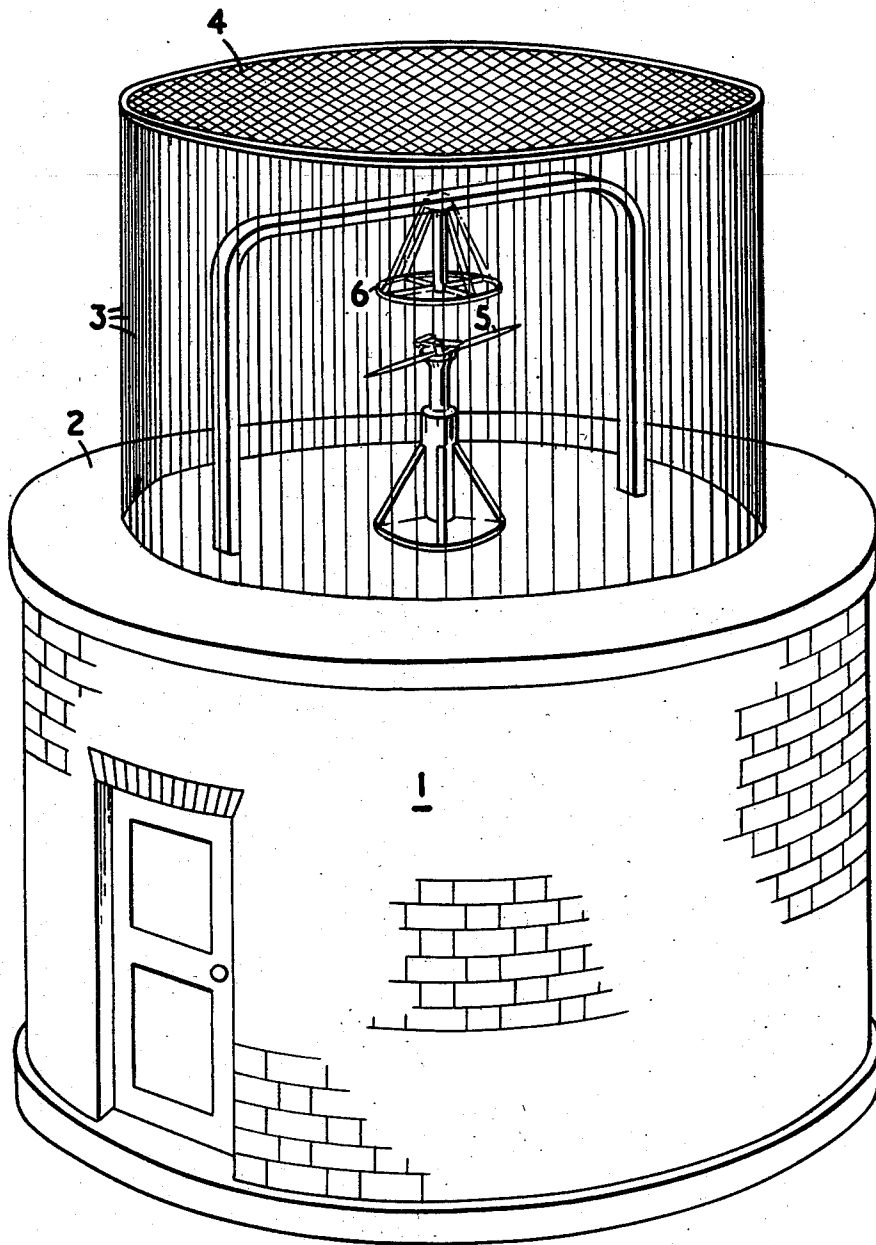


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RADIO AERIAL SYSTEM, AND PARTICULARLY
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RADIO AERIAL SYSTEM, AND PARTICULARLY DIRECTIVE AERIAL SYSTEM

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7 Claims. (Cl. 250—33.63)

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This invention relates to radio aerial systems, and particularly but not exclusively to those transmitting systems which are of a directive character and are sometimes referred to as omnirange beacons for very high frequency radio communications and signalling.

Various systems of this character have been proposed, which utilise fixed loops and a rotating goniometer, or a rotating loop either with a plurality of parasitic loops, or a parasitic dipole. Another system embodies a fixed loop and a rotating dipole, which is fed by a separate feeder.

It has been found with these systems, that if there is any vertical component of radiation at high angles of elevation, serious errors are introduced. Proposals have been made to use screens to overcome this defect, and it is the object of the present invention to provide an alternative or additional arrangement for reducing the contingency of this type of error.

The invention is not restricted, however, to directive transmitting systems but may be used for omnidirectional transmission or reception of horizontally polarised radiation.

According to the invention an aerial system comprises upper and lower electrically conductive discs at least one wavelength in diameter and spaced apart more than half a wavelength at the operating frequency so as to form a radial transmission line or waveguide for an aerial system located substantially centrally between said discs.

The lower disc may, conveniently, form the roof of a building.

The upper conducting disc may have a diameter different from that of the metal roof of the building, and such that it gives the required control of the vertical pattern of the radiation.

It will be understood that although it is convenient to provide this radial wave guide device as a part of the building containing the transmitting equipment, in some cases it may be more desirable to provide a separate waveguide device. Accordingly, the radial waveguide device may be generally defined as a pair of co-axial conducting discs, between which the aerial system is located and the upper one of which is of a diameter the same or different from that of the lower disc, in order to give the required propagation to horizontally polarised waves, and the desired control of the vertical pattern of radiation.

For improved results, conducting screens may be disposed between the two discs, such screens preferably being of an annular form, their size and spacing being adjusted in accordance with known wave guide lens technique, so that additional control of the relative amounts of horizontal and vertical polarised radiation, as well as of the vertical polar patterns, may be achieved. The number of the annular screens and the heights to which they are stacked, may be varied

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as necessary, in order to obtain the required vertical polar pattern.

Alternatively, a grating consisting of a plurality of vertical metal bars electrically connected to the periphery of the upper conducting disc and to the metal roof of the building, may be provided for assisting in the suppression of any vertically polarised component present in the radiation.

Reference is directed to the accompanying perspective drawing which shows by way of example a practical embodiment of the invention which was designed to include the aerial system described in the specification of my co-pending U. S. patent application Serial No. 44,186, filed August 13, 1948.

In the drawing 1 is a building which is circular in plan and advantageously houses the transmitter installation for the aerial system. The roof 2 is also circular and is made of metal, for example copper, although a non-conducting roof covered with, say, wire mesh would serve equally well and is to be understood as being within the meaning of the expression "metal roof" used herein.

Supported above and parallel with the roof on vertical metal rods 3 is a conducting disc 4 consisting of a wire mesh on a suitable support. The disc 4 could, of course, consist of sheet metal if more convenient from a constructional point of view. It is important that the metal rods 3 be short circuited at both ends and they are therefore electrically bonded to the roof 2 and to the disc 4.

Centrally between the two discs formed by the roof 2 and the disc 4 there is shown a directive aerial system of the character described. It is the one described and illustrated by way of example in greater detail in the specification of my aforesaid co-pending patent application consisting of a parasitic dipole 5 mounted so as to rotate slightly off-centre below a fed loop aerial 6. The mounting of the dipole is such that it is always disposed adjacent and parallel with a chord of the loop so as to be excited by the loop. The operating wavelength in this chosen example is approximately 100 in. and typical dimensions for the construction of the present invention for use at the wavelength are—

Diameter of upper disc	10 ft.
Diameter of roof	15 ft.
Separation of disc and roof	6 ft. (more than half wave length)
Spacing of rods	5 in. (about $\frac{1}{20}$ wave length)

The upper and lower discs of the invention may be regarded as a radial transmission line or waveguide for the energy launched at the centre by the loop aerial and parasitic dipole and tend to screen the direct high angle radiation which, due

to the dipole, contains a vertically polarised component. Thus energy received at high angles is that which has been propagated by the discs acting as a radial transmission line, none being received direct from the dipole, and the vertical component is reduced. The vertical grating also acts as a suppressor of vertical polarisation, it may be regarded as a plurality of vertical slots, and still further tends towards reduction of said undesired component.

It will be understood that the aerial system of the present invention is not limited to use in connection with the aerial system described in my aforesaid co-pending patent application, nor with an aerial system which radiates a directive pattern but may be used in combination with any omni-directional or substantially omni-directional aerial system adapted for radiating or receiving horizontally polarised radiation in which there may be an undesired vertical component at high angles.

I claim:

1. An aerial installation for omni-directional transmission or reception of horizontally polarised radiation comprising upper and lower electrically conducting discs at least one wavelength in diameter and spaced apart more than half a wavelength at the operating frequency so as to form a radial transmission line or waveguide, a rotatable directive aerial system having an undesired vertically polarised component at high angles of elevation located substantially centrally between said discs, a plurality of spaced metallic vertical bars arranged in a circle and extending from the upper disc to the lower disc, said bars being electrically connected to the discs.

2. An aerial installation for omni-directional transmission or reception of horizontally polarised radiation comprising upper and lower electrically conductive discs at least one wavelength in diameter and spaced apart more than half a wavelength at the operating frequency so as to form a radial transmission line or waveguide, a rotatable directive aerial system having an undesired vertically polarised component at high angles of elevation located substantially centrally between said discs comprising a horizontally mounted fed loop aerial and a parasitic dipole disposed adjacent and parallel with a chord of the loop so as to be excited by the loop.

3. An aerial installation as claimed in claim 2 in combination with a grating consisting of a plurality of vertical bars arranged in a circle and extending from the upper disc to the lower disc, said bars being electrically connected to the discs.

4. A radio beacon for transmitting a rotating directive pattern of horizontally polarised radiation up to high angles of elevation comprising in combination a rotatable directive aerial system having an undesired vertically polarised component at high angles of elevation, and a filter device consisting of a pair of electrically conducting co-axial discs arranged above and below the aerial system, the discs being at least one wavelength in diameter and separated by at least half a wavelength at the operating frequency, and a grating consisting of a plurality of vertical conducting bars surrounding the aerial system, extending from the upper to the lower disc, and spaced apart a distance which is small compared with a wavelength, the arrange-

ment being such that the filter device cuts off the transmission of said undesired vertically polarized component.

5. A radio beacon for transmitting a rotating directive pattern of horizontally polarised radiation up to high angles of elevation comprising in combination a rotatable directive aerial system including a horizontal dipole; and a filter device consisting of a pair of electrically conducting co-axial discs arranged above and below the aerial system, the discs being at least one wavelength in diameter and separated by at least half a wavelength at the operating frequency, and a grating consisting of a plurality of vertical conducting bars joining the peripheries of the discs and spaced apart a distance which is small compared with a wavelength, the arrangement being such that the filter device cuts off the transmission of the vertically polarised component of the radiation from the dipole at high angles of elevation.

6. An aerial installation comprising upper and lower substantially flat horizontally disposed electrically conductive members, a plurality of spaced metallic vertical bars electrically connecting the periphery of the upper member to the lower member and a rotatable directive aerial system supported substantially centrally within said bars and between said members, the dimensions being such that the aerial system is spaced at least one-quarter wave-length at its lowest operating frequency from the members and at least one-half of said wavelength from said bars and each bar being spaced from adjacent bars by a distance which is small compared with a wavelength.

7. An aerial installation comprising upper and lower substantially flat horizontally disposed electrically conductive members, a plurality of spaced metallic vertical bars electrically connecting the periphery of the upper member to the lower member and a rotatable directive aerial system supported substantially centrally within said bars and between said members, the dimensions being such that the aerial system is spaced substantially one-quarter wave-length at its lowest operating frequency from the members and substantially one-half of said wavelength from said bars and each bar being spaced from adjacent bars by a distance which is small compared with a wavelength.

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