FOLDED VERTICAL MONPOLE ANTENNA

FIG 1

FIG 2

FIG 3
FLOODED VERTICAL MONOPOLE ANTENNA

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This invention relates in general to antennas and in particular to an umbrella-shaped vertical antenna. It is an object of this invention to provide an antenna which has high efficiency and broad bandwidth.

Another object of this invention is to provide an antenna which consists of two short vertical monopole elements which are connected together with a half wavelength transmission line. The half wavelength line is wound back and forth about the surface of an imaginary solid which can take many alternate forms.

An antenna constructed for low frequencies results in a relatively long half wavelength and such length can be formed into a relatively small space by winding the half wavelength in the form of a cone or pyramid.

A feature of this invention is found in the provision for a pair of short monopole elements which are connected together with a half wavelength transmission line formed to define a surface of a cone or pyramid.

Further objects, features and advantages of this invention will become apparent from the following description and claims when read in view of the accompanying drawings, in which:

FIGURE 1 is a perspective view of an antenna constructed in accordance with this invention;

FIGURE 2 illustrates a modification of the invention; and,

FIGURE 3 illustrates a further modification of the invention.

In the low frequency range of 15 to 60 kilocycles, it is desirable to provide an efficient and compact antenna. Since half wavelengths at these frequencies are considerable, the present antenna has been developed in which a half wavelength portion is formed into a conical or other surface and has its opposite ends connected to two monopole elements. Such a structure has been determined to have a high efficiency and a relatively broad bandwidth.

FIGURE 1 illustrates an antenna constructed according to the teachings of this invention.

A ground plane is generally designated as 10 and supporting mast 11 has its lower end 12 firmly attached to the ground plane. In a particular embodiment, such an antenna might extend over one thousand feet in the air.

The top end 13 of the mast 11 has attached to it a first section 14 of a wound half wavelength conductor 15. The half wavelength conductor is wound to form a cone from the end of the mast to a plane A which is a distance X above the ground plane 10. From the end 17 of the slant portion 14, a radial portion 18 extends to an insulating disc 20 closely adjacent the mast 11 and is then carried upwardly by a section 19 to an insulating disc 21 which is attached adjacent the top of the mast 13. A second slant portion 22 extends from the disc 21 to plane A and then in a radial portion 23 to the mast 11 and back to disc 21 and so on about the mast. The second end 24 of the conductor 15 is connected to a second vertical monopole 31 which has its lower end connected to a coax feed line 32. To support the mast 11 and the half wavelength conductor 15, suitable guy wires 33 are attached to the junctions between sections 14 and 18 and 22 and 23 by insulators 34. The lower ends of guy wires 33 are attached to suitable anchors mounted in the ground.

The mast 11 and conductor 31 constitute a pair of monopoles which are connected by the half wavelength line consisting of the conical shaped winding illustrated. By forming the winding into a conical shape, the special requirements of the antenna are substantially reduced and a relatively compact structure results. Since the guys are insulated from the ground plane and the half wavelength conductor 15, they do not form a part of the radiating structure of the antenna.

FIGURE 2 illustrates a structure similar to the configuration of FIGURE 1 except that the half wavelength winding 36 is wound differently to eliminate the vertical lengths 19 of FIGURE 1. The winding 36 extends from end 13 of mast 11 to plane A in a section 37. Then to disc 20 adjacent the mast and then radially out from the mast in a section 39 to plane A. Then upwardly to disc 21, etc., until the antenna is completely formed. The end 44 is joined to a coax feed line 46.

Another modification of the invention is illustrated in FIGURE 3 wherein the feed monopole 50 and grounded monopole 11 are connected by a spiral winding 51 generally as 51 which passes upwardly about an imaginary conical surface from the end 52 of feed monopole 50 to the upper end 13 of the grounded monopole 11. Suitable guy wires 53 and insulators 54 support the structure.

Although the half wavelength windings have been shown in the form of a cone, it is to be realized that a pyramid with any number of sides could also be used. The cone or pyramid apex angle at the top of the mast should be kept as close to 90 degrees as possible but for very large structures, angles in the range of 45 to 55 degrees would normally be used.

Although this invention has been described with respect to particular embodiments thereof, it is not to be so limited, as changes and modifications may be made therein which are within the spirit and scope of the invention as defined by the appended claims.

We claim:

1. An antenna comprising a pair of monopole radiating elements extending in the same general direction, one of said monopoles being connected to ground and the other of said monopoles being connected to a signal source, a single continuous half wavelength transmission line section connecting the ends of the monopole radiating elements, and the half wavelength section of line wound about the surface of an imaginary cone so as to dimensionally shorten the half wavelength section and produce an antenna which requires a small space.

2. An antenna comprising a pair of monopoles, one of the monopoles connected to the ground plane and being rigid to provide mechanical support, the other of said monopoles being connected to a signal source, a single continuous half wavelength transmission line section with one end attached to the upper end of the rigid monopole and folded about the surface of an imaginary cone,
the other end of the half wavelength line connected to the second monopole.

3. In apparatus according to claim 2 wherein said surface defined by the half wavelength line consists of a pyramid.

4. In apparatus according to claim 2 guy wires insulatingly attached to the half wavelength line at certain points and to the ground to support the line in a surface and to guy the mast.

5. In apparatus according to claim 2 wherein the cone is formed by slanting portions which extend downwardly and outwardly from the top of the mast.

6. In apparatus according to claim 1 wherein said cone is formed by spirally winding the line from the top of the grounded monopole.

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