being to a portion of said inner loop intermediate the connections of said inner loop to the plate and to the source of supply to the grid.

3. A radio receiving system comprising an electron discharge tubing being provided with a thermionic emitter, a plate and a grid rotatably mounted inner and outer loops, said inner and outer loops being adjustable in respect to each other, the outer loop being connected to the grid and thermionic emitter of a tube and the outer loop being connected to the plate and to the positive voltage supply of the plate and a tap from an intermediate portion of said inner loop to said grid, said connection being provided with a variable condenser, said tap including a condenser and said tap being to a portion of said inner loop intermediate the connections of said inner loop to the plate and to the source of supply to the grid.

4. In a radio receiving system of the type having a tube with the grid, a thermionic emitter and a plate, and positive and negative voltage connections for the plate; an enclosed compact aerial connection comprising an outer loop and an inner loop, the outer loop being connected to the thermionic emitter and the inner loop being connected to the plate and both loops also being connected to the grid, said inner loop having a

tap connection to said grid and the inner loop being also connected to the positive plate voltage connection, said tap connection being to a portion of the inner loop intermediate of the ends thereof, and said tap connection including a tuning condenser for said inner loop.

5 In a radio receiving system of the type having a tube with the grid, a thermionic emitter and a plate, and positive and negative voltage connections for the plate; an enclosed compact aerial connection comprising an outer loop and an inner loop, the ends of the outer loop being connected to the grid and the emitter and the ends of the inner loop being connected to the plate and the positive voltage connections and the inner loop having an intermediate tapped connection to the grid, said connection including a tuning condenser for said inner loop.

10 6. In a radio receiving system of the type having a tube with a grid, a thermionic emitter and a plate, and positive and negative voltage connections for the plate; an enclosed compact aerial connection comprising an outer loop and an inner loop, the ends of the outer loop being connected to the grid and the emitter and the ends of the inner loop being connected to the plate and the positive voltage connections and the inner loop having an intermediate connection to the grid, said connection including a tuning condenser for said inner loop, the end of the outer loop connected to the filament being also connected to the negative voltage connection through a variable resistance.

15 7. In a radio receiving system of the type having a tube with a grid, a thermionic emitter and a plate, and positive and negative voltage connections for the plate; an enclosed compact aerial connection comprising an outer loop and an inner loop, the ends of the outer loop being connected to the grid and the emitter and the ends of the inner loop being connected to the plate and the

positive voltage connections and the inner loop having an intermediate connection to the grid, said connection including a tuning condenser for said inner loop, the ends of the outer loop being shunted by a connection including a variable condenser.

5 8. Radio receiving apparatus comprising in combination an electron tube having grid, filament and plate electrodes, an input circuit including said grid and filament electrodes, an output including said plate and filament electrodes, and a pair of radio frequency energy collecting loops superimposed upon each other and including an outer loop and an inner loop, the ends of the outer loop being connected to the grid and filament electrodes and the ends of the inner loop being connected to the plate and the positive plate voltage supply, and said inner loop also having an intermediate tap connection to the grid, said connection also including a variable capacity for tuning the inner loop.

10 9. Radio receiving apparatus comprising in combination an electron tube having grid, filament and plate electrodes, an input circuit including said grid and filament electrodes, an output including said plate and filament electrodes, and a pair of radio frequency energy collecting loops superimposed upon each other and including an outer loop and an inner loop, the ends of the outer loop being connected to the grid and filament electrodes and the ends of the inner loop being connected to the plate and the positive plate voltage supply, said inner loop also having an intermediate tap connection to the grid, said connection also including a variable capacity for tuning the inner loop and mounting means permitting independent adjustment of said loops in respect to each other and also permitting joint adjustment of both loops together, said inner loop being positioned inside of said outer loop.

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