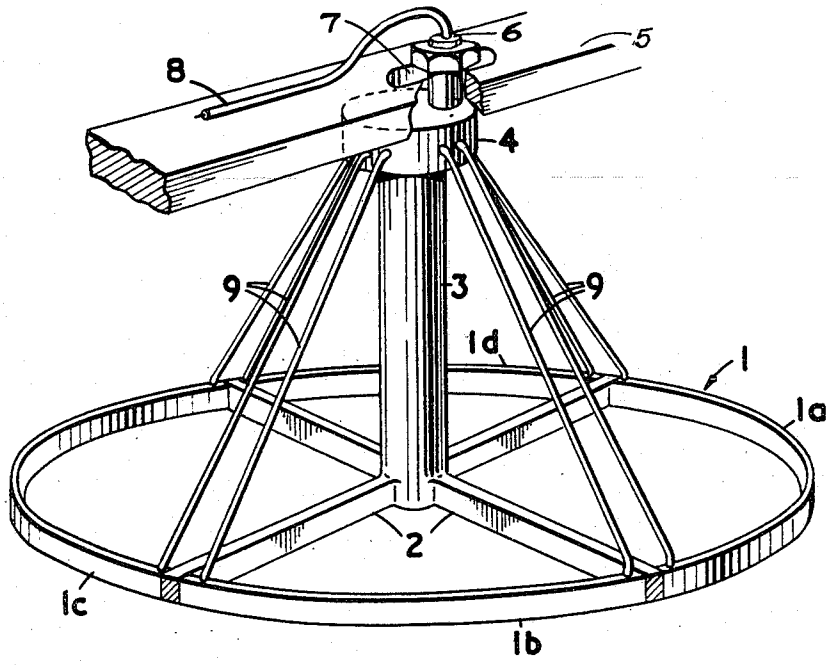
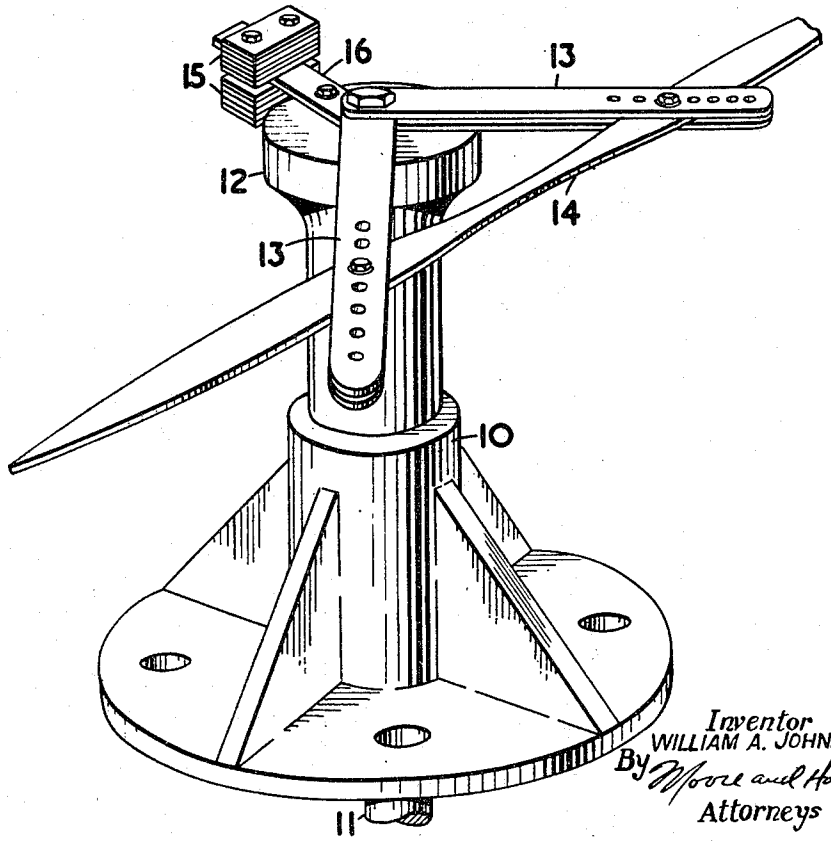
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RADIO AERIAL SYSTEM, AND PARTICULARLY DIRECTIVE AERIAL SYSTEMS

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RADIO AERIAL SYSTEM, AND PARTICULARLY DIRECTIVE AERIAL SYSTEM

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6 Claims. (Cl. 250—33.65)

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This invention relates to radio aerial systems which are of a directive character, and are sometimes referred to as omni-range beacons, for very high frequency radio communication and signalling.

An object of the invention is to provide a directive pattern of radiation polarised in the plane of the pattern (normally the horizontal plane).

Another object of the invention is to provide a rotating horizontally polarised directive pattern such that the signal received at a fixed station is amplitude modulated substantially sinusoidally.

The invention consists essentially in the combination effectively in the same plane of a fed loop aerial and a parasitic dipole so as to produce in said plane the required directive pattern.

An aerial system in accordance with the invention comprises a fed loop aerial adapted for mounting in a horizontal plane and a parasitic dipole excitable by the loop disposed parallel with a chord of the loop in an adjacent horizontal plane.

The dipole may be mounted for rotation about the central vertical axis of the loop so that the directive pattern is caused to rotate and is preferably adjustably mounted relatively to said axis so as to enable its excitation and the degree of directivity of the pattern to be varied.

The feeders to the loop, of which there may be, say, four pairs each pair feeding a quadrant of the loop so as to obtain substantially constant current distribution in the loop, preferably subtend an angle of approximately 45° with the plane of the loop so as to minimise both vertically polarised radiation from the feeders and interference effects between the feeders and the dipole.

The accompanying drawing is a perspective view of one practical embodiment of the invention which is shown and will now be described purely by way of example.

The loop 1 consists of four metal quadrants 1*a*–1*d* connected together to form a circle and supported by four radial arms 2 of insulating material.

Arms 2 project from a column 3 the head 4 of which is adjustably secured to the underside of a beam 5 by means of a hollow bolt 6 which is eccentric with the column 3 and passes through a slot 7 in the beam. A feed cable 8 passes through the bolt into the column head 4 which is hollow and constitutes a junction box for the four pairs of feeders 9 which extend at approximately 45° from the head 4 to the loop 1.

Vertically below the centre of the loop 1 is a hollow pedestal 10 for a vertical shaft 11, the

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upper enlarged end 12 of which carries insulating radial arms 13 perforated for the adjustable mounting of a dipole 14. A weight 15 also adjustably mounted on an arm 16 is arranged to balance the dipole about the vertical axis. The shaft 11 is driven by an electric motor (not shown) mounted below the pedestal 10.

The polar diagram of radiation from the loop in the horizontal plane is a circle and that of the dipole is a figure of eight so that the resultant is more or less a cardioid depending on the degree of excitation of the dipole. When the dipole is on a diameter of the loop the excitation is zero but increases as the dipole is moved towards the circumference to constitute a chord of the loop.

The above described embodiment of the invention is designed for use in connection with the omni-directional radio beacon (O. R. B.) described in U. K. Technical Paper No. 13 of the Provisional International Civil Aviation Organisation (P. I. C. A. O.) and as such operates on a wavelength of about 100 in. in the 100–156 mcs. band. Typical dimensions of the embodiment for use on this wavelength are as follows:

Loop diameter 28 in. i. e. approximately ¼ wavelength.
Length of dipole 41 in. i. e. approximately ½ wavelength.
Vertical spacing dipole and loop 10 in.
Dipole offset from loop 6 in.

The invention as above exemplified provides a directive pattern of horizontally polarised radiation in the horizontal plane and at low angles of elevation. At high angles of elevation (reaching a maximum at 45°) a vertically polarised component due to the dipole is present and therefore if only horizontally polarised radiation is required to be received from the aerial system of the invention at high angles a means of suppressing the vertical component radiated at the higher angles must be provided. One suitable means is described in the specification accompanying my co-pending U. S. patent application Serial No. 44,185, filed August 13, 1948.

The construction described and shown is but one example of many practical forms the invention may take.

It may sometimes be desirable when carrying out the invention to incorporate means for adjusting some or all of the dimensions which have been shown as fixed. For example, the phase of the current in the dipole varies with its length and therefore may be made controllable within limits, by providing a telescopic or other extend-

ing form of dipole. Alternatively, or in addition, tuning means such as a variable capacity may be associated with the dipole. Provision could also be made for varying the diameter of the loop.

Complex radiation patterns may be produced according to the invention by providing more than one parasitic dipole excited by a single loop.

The amount of vertical spacing between the loop and the dipole depends upon the uniformity of the current in the loop. If dipole is placed too close the unavoidable irregularities in the field of the loop at the junction of the quadrants cause non-uniform excitation of the dipole as it rotates. For any particular construction there is an optimum spacing readily found by trial (10 in. in the example described above) at which the excitation is made practically uniform without serious loss of coupling.

I claim:

1. The combination in adjacent parallel planes of a fed loop aerial and at least one parasitic dipole disposed such that its projection on the plane of the loop contains a chord of the loop thereby producing in said plane of the loop a directive pattern of radiation polarised in said plane.

2. An aerial system particularly for transmitting a horizontally polarized directive pattern of radiation comprising a fed loop aerial adapted for mounting in a horizontal plane and a parasitic dipole excitable by the loop disposed horizontally and such that its projection on the plane of the loop contains a chord of the loop.

3. An aerial system for transmitting a horizontally polarised directive pattern of radiation comprising a circular loop aerial, means for mounting said aerial horizontally, feeders for supplying high frequency current to said aerial, a

parasitic dipole and means rotatable about the central vertical axis of the loop aerial for supporting the dipole horizontally and such that its projection on the plane of the loop contains a chord of the loop aerial.

4. An aerial system as claimed in claim 3 wherein the means for supporting said dipole are adjustable in respect of the distances of the dipole from said axis.

5. An aerial system for transmitting a horizontally polarised directive pattern of radiation comprising a circular loop aerial consisting of four quadrants, radial arms of insulating material for supporting said quadrants in a horizontal plane, a pair of feeders extending substantially from the central vertical axis of the loop at an angle of approximately 45° to said axis to each quadrant, a parasitic dipole, and means rotatable about said axis for supporting the dipole close to and parallel to a chord of the loop aerial.

6. An aerial system as claimed in claim 5 wherein the means for supporting said dipole are adjustable in respect of the distance of the dipole from said axis.

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