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H. RICHMOND

WIRELESS TELEGRAPHY

Filed July 23, 1921

Fig. 1

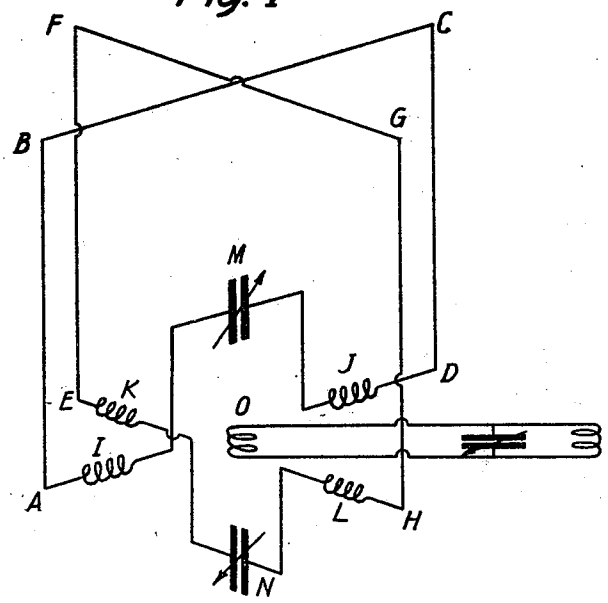
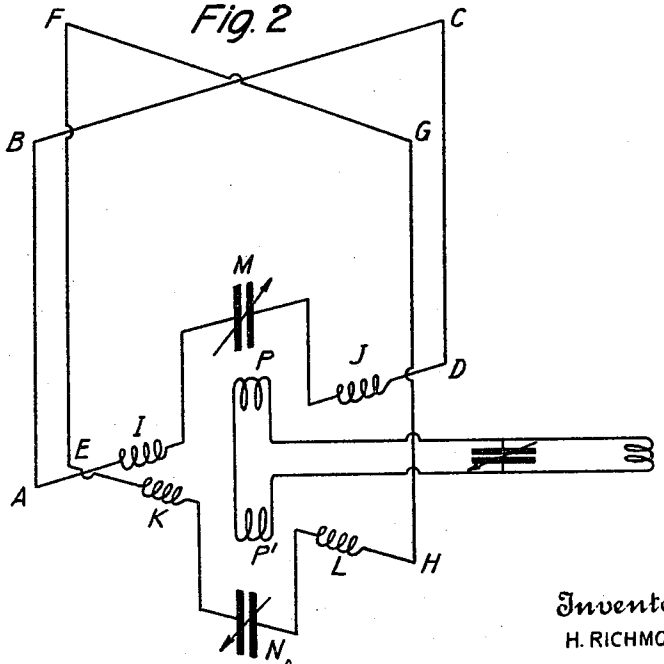



Fig. 2




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# UNITED STATES PATENT OFFICE.

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## WIRELESS TELEGRAPHY.

Application filed July 23, 1921, Serial No. 487,124, and in Great Britain April 25, 1918.

(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313.)

This invention relates to improvements in apparatus for eliminating interference in wireless telegraphy whereby signals coming from a different direction from that of the signals it is desired to receive may, even though of the same wave length, be eliminated without materially reducing the strength of the desired signals.

It is well known that if a receiver be connected to a coil which can be rotated in two independent fields produced by two directional aerials at right angles to each other, as in the radiogoniometer, there is a position of the coil in which no sound is caused by signals from a particular direction.

According to the present invention, and with the object of avoiding reduction in the strength of the desired signals, I produce an unsymmetrical field for the coil by adjusting the coupling between the coil and the two aerials so as to strengthen one of the two component fields resulting from the jamming station relatively to the other. This has the effect of twisting the resultant field that is set up by the jamming station from its normal position to a position approximately at right angles to the field that is set up by the station it is desired to receive. The coil is then rotated to a position of maximum coupling with the desired field and minimum coupling with the objectionable field.

According to a modification of the invention I produce the same effect in cases where the inductance coils of the two aerials are not all arranged in a single plane by dividing the rotatable coil into two parts, one of which is coupled to the inductance of one aerial and the other to the other, and adjusting the couplings so that the two aerials produce an unsymmetrical action on the receiving circuit.

My invention is illustrated by the accompanying diagrams, in which Fig. 1 is a diagrammatic representation of an aerial circuit and a receiving circuit embodying the invention, and Fig. 2 is a similar view of a modification.

In Figure 1, A B C D and E F G H are two frame aerials situated at right angles to each other. These aerials may be rectangular or may consist of directive systems of any known type.

In these aerials are connected inductances I J K L and condensers M N. An inductance O is coupled to the coils I and J and to the coils K and L and is connected to the receiving circuit. The distance of I J K and L from O can be adjusted so that the coupling between each aerial and the receiving circuit may be varied independently so as to produce an unsymmetrical field.

In practice it is preferable to set out the aerials so that the plane of one frame lies in the direction of the station it is desired to receive, the other being at right angles to this direction. It is also essential that the coils I and J should be so situated with respect to K and L that no mutual action can occur between them.

Figure 2 shows another arrangement which is substantially the same as that shown in Figure 1 except that the coils I and J are not in the same plane as the coils K and L and the inductance O is divided into two parts P, $P^1$. With this arrangement the coils may be so mounted that when the coupling between I, J and P is a maximum, the coupling between K, L and $P^1$ is a minimum.

In use it is found best to have the aerial whose plane is in the direction of the station it is desired to receive as loosely coupled as possible without unduly weakening the signals, and the other or balancing aerial as tightly coupled as possible. This arrangement also reduces to a minimum the effect of any mutual action between the two circuits.

The two aerials should be tuned to exactly the same frequency. When this condition is obtained the currents produced in the aerials by a jamming station will be identical in phase and by adjusting the positions of the coils I J K L the field resulting from the jamming station can, in effect, be twisted to a direction approximately at right angles to the field set up by the station it is desired to receive. The rotatable coil is then positioned so that it has a maximum coupling with the desired field and a minimum coupling with the objectionable field; consequently no indication results from the objectionable signals in the receiver, while the signals to be received are not unduly weakened.

Having described my invention, what I claim is:

1. The method of eliminating interfering signals with a radiogoniometer having a rotating coil coupled to two aerials which consists in producing an unsymmetrical relation between the fields of the coupling means and the rotating coil, and adjusting the angular position of the coil to eliminate interference.

2. The method of eliminating interfering signals with a rotating coil two aerial radiogoniometer system which consists in disposing the rotating coil to produce unsymmetrical coupling with the aerials, and then adjusting the angular relation of the coil to eliminate interference.

3. The method of eliminating interfering signals with a rotating coil two aerial radiogoniometer system which consists in tuning the aerials to the same frequency, disposing the rotating coil to produce unsymmetrical coupling with the aerials, and then adjusting the angular relation of the coil to eliminate interference, and receiving desired signals with the coil in this position.

4. The method of eliminating interfering signals with a rotating coil two aerial radiogoniometer system which consists in tuning the aerials to the same frequency, disposing the rotating coil to produce unsymmetrical coupling with the aerials and then adjusting the angular relation of the coil to eliminate interference.

5. A directional radio receiving system comprising a pair of directional aerials, a receiving circuit having a rotatable coil, and separate coupling coils for coupling each of the aerials to the rotatable coil, arranged so that the fields produced by each of said coupling coils are unequal in strength at the effective center of said rotatable coil when equal strength currents flow in said aerials.

6. A directional radio receiving system comprising a pair of aerials having different directivity, a receiving circuit, having a rotatable coil, and means for coupling the aerials to the rotatable coil, said means and said coils being so disposed that at the effective center of said rotatable coil the fields produced by said coupling means are unequal in strength when equal strength currents flow in said aerials.

7. A directional radio receiving system comprising a pair of aerials tuned to the same frequency, having different directivity, a receiving circuit having a rotatable coil, and means for coupling the aerials to the rotatable coil, said means being disposed at different distances from said rotatable coil so that the fields produced by said coupling means are unsymmetrical at the effective center of said rotatable coil.

8. A directional radio receiving system comprising a pair of crossed loop aerials, a receiving circuit having a rotatable coil, and means for coupling the aerials to the rotatable coil, said means being disposed at different distances from said rotatable coil so that the fields produced by said coupling means are unequal at the effective center of said rotatable coil.

9. A directional radio receiving system comprising a pair of crossed loop aerials, a receiving circuit having a rotatable coil and coupling coils connected in said aerials disposed at different distances from the rotating coil.

10. A directional radio receiving system comprising a pair of crossed loop aerials, and a receiving circuit having a rotatable coil, each of said aerials having a pair of coupling coils, the coils of each pair being disposed on opposite sides of the rotating coil, and each pair being disposed at different distances therefrom.

11. A directional radio receiving system comprising a pair of aerials having different directivity, one of said aerials being disposed for maximum reception of signals, a receiving circuit having a rotatable coil, and means for coupling the aerials to the rotatable coil, said means and said coils being related so that the fields produced by said coupling means are unsymmetrical at the effective center of said rotatable coil when equal strength currents flow in said aerials.

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