May 17, 1938. E. KRAMAR 2,117,848

DIRECTION FINDING METHOD

Filed March 25, 1936

Fig.1

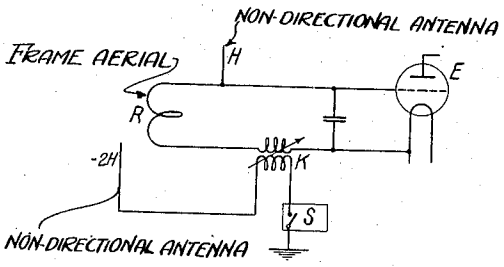


Fig.4

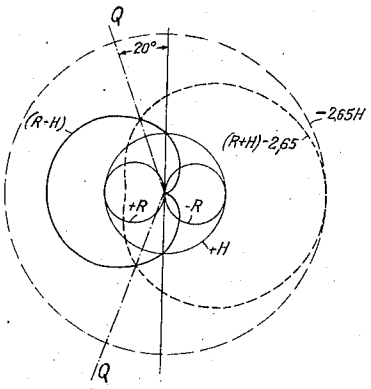


Fig.2

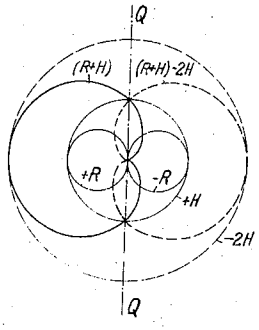
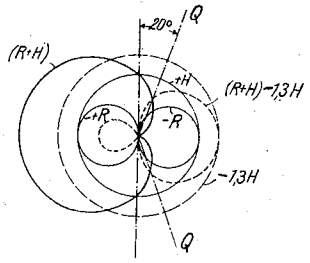


Fig.3



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Patented May 17, 1938 2,117,848

UNITED STATES PATENT OFFICE

2,117,848

DIRECTION FINDING METHOD

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Application March 25, 1936, Serial No. 70,790
In Germany March 26, 1935

5 Claims. (Cl. 250—11)

It is well known to employ a combination of frame or loop aerials and non-directional antennas in order to obtain bearings with respect to a non-directional transmitter. Previously two frame aerials have been employed which are of different sense of winding and are alternately combined with a non-directional antenna in order to produce two differently located cardioids. The same effect can be accomplished also by means of one frame aerial tapped in the middle. Recently instead of employing a separate non-directional antenna the non-directional antenna effect of the frame aerial has been utilized. It has also become customary not to reverse the winding of the frame aerial but to reverse the polarity of the non-directional antenna.

These methods have the disadvantage of operating on the receiving side and in the input circuit thereof by means of a push-pull tube device in order to provide for the requisite symmetry of the arrangement. Hereby the expenditure in means is considerable so that such methods are often questioned as to their applicableness.

In order to overcome these drawbacks the invention proposes to provide for a permanent combination of the frame aerial with a non-directional antenna effect and to cause a non-directional antenna effect of double the magnitude of the first said non-directional antenna effect to be connected and disconnected alternately and in phase opposition (counter coupling). In this way it is rendered possible that the circuit arrangement of the receiver can be simple in structure.

The invention is described hereafter by way of example, reference being had to the accompanying drawing in which—

Fig. 1 is a wiring diagram of a high frequency receiver as provided by the invention, Figs. 2, 3, and 4 are diagrams relating to the operation of this receiver.

In Fig. 1 E denotes the input tube of the receiver, the details of which are not shown as they are immaterial to the idea of the invention.

The frame or loop aerial is designated R. Connected to the grid of the tube E is a non-directional antenna H or a predetermined non-directional antenna effect of the aerial R. The grid circuit of the tube E is coupled also to a non-directional antenna —2H by an inductive coupling K. The high frequency energy received by the antenna —2H is double the energy received by the antenna H and is coupled at K in phase opposition to the energy received by H, the latter fact being indicated by the minus sign. In the circuit of the antenna —2H a switching device S is included by which the energy is added in a rhythm adapted for obtaining bearings, such as a dot rhythm, the pauses corresponding to the dashes intervening between the dots.

The diagrams corresponding to the several antennas and the resultant cardioids are represented in Fig. 2. If the amplitude of the non-directional antenna —2H is likewise denoted by —2H, that is to say, is exactly double that of the antenna H, then the bearing beam Q is directed forward, that is to say, is normal to the plane of the frame aerial. By varying the coupling K, such variation resulting in an amplitude variation of the second non-directional antenna effect, beam Q can be rotated in the manner appearing from Figs. 3 and 4. The diagrams of Fig. 3 are due to an amplitude less than 2H, and those of Fig. 4 are due to an amplitude greater than 2H. In this way, when a vehicle carrying the direction finding arrangement happens to be off the proper course the drift may be compensated.

The device S is preferably a tripping device or saw tooth generator of a well-known type, whose tripping oscillation is made to accord with the keying rhythm. A commutator arrangement may of course be provided instead, but a saw tooth generator has the advantage of being simpler than this.

What is claimed is:

1. The method of obtaining bearings from a non-directional radio transmitter which consists in combining a frame aerial effect with a non-directional antenna effect so that these two effects cooperate, and in adding periodically a non-directional antenna effect substantially double that of the first said non-directional antenna effect, such periodic additions being made in phase opposition to the first said non-directional antenna effect and in a rhythm adapted for obtaining bearings.

2. In a method according to claim 1 the step of controlling the position of the bearing beam by varying the amplitude of the periodically added non-directional antenna effect.

3. In a method according to claim 1 the step of varying the amplitude of the periodically added non-directional antenna effect in such a manner that the bearing beam is at right angles to the plane of the frame aerial.

4. In a method according to claim 1 the step of varying the amplitude of the periodically added non-directional antenna effect in such a manner that the bearing beam is positioned angularly with respect to the normal to the frame-aerial plane.

5. In a method according to claim 1 the step of varying the amplitude of the periodically added non-directional antenna effect in such a manner that a drift of a direction-finding vehicle is compensated.

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