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May 10, 1932. L. COHEN 1,857,359

RADIO SIGNALING

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Fig. 1.

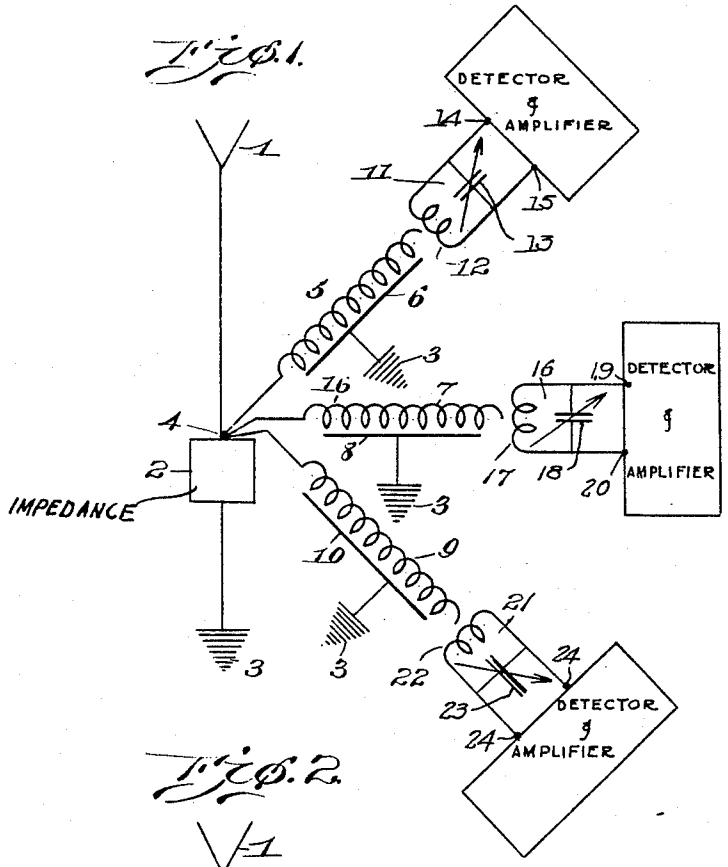
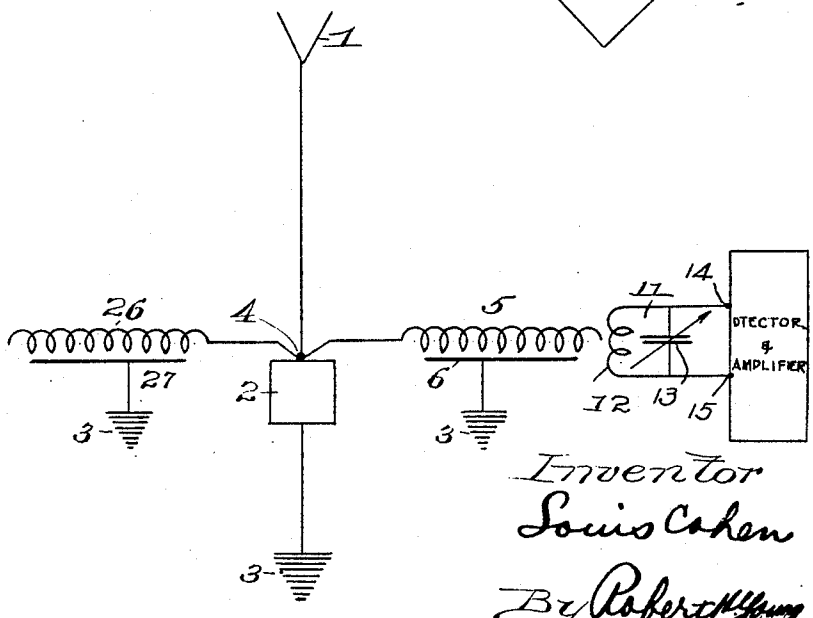


Fig. 2.



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[redacted] ENERGY.

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RADIO SIGNALING

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Fig. 3.

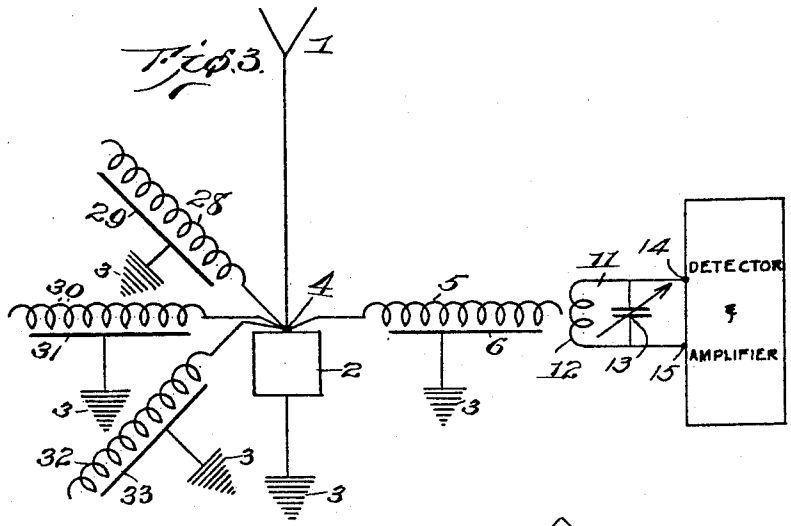
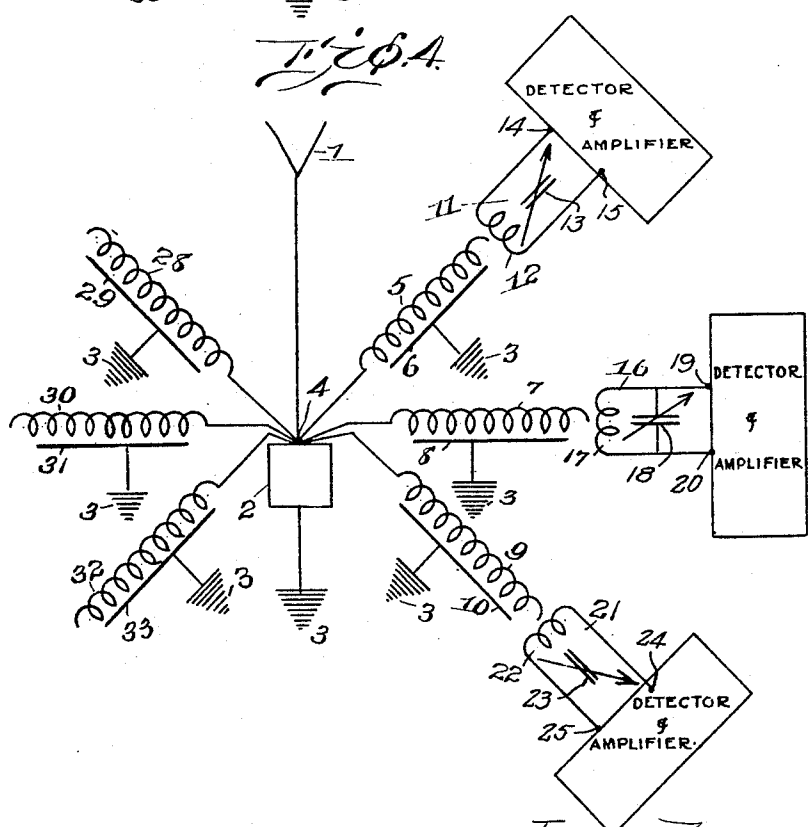


Fig. 4.



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250 RADIANT ENERGY

Examiner

Patented May 10, 1932

1,857,359

UNITED STATES PATENT OFFICE

LOUIS COHEN, OF WASHINGTON, DISTRICT OF COLUMBIA

RADIO SIGNALING

Application filed August 13, 1928. Serial No. 299,386.

(GRANTED UNDER THE ACT OF MARCH 3, 1883, AS AMENDED APRIL 30, 1928; 370 O. G. 757)

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

This invention relates to the art of radio signaling and more particularly to improvements in receiving systems of radio signals.

One object of this invention is to provide methods and means for the simultaneous reception of several radio signals on a single antenna. Another object is the elimination of interferences from local transmitting stations.

In my copending applications, Serial No. 293,608, filed July 18th, 1928, Patent No. 1,813,563, granted July 7, 1931, and Serial No. 294,742, filed July 23, 1928, I have described novel methods for the reception of radio signals and the elimination of interferences. The methods disclosed in the above applications depend on the utilization of a wave conductor, that is one of distributed inductance and capacity, on which a wave development is effected, and adjusted to the particular wave length of the incoming signals. In the first of the above referred to pending applications I have disclosed a method for the reception of radio signals, which consists in interposing a suitably adjusted wave conductor between the antenna and the receiving system which affords a means for securing a high degree of selectivity in the reception of radio signals. In the second of the above referred to patent applications I have disclosed a method also based on the use of wave conductors for the elimination of interferences from one or more local transmitting stations.

The scope of the invention is to be determined by a reference to the accompanying descriptiton and particularly the claims attached thereto, certain embodiments of my invention being disclosed in the accompanying drawings, in which:

Fig. 1 is a diagrammatical showing of one form of my invention for multiple reception of radio signals.

Fig. 2 shows a single receiving circuit together with an auxiliary circuit for the elimination of interferences from one station.

The arrangement shown in Figure 3 provides for a single receiving circuit together with a multiple interference eliminating system.

The modification shown in Figure 4 provides for the simultaneous reception of several signals and the interference elimination of other signals.

Having particular reference to the drawings in which similar numbers designate similar parts, in Figure 1 the antenna designated by 1 is connected through impedance designated by 2 to ground 3. A resistance may be employed in place of the impedance 2. At the junction point 4 three wave conductors 5, 6; 7, 8; and 9, 10 are connected, each of these wave conductors consisting of a solenoidal coil placed in close proximity to a grounded metal plate, that is coil 5 together with grounded metal plate 6 forming one wave conductor; coil 7, together with grounded plate 8 and coil 9 together with grounded plate 10 are two other wave conductors. These plates, however, may be ungrounded. Each of these wave conductors is separately adjustable by the variation of the separation distances of each coil from its respective plate. Placed in proximity to the extreme open ends of each of the wave conductors is a separately tuned circuit 11, 16 and 21 respectively, and each of these tuned circuits is associated with suitable detecting and amplification means of the usual types which are connected at the points 14, 15; 19, 20; and 24, 25. In operation each of these wave conductors is separately adjusted to a particular signal wave length and the tuned circuit associated with it is also tuned to that particular signal frequency. By this arrangement with the proper adjustments it is possible to receive simultaneously three signals of different frequencies, each wave conductor together with the receiving circuit associated with it picking up one signal for which it is in adjustment to the exclusion of others.

Theory indicates that for best results the wave conductors should be adjusted for quarter wave lengths or odd multiple of quarter wave lengths of the signals to be received. In practice, however, an adjustment is ef-

fected by varying the separation distance of each coil from its respective plate until the maximum signal effect in the receiving circuit is obtained. The variation of the separation distance of the coil from the grounded metal plate varies the distributed capacity, which affords a means of varying the electrical wave length of each wave conductor.

To appreciate fully the principle of this invention reference must be made to the two pending patent applications referred to in which it was pointed out that when a wave conductor is connected to an antenna, the junction point of antenna and wave conductor is at zero voltage, when the wave conductor is in adjustment for a quarter or odd multiple of quarter wave lengths of the signals acting on the antenna. In the system for multiplex reception shown in Figure 1, the junction point 4 is at zero potential for all of the three wave lengths for which the three wave conductors are in adjustment and therefore none of the energies of these signals are by-passed to ground through the impedance 2 which may be in the form of an inductance, a capacity, a resistance, or a combination of these elements.

It is obvious that this method may be extended for the simultaneous reception of any number of signals of different frequencies.

The arrangement shown in Figure 2 provides for the receiving of one signal and the elimination of interference of another signal. The wave conductor 5, 6 together with the receiving circuit 11 are adjusted for the reception of a signal of a particular frequency, while wave conductor 26, 27 is adjusted to the wave length of an interfering signal both wave conductors connected at the junction point 4. The interfering signal is absorbed by the wave conductor 26, 27 while the signal desired to be received is transmitted to wave conductor 5, 6, which is in adjustment for it, and transmitted by induction to the circuit 11. This arrangement affords a means for the reception of signals and the elimination of interferences of some particular signal which may be due to a local transmitter. Experience has shown that this arrangement permits the separation of the received signal from an interfering signal even when the frequencies of these signals are close to each other.

The modification shown in Figure 3 is an extension of the principle embodied in Figure 2 in that it provides for the simultaneous elimination of three interfering signals of different frequencies from the receiving circuit. The wave conductors 28, 29; 30. 31; and 32, 33; are each separately adjusted for one of the frequencies of the interfering signals, absorbing the energies of these signals; while wave conductor 5, 6 together with receiving circuit 11, are adjusted for the frequency for the signals desired to be received.

The modification shown in Figure 4 provides an arrangement for the simultaneous reception of several signals of different frequencies, and at the same time means are provided for the elimination of interferences from several undesired signals which may be due to local transmitting stations. The wave conductors 28, 29; 30, 31; 32, 33 are each separately adjusted for a frequency of one of the interfering signals desired to be eliminated from the receivers. The wave conductors 5, 6; 7, 8; and 9, 10 together with their respective circuits 11, 17, 22 are separately adjusted for the frequencies of the signals desired to be received. The principle of operation is the same as that outlined in connection with the discussion of Figures 1 and 2.

While I have described only one way of adjusting the wave conductor I do not mean to limit the invention to that particular method and means disclosed. I consider the matter of adjusting the wave conductor as merely a mechanical detail which has little bearing on the scope of the invention.

What is claimed is:

1. In a system for multiplex reception of radio signals comprising an antenna which is grounded through an impedance, a plurality of wave conductors connected at the junction point of connection of said antenna to said impedance, each of said wave conductors being separately adjustable to respond to the wave length of one of the signals desired to be received, a separate receiving circuit system coupled to each of said wave conductors, and each of said receiving circuit systems being provided with means for detecting and amplifying said signals.

2. In a system for multiplex reception of radio signals comprising an antenna which is grounded through an impedance, a plurality of wave conductors connected at the junction point of connection of said antenna to said impedance, each of said wave conductors being separately adjustable to respond to the wave length of one of the signals desired to be received, a separate receiving circuit system coupled to each of said wave conductors, each of said receiving circuit systems being provided with means for detecting and amplifying said signals, each of said wave conductors comprising a solenoidal coil placed in proximity to a grounded metal plate, the adjustment of said wave conductors being effected by varying the distance separation of said solenoidal coil from said grounded metal plate.

3. In a system for the multiplex reception of radio signals comprising an antenna which is grounded through an impedance, a plurality of wave conductors connected at the junction point of connection of said antenna to said impedance, each of said wave conductors being adjustable to a quarter wave length of the desired signal, a separate receiving cir-

cuit system coupled to each of said wave conductors, each of said receiving circuit systems being provided with means for detecting and amplifying said signals.

4. In a system for the multiplex reception of radio signals comprising an antenna which is grounded through an impedance, a plurality of wave conductors connected at the junction point of connection of said antenna to said impedance, each of said wave conductors being adjustable to an odd multiple of quarter wave lengths of the desired signal, a separate receiving circuit system coupled to each of said wave conductors, and each of said receiving circuit systems being provided with means for detecting and amplifying said signals.

5. In a system for the reception of radio signals comprising an antenna which is grounded through an impedance, a plurality of wave conductors connected at the junction point of connection of said antenna to said impedance, one of said wave conductors being coupled to a receiving circuit system and being adjustable for the reception of a signal of a particular frequency, and another wave conductor being adjustable to absorb the energy of an interfering signal of a particular frequency different from that of the desired signal.

6. In a system for the multiplex reception of radio signals, comprising an antenna which is grounded through an impedance, a plurality of wave conductors connected at the junction point of connection of said antenna to said impedance, several of said wave conductors each being coupled to a separate receiving circuit system provided with means for detection and amplification, each of said last named wave conductors being separately adjustable for the reception of a signal of a particular frequency, and the others of said wave conductors each being separately adjustable to absorb the energy of a different interfering signal of a particular frequency different from that of the desired signal.

7. In a system for the reception of radio signals comprising an antenna; a plurality of wave conductors arranged in groups and connected to a common point in said antenna, each wave conductor of one group being separately adjustable to respond to the wave length of a desired signal; and each wave conductor of the other group being separately adjustable to the wave length of an interfering signal.

8. In a system for the reception of radio signals comprising an antenna which is grounded through an impedance; a plurality of wave conductors arranged in groups and all connected to the common junction point of said antenna with said impedance, each wave conductor of one group being separately adjustable to respond to the wave length of a desired signal and operatively coupled to a separate receiving system; and each wave conductor of the other group being separately adjustable to the wave length of an interfering signal.

In testimony whereof I affix my signature.

LOUIS COHEN.