United States Patent [19]

Galloway et al.

[11] **3,727,231**

[45] **Apr. 10, 1973**

[54] **COLLINEAR DIPOLE ANTENNA**

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[22] Filed: **Sept. 24, 1971**

[21] Appl. No.: **183,388**

[52] **U.S. Cl.** .....**343/813,** 343/814, 343/821, 333/84 M, 333/26

[51] **Int. Cl.**.....**H01q 21/12**

[58] **Field of Search**.....343/813, 814, 821, 343/816; 333/84 M, 26

[56] **References Cited**

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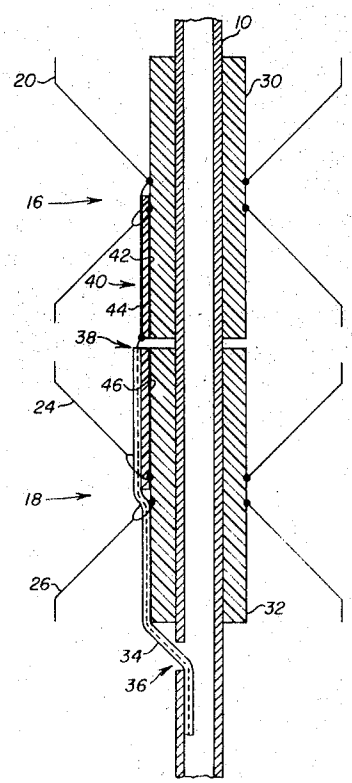
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[57] **ABSTRACT**

A collinear dipole array antenna including feed means whereby the dipoles are energized in phase independent of frequency over the operating frequency range.

4 Claims, 2 Drawing Figures



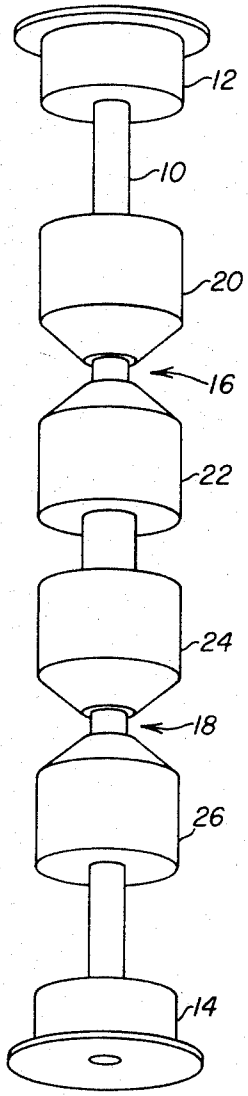


FIG. 1

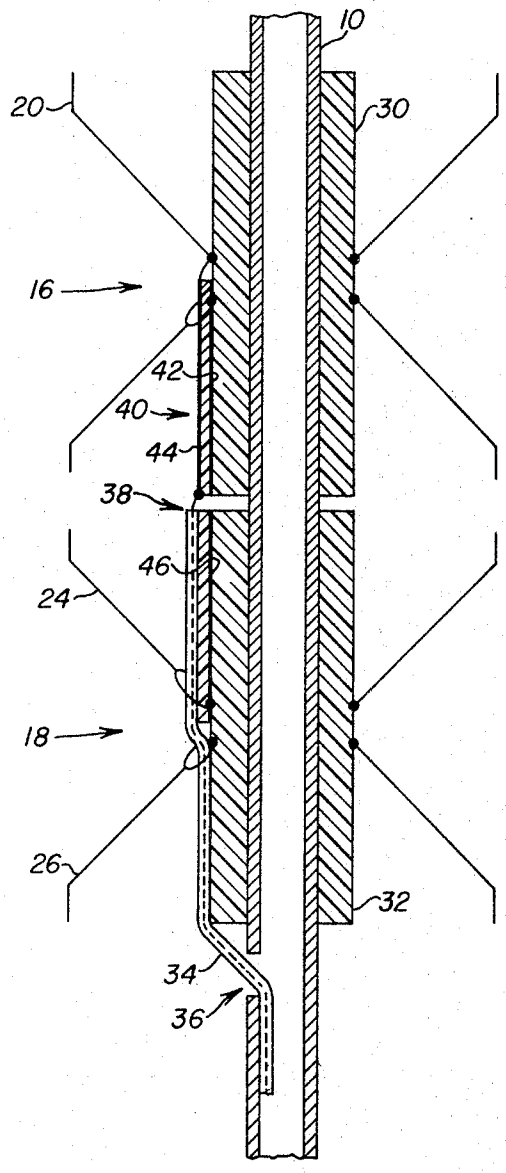


FIG. 2

COLLINEAR DIPOLE ANTENNA

This invention relates to electromagnetic radiating antennas, and more particularly to a dipole antenna utilizing collinear dipole arrays.

An object of this invention is an improved antenna utilizing collinear dipole arrays.

Another object of the invention is a collinear dipole array antenna with novel feed means for energizing said arrays in phase independent of frequency over an operating frequency range.

Still another object of the invention is an improved collinear dipole array antenna providing a 360° horizontal radiation pattern.

Briefly, a dipole antenna in accordance with the present invention comprises a support mast and two dipole structures mounted collinearly thereon. Preferably, said dipoles comprise bicones whereby 360° radiation is provided, and said mast is hollow whereby coaxial feed means may be housed therein.

An important feature of the invention is novel feed means which is economical and which energizes said dipoles in phase independent of frequency whereby the radiation pattern lobe maximum is always directed toward the horizon. The coaxial feed means is provided internally in said mast to said dipoles and is connected to stripline transmission means mounted externally to said mast and between the input terminals of each of said dipoles. Said stripline transmission line means is discontinuous at the midpoint between the two dipoles thereby providing two stripline transmission line segments. The center conductor of said coaxial line is connected to the conductor of one stripline portion while the outer conductor of the coaxial line cooperatively functions with the ground plane of the other stripline section whereby 180° phase reversal is accomplished and said dipoles are energized in phase by proper dipole element connection.

The invention and objects and features thereof will be more readily apparent from the following detailed description and appended claims when taken with the drawing, in which:

FIG. 1 is an isometric view of a collinear dipole antenna in accordance with the present invention; and

FIG. 2 is a schematic view of the antenna of FIG. 1 in section and illustrates the novel feed system in accordance with the present invention.

Referring now to the drawing, FIG. 1 is an isometric view of a collinear dipole antenna in accordance with the present invention and in which the cylindrical housing portion is removed. A central hollow mast **10** is provided with support members **12** and **14** at either end thereof which receive the cylindrical housing member (removed in this view for illustration). Mounted collinearly on mast **10** are two bicone dipole radiating elements shown generally at **16** and **18**. Conical elements **20** and **22** are insulatively mounted on mast **10** and comprise bicone **16**; similarly, conical elements **24** and **26** are insulatively mounted on mast **10** and comprise bicone **18**. Each of the bicones functions as radiating dipoles in which the radiation pattern is omnidirectional toward the horizon.

In order to accomplish the pattern load maximum directed toward the horizon, each of the dipole arrays must be fed in phase. To accomplish this over a narrow bandwidth is quite simple, but when the bandwidth is large and the feed system must be external to the central mast feed systems may become quite complex.

As illustrated in the cross section of the antenna array illustrated in FIG. 2, a novel feed system in accordance with the present invention is simple in structure while operable over a wide frequency range. The two biconical arrays **16** and **18** are insulatively mounted on mast **10** by insulators **30** and **32** which function as quarter-wave chokes at the center frequency of the spectrum to be radiated. Coaxial feedline **34** which is preferably situated within mast **10** is passed externally at point **36** and terminates at a point **38** equidistant between bicone **16** and bicone **18**. Extending from point **38** to the input of bicone **16** is a stripline **40** including base plane **42** and top conductor **44**. The center conductor of coaxial line **34** is connected to the top conductor **44** which, in turn, is connected to the upper cone **20** of bicone **16**. Ground plane **42** is connected to the bottom cone **22**.

Extending from point **38** downwardly to bicone **18** is a conductor **46** which cooperatively functions with the outer conductor of coaxial line **34** as a second stripline. Conductor **46** is electrically connected to upper cone **24** of bicone **18**, and the outer conductor of coaxial line **34** is electrically connected to the bottom cone **26** of bicone **18**.

The simple structure of the described feed system provides for inphase energization of the two bipole arrays for any operating frequency. The transposition at terminal point **38** of coaxial line **34** induces a current in conductor **46** which is in phase with the current flowing in the center conductor of coaxial line **34**. Further, the current flowing on the outer surface of the outer conductor of coaxial line **34** is in phase with the current induced in ground plane **42** of stripline **40**.

Thus, conical element **20**, which is energized by the center conductor of coaxial line **34**, and upper conical element **24** of bicone **18**, which is energized by conductor **46**, will always be in phase at any operating frequency. Similarly, conical element **22** of bicone **16**, which is energized by ground plane **42** of stripline **40**, and the bottom cone **26** of bicone **18**, which is energized by the outer surface of outer conductor of coaxial line **34**, are energized in phase at any operating frequency.

Collinear dipole antennas in accordance with the present invention have proved to be very economical in construction with satisfactory operation across a relatively wide frequency band. One such antenna designed for use in ground-to-air communication and operating from 225 to 400 megahertz has a VSWR of less than 2:1. The antenna gain varies from 4.0 to 5.0 db over isotropic and has an average power range of 5 kw. Because the array may employ a hollow continuous mast thereby minimizing weight, several such units may be stacked and supported by the space flanges on the end portions of the antennas.

While the invention has been described with reference to a specific embodiment, the description is illustrative and is not to be construed as limiting the scope of the invention. Various modifications and changes may occur to those skilled in the art without departing from the spirit and scope of the invention as defined by the appended claims.

We claim:

1. A vertically polarizable antenna having a horizontal radiation pattern comprising a support mast, two dipoles insulatively mounted collinearly on said mast, coaxial feed means, first and second stripline means, said first stripline means comprising a ground plane extending from a point between and equidistant from each of said dipoles to and electrically connected with a first element of a first of said dipoles, said second stripline means comprising a ground plane and a conductor extending from said point to the other of said dipoles with said ground plane and said conductor connected to respective elements of said other dipole, said coaxial feed means running parallel with and spaced from said first stripline means whereby the outer conductor of said feed means cooperatively functions as part of said first stripline, said coaxial feed means terminating at said point, means interconnecting the center conductor of said feed means and said conductor of said second stripline means, means connecting said outer conductor with a second element of said first dipole, and means electrically connecting said ground plane of said first stripline means to said first element of said first dipole, whereby said two dipoles are energized in phase independent of frequency over a wide operating frequency range.

2. An antenna as defined by claim 1 wherein said dipoles comprise bicones whereby 360° radiation is provided.

3. An antenna as defined by claim 2 wherein said mast is hollow and said coaxial feed means is positioned within said mast and emerges outside said mast near said dipoles.

4. An antenna is defined by claim 1 wherein support flanges are provided at both ends of said mast whereby a plurality of antennas may be stacked.

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