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FOLDED VERTICAL MONOPOLE ANTENNA

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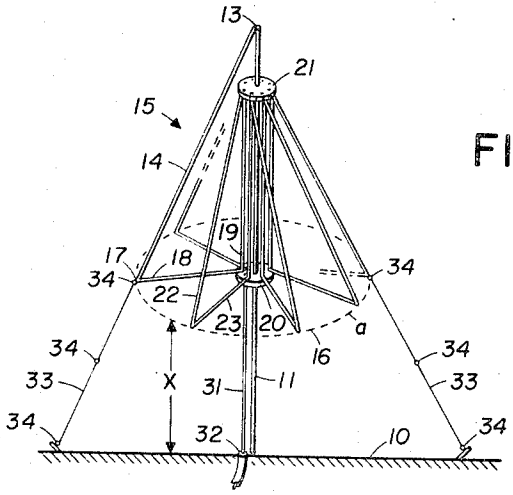


FIG 1

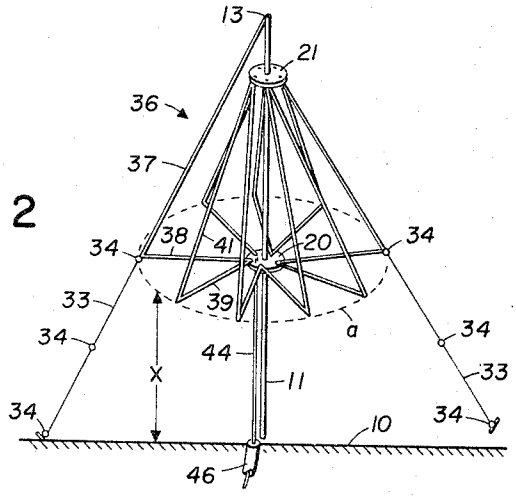


FIG 2

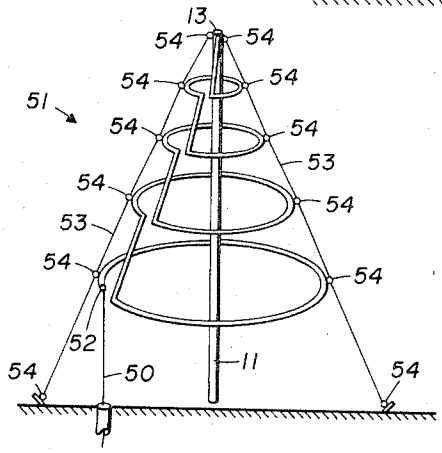


FIG 3

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FOLDED VERTICAL MONOPOLE ANTENNA

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6 Claims. (Cl. 343—845)

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 spacial 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 designated 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, and

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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