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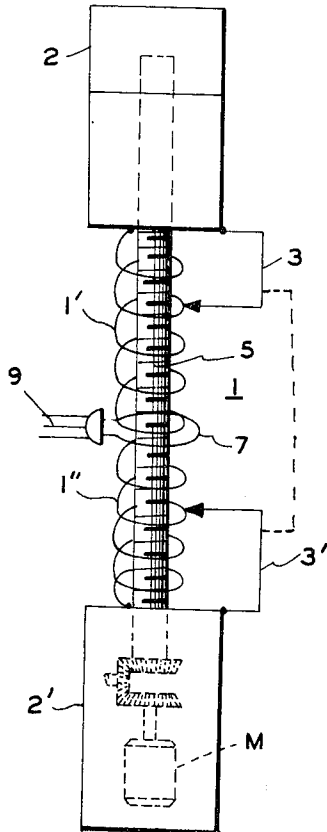
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[54] **BALANCED TUNABLE HELICAL MONOPOLE ANTENNA**
 4 Claims, 2 Drawing Figs.

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 [50] Field of Search..... 343/807,
 895, 908, 747, 792, 823

ABSTRACT: This disclosure deals with a novel balanced tunable helical monopole antenna, that, through a symmetrical construction involving a central feed and simultaneous turn-shortening tuning from the ends thereof, enables the obviating of the necessity for a ground plane.



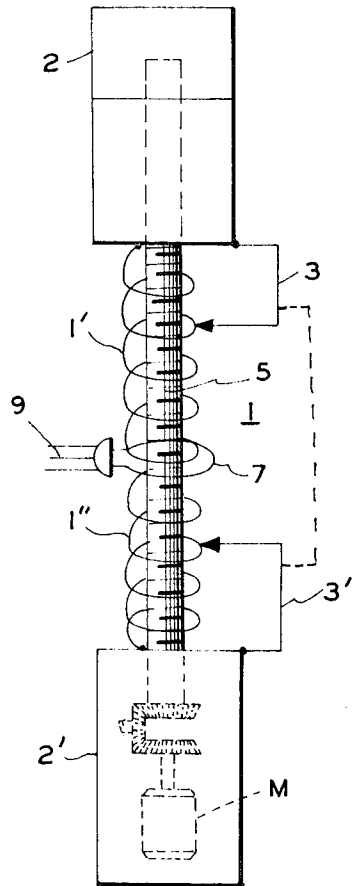


FIG. 1

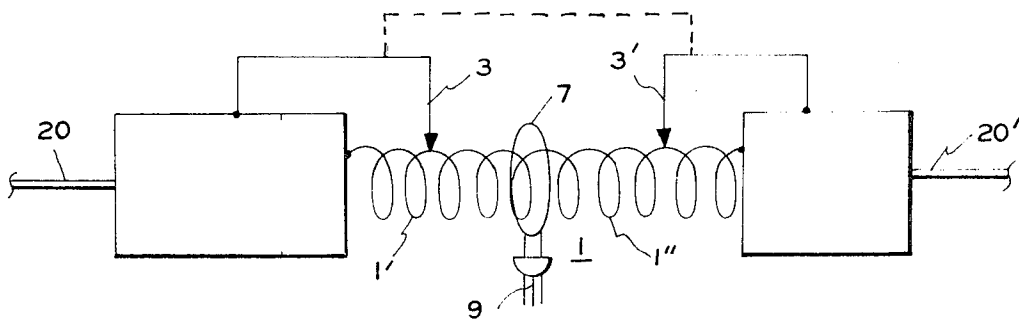


FIG. 2

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BALANCED TUNABLE HELICAL MONOPOLE ANTENNA

The present invention relates to helical antennas, being more specifically directed to tunable helical monopoles and the like.

In prior U.S. Letters Pat. No. 3,235,871, issued Feb. 15, 1966 to Lan Jen Chu et al., a successful tunable helical antenna is disclosed operable with a ground plane. There are occasions, however, as when the antennas are to be used on small vehicles and the like which are to serve as the ground plane, that such operation introduces aberration into the pattern because the dimensions of such structures are an appreciable portion of the wavelength of an operating frequency or are otherwise too small to permit effective operation as a ground plane. Matching problems are also introduced since a small ground surface does not permit the matching attainable with an effectively infinite ground plane. At low frequencies, moreover, particularly for location on masts and the like, sizable ground planes are bulky and often impractical.

It is to the objective of providing a new and improved helical antenna that shall not be subject to such ground-plane limitations and difficulties, accordingly, that the present invention is primarily directed; it being an object of the invention to provide a new and improved helical antenna of the monopole type.

A further object is to provide a novel and balanced antenna of more general utility, as well.

Other and further objects will be hereinafter set forth and are more particularly pointed out in the appended claims.

In summary, the invention contemplates a helical antenna winding centrally fed and provided with a pair of similar terminal antenna elements, one connected to each end of the helical winding and each provided with shorting means for contacting the turns of the helical winding thereadjacent; the system being provided with means at each end for synchronously rotating shorting means around the helical winding towards or away from the center of the helical winding to tune the antenna.

The invention will now be described with reference to the accompanying drawing FIG. 1 of which is a schematic circuit diagram illustrating the invention in preferred form; and FIG. 2 is a similar view of the modification.

Referring to FIG. 1, a helical monopole antenna winding is shown at 1 having an upper portion 1' and a lower portion 1'', symmetrically substantially identical. Connected to each end of the two winding halves 1' and 1'' are shown cylindrical terminal dipole antenna elements 2 and 2' preferably in the form of "top hat" or "can"-type housings electrically connected with respective upper and lower ends of the helical winding 1.

Connected with these terminal elements 2 and 2' are shorting fingers, schematically illustrated at 3 and 3', respectively, which, in response to the rotation of, for example, an internally disposed insulating screw or other threaded member 5 to which they may be mechanically secured, are caused to move synchronously both towards the center of the helical winding 1 or away from the same, as in response to the driving action of a motor M which may, if desired, be contained within the element 2'. The fingers 3 and 3' will thus synchronously effectively shorten or lengthen the respective helical winding

halves 1' and 1'' to tune the same. Other types of ganged symmetrical shorting elements may similarly be used.

In this antenna, radiation is effected or received in the normal mode; that is, with a radiation pattern extending in a plane normal to the winding axis along which the member 5 is disposed. This is shown effected by means of a feed loop 7, connected to the feed transmission line 9, and illustrated in the form of a coupling, as described in said Letters Patent, though other types of central symmetrical feeding may also be employed.

Under such circumstances, particularly with the cross dimension of the terminal elements 2 and 2' approximately the same as (preferably slightly somewhat larger than) the turn diameter or cross section of the helical winding 1, it has been found that the antenna may be operated over wide tunable frequency ranges without the necessity for a ground plane; and thus, the antenna becomes entirely useable with small vehicles, masts and other structures where such structures themselves serve as ineffective ground planes, as before discussed.

A somewhat similar structure is illustrated in FIG. 2, more particularly adapted for horizontal operation, wherein, again, the elements 3 and 3' are ganged to move synchronously, inwardly and outwardly, symmetrically and simultaneously to tune the two equal halves 1' and 1'' of the helical winding 1. In this embodiment, the dipole extensions 20 and 20' are shown in the form of linear elements extending substantially parallel with winding axis and, indeed, if desired, in the form of wire dipole radiators which may support the helical winding.

As an example, a monopole of the type illustrated in FIG. 1 has been successfully operated over the wide band from 17 MHz. to about 80 MHz. with an overall antenna length of about 21 inches and a helical winding length of about 10 inches, with a helical turn diameter or winding cross dimension of about 3 inches.

Further modifications will occur to those skilled in the art and all such are considered to fall within the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

- 1. A balanced tunable helical monopole antenna which obviates the need for a ground plane, having, in combination, a continuous helical monopole winding, means for feeding the winding disposed centrally thereof such that the radiation pattern of the helical winding extends in a plane normal to the winding axis, a pair of similar terminal antenna elements, one connected to each end of the helical winding and each provided with shorting means for contacting the turns of the helical winding thereadjacent, and means for synchronously adjusting said shorting means towards and away from the center of the helical winding to tune the antenna.
- 2. An antenna as claimed in claim 1 and in which said terminal elements are dipole elements.
- 3. An antenna as claimed in claim 2 and in which said dipole elements are cylindrical devices of cross dimension comparable to that of the helical winding.
- 4. An antenna as claimed in claim 1 and in which said terminal elements are linear elements extending substantially parallel with the said winding axis.

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