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RADIO LOOP ANTENNA SYSTEM

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Fig. 1

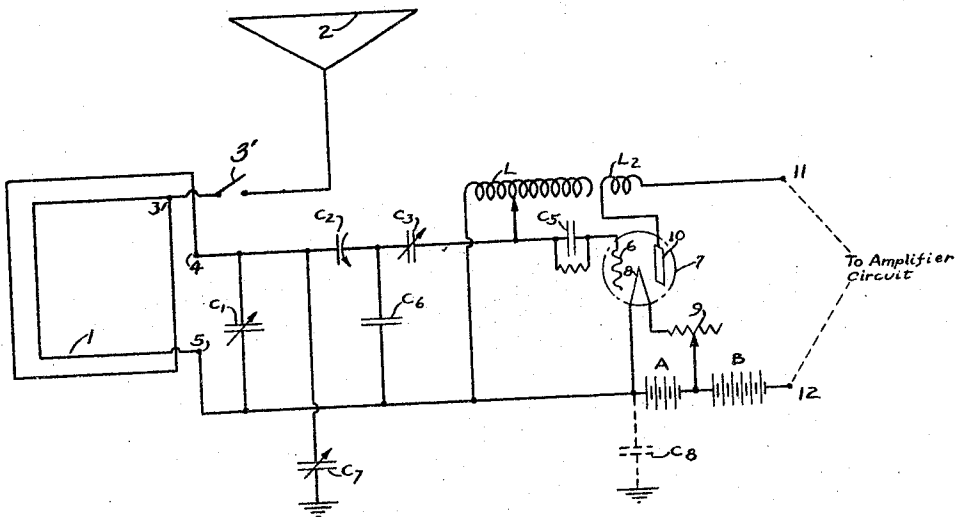
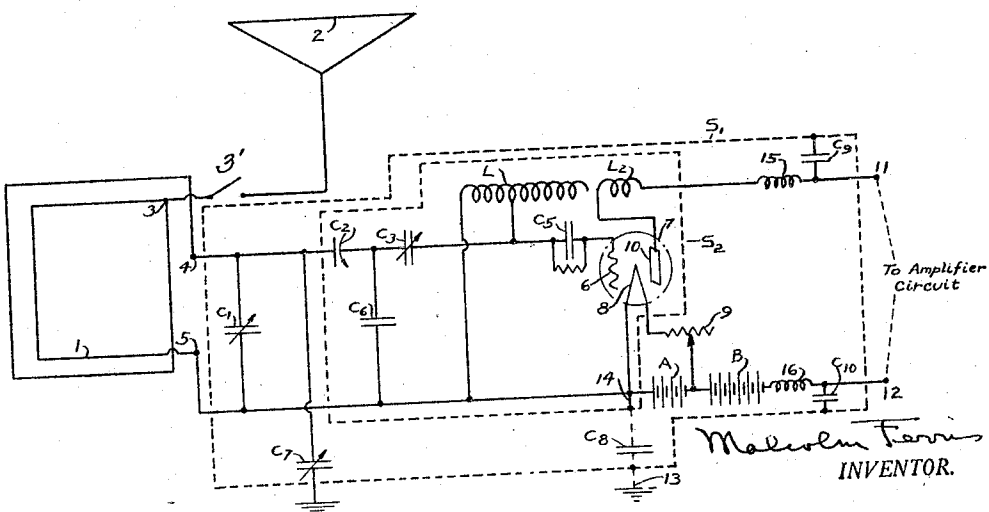


Fig. 2



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RADIO LOOP ANTENNA SYSTEM

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My invention relates broadly to directional antenna systems and particularly to loop antenna systems.

5 The principal object of my invention is to produce a sharp, minimum angle of position of a loop antenna through which no signals will be received from the transmitting station whose location it is desired to determine.

10 It has been found that when a loop antenna is turned at right angles to the direction of propagation of a transmitted wave, even though the antenna may be in a region where there are no reflected or re-
15 fractured waves, there is still a residual signal produced in the receiver. This has been accounted for as due to the capacity to ground of the loop antenna coil. This effect has been eliminated in part by the
20 use of a compensating condenser between the high potential side of the loop and the ground, and by enclosing the entire apparatus, with the exception of the loop, in a grounded shield.

25 I have found, however, that there is still a residual signal left in the more sensitive receivers even though the compensating condenser and shield arrangement has been utilized, due to the capacity effect of the
30 coils of the apparatus that couple the receiving loop to the amplifying apparatus.

It is the specific object of this invention to eliminate this residual signal caused by the capacity effect of these coils.

35 Further objects of my invention will appear more fully hereinafter.

Reference is to be had to the accompanying drawings forming a part of this specification in which like reference characters
40 indicate corresponding parts throughout the several views and in which:

Figure 1 is a diagrammatical view of a simple form of a loop antenna circuit, and

45 Figure 2 sets forth my improved coupled circuit containing the novel features of my invention.

Referring to Figure 1, numeral 1 represents the conventional type of directive loop antenna with or without the additional
50 capacity antenna 2 connected thereto at a

point 3 symmetrically disposed with reference to terminals 4 and 5 of the loop antenna. Tuning condenser C1 is connected in parallel with the loop.

Terminal 4 of the tuned loop antenna is coupled to grid 6 of vacuum tube 7 through
55 coupling condenser C2, tuning condenser C3, and grid condenser and grid leak C5. The other terminal 5 of the tuned loop antenna 1 is connected directly to the filament
60 8 of vacuum tube 7. This lead serves as the common filament terminal for the coupling and tuning apparatus to transfer the energy collected in the loop 1 to the vacuum
65 tube 7.

In the circuit between terminal 4 and grid 6 one terminal of a fixed condenser C6 is inserted between variable condenser C2 and
70 tuning condenser C3. Condenser C6 is associated in series with the tuning condenser C3 in parallel with variable tuning inductance L one end of which is connected to the grid 6 of vacuum tube 7 and the other
75 end of which is connected to the common lead from terminal 5 of the tuned loop antenna to filament 8 of vacuum tube 7.

The source of current for the vacuum tube 7 is represented by batteries A and B of which battery A supplies current to the filament 8 through a rheostat 9. Battery
80 B supplies current to the plate 10 of vacuum tube 7 through the connections to the amplifier circuit (not shown) and through regenerative inductance L2.

Referring specifically to Figure 2, C7 represents the usual compensating condenser
85 connected in series between the terminal 4 of the tuned loop antenna 1 and the ground. S1 represents the usual shield surrounding the entire apparatus and grounded at 13.

90 With the arrangement set forth in the preceding paragraph, I have found that there is a considerable residual signal due to the capacity between the coupling apparatus and the shield S1 that can not be compensated for by condenser C7.

To eliminate this capacity effect, I have placed an inner shield S2 within the outer shield and surrounding the vacuum tube 7,
95 the coils L and L2 and the condensers C2, L20

C3, C5 and C6. This shield S2 is entirely insulated from shield S1 and is connected to the filament of the vacuum tube 7 at a point 14.

5 By means of this shield I have produced an electrostatic field surrounding the entire coupling unit that has a constant capacity relation to the outer shield S1, which capacity relation may be represented by C8.
10 This capacity is in parallel with the antenna capacity of the tuned loop antenna and merely increases the total antenna effect of the apparatus concentrated at one point. By adjusting the compensating condenser
15 C7, both the antenna effect of the tuned loop antenna and the capacity effect of the shield and the apparatus disposed therein, as represented by C8, may be compensated for and eliminated. As a result, the receiving and
20 amplifying circuits are freed from any residual signal due to either the antenna effect of the loop or any part of the coupling circuit, thereby producing a sharp minimum angle of position of the loop in which no
25 signal is heard in the telephone receivers.

In order that the capacity of the inner circuit may remain constant I have found that it is necessary to insert in the plate circuit and located between the two shields
30 S1 and S2 the radio frequency choke coils represented at 15 and 16, and also the bypass condensers C9 and C10 between the choke coils and the outer shield.

It will be understood that the above description and accompanying drawings comprehend only the general and preferred embodiment of my invention and that minor detail changes in the construction and arrangement of parts may be made within the
40 scope of the appended claims without sacrificing any of the advantages of my invention.

The invention herein described may be manufactured and used by or for the Government of the United States for governmental purposes without the payment to me of any royalty thereon or therefor.

What I claim is as follows:

1. In a compensated radio compass receiver including a tuned loop antenna, a coupling unit and a detecting unit, a grounded shield surrounding the entire set with the exception of the tuned loop antenna, and a second shield surrounding the
55 coupling and detecting units and disposed within the outer shield and insulated therefrom.

2. In combination with a compensated radio compass loop, a vacuum tube, coupling means between the loop and the vacuum tube, current supply for the vacuum tube, an outer shield surrounding the entire apparatus with the exception of the loop and a second shield surrounding the vacuum
65 tube and the coupling apparatus and dis-

posed within the outer shield and electrically insulated therefrom.

3. In combination with a compensated directive loop antenna system including a loop, balancing means therefor, a coupling unit and a detector coupled to a balanced portion of the loop circuit, a shield surrounding the coupling unit and the detector, means for maintaining the potential of said shield the same as that of one of the balanced points of the loop and a second shield surrounding the entire system with the exception of said loop.

4. In combination with a compensated directive loop antenna system including a loop, balancing means therefor, a coupling unit and a detector coupled to a balanced portion of the loop circuit, a shield surrounding the coupling unit and the detector, means for maintaining the potential of said shield the same as that of one of the balanced points of the loop, a second shield surrounding the entire system with the exception of said loop and means for maintaining said second shield at ground potential.

5. In a system for receiving high frequency currents a normally unbalanced circuit upon which said high frequency currents initially impinge, means for shielding a portion of said system other than said normally unbalanced circuit from high frequency current external to said system, a secondary circuit within said means coupled to said normally unbalanced circuit, means for rendering controllable the capacity between said secondary and said first mentioned means, and compensating means for balancing said normally unbalanced circuit and neutralizing the capacity between said secondary circuit and said first mentioned means.

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