Nov. 2, 1948. J. D. KRAUS 2,452,767

BROAD-BAND ANTENNA

Filed April 2, 1946

FIG. 1

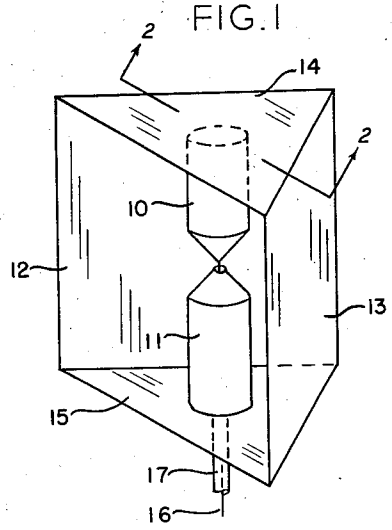


FIG. 2

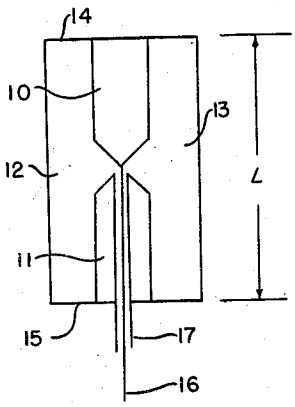


FIG. 3

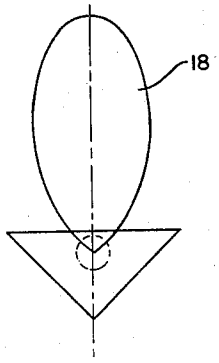
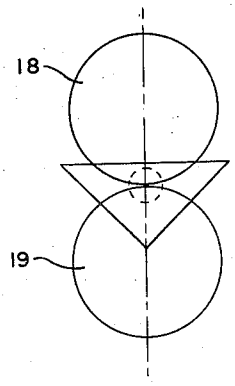


FIG. 4



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BROAD-BAND ANTENNA

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5 Claims. (Cl. 250—33.65)

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This invention relates generally to electrical apparatus and more particularly to antennas.

Frequently, in antenna applications, some of the characteristics of antennas may be of greater importance than others. For example, a given antenna application may require that the antenna be operable over extremely wide ranges of frequences, even at the expense of antenna directivity.

In antenna applications, where directivity may be sacrificed in favor in broad-band characteristics, some antennas of the prior art have been used over fairly wide ranges of operating frequencies. However, the response or radiation patterns of these antennas usually split into a plurality of secondary lobes as the operating frequency is varied.

In many antenna installations, where broad-band antenna characteristics are required, it is desirable only that the antenna patterns remain generally directional as the operating frequency is varied. Antenna applications requiring a narrow and precise pattern have become numerous in recent years, however there still remain many antenna applications for which antennas having a fairly broad-beam width are more desirable.

It is an object of the present invention to provide a very broad-band directional antenna.

It is also an object to provide a broad-band antenna whose major lobe retains its original direction of maximum response or radiation as the operating frequency is varied over wide ranges.

Generally this invention comprises a dipole antenna and a corner reflector. The corner reflector consists of two sides, a top and a bottom. A center fed radiating element is inserted in the corner reflector with the ends of the element in contact with the top and bottom plates of the corner reflector.

Other objects, features and advantages of this invention will suggest themselves to those skilled in the art and will become apparent from the following description of the invention taken in connection with the accompanying drawing in which:

Fig. 1 is an isometric view of an antenna embodying the principles of this invention;

Fig. 2 is a sectional view of Fig. 1 taken at section 2—2 shown schematically;

Figs. 3 and 4 are antenna patterns obtainable by the antenna shown in Fig. 1.

Referring now to Fig. 1, a center fed radiating element consisting of upper and lower sections 10 and 11, is inserted in a corner reflector. The

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axis of the antenna is contained in a plane which bisects the included angle between sides 12 and 13 of the corner reflector. Section 10 is in contact with the top plate 14 and section 11 is in contact with the bottom plate 15 of the corner reflector. A coaxial feed line consisting of inner conductor 16 and outer conductor 17 enters the corner reflector through a hole in bottom plate 15 and is coaxially inserted in section 11. Inner conductor 16 terminates in contact with the tapered end of section 10, and outer conductor 17 terminates in contact with the tapered end of section 11.

Fig. 2 shows the connections of the radiating elements 10 and 11 to the inner, and outer conductors 16 and 17 of the coaxial line.

Fig. 3 shows the horizontal pattern 18 of a vertically polarized antenna-reflector system when the length L, Fig. 2, corresponds to approximately one-half of a wavelength or more of the operating frequency.

Fig. 4 shows the horizontal pattern comprising lobes 18 and 19 of a vertically polarized antenna-reflector system when the length L, Fig. 2, corresponds to approximately one-quarter of a wavelength or less of the operating frequency.

Referring again to Fig. 1, this assembly operates at high frequencies similarly to a conventional dipole-reflector. When the operating frequency is such that the length of the element is of the order of one-half of a wavelength or more, the unidirectional antenna pattern 18, Fig. 3, is obtained. However, when lower operating frequencies are used, so that the length of the element is of the order of one-quarter of a wavelength or less, the bidirectional antenna pattern shown in Fig. 4 is obtained. At these lower operating frequencies, the element together with the reflector, operates similar to a conventional loop antenna, resulting in the familiar bi-directional pattern of Fig. 4.

At the lower frequencies, the existence of the rear lobe 19, Fig. 4, may or may not be undesirable. The pertinent fact is that the main forward lobe 18 is still retained and that its axis has not been shifted.

At the center of the radiating element, the ends of the upper and lower sections 10 and 11 are tapered to improve the impedance match between the coaxial feed line and the antenna assembly.

The included angle formed by the intersection of the two sides of the corner reflector is not critical and is determined by the desired bandwidth of the antenna pattern.

Although a corner reflector has been shown as a part of the combination, by way of example, reflectors of other configurations can be used. For instance, the reflector surfaces 12 and 13 may be of cylindrical or parabolic shape instead of flat surfaces as in Fig. 1.

While there has been here described what is at present considered to be the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the scope of the invention.

What is claimed is:

1. A broad-band vertically polarized antenna assembly including a metallic corner reflector having two sides which meet to form a corner, a bottom and a top inclosing said corner, a center fed radiating element, said element comprising two linearly arranged radiating sections each having a large diameter, the adjacent ends of said sections being tapered to a smaller diameter, said element being vertically oriented within said reflector so that the longitudinal axis of said element lies in a plane which bisects the included angle formed by the intersection of the two sides of said reflector, the outer ends of said sections terminating in electrical contact with the top and bottom of said reflector, and a coaxial feed line inserted through a hole in the bottom of said reflector and coaxially enclosed within the lower section of said element with its inner conductor terminating in electrical contact with the tapered end of the upper section of said element and with its outer conductor terminating in electrical contact with the tapered end of the lower section of said element.

2. A broad-band plane polarized antenna assembly including a vertical corner reflector having a pair of side plates which meet to form a corner and a bottom plate and a top plate inclosing said corner, a center fed radiating element vertically oriented in said reflector adjacent the corner thereof with the ends of said element electrically connected to the top and bottom plates of said reflector whereby a sharply defined unidirectional antenna pattern is obtained when the length of said element corresponds to approximately one-half of a wavelength or more of the operating frequency and a bidirectional antenna pattern is obtained when the length of said element corresponds to approximately one quarter of a wavelength or less of the operating frequency.

3. A broad-band antenna assembly comprising a corner reflector having a pair of side surfaces which meet to form a corner with bottom and top surfaces inclosing said corner, and a center fed linear radiating element disposed within said reflector, said element being arranged so that the longitudinal axis thereof lies in the plane which bisects the angle between said sides, the opposite ends of said element being electrically connected to said top and bottom surfacs.

4. A broad-band antenna assembly comprising a corner reflector having a pair of side surfaces which meet to form a corner with top and bottom surfaces inclosing said corner, a center fed radiating element within said reflector, said element including two linearly arranged radiating sections, said element being disposed so that the longitudinal axis thereof lies in the plane which bisects the angle between said side surfaces, the opposite ends of said sections terminating in electrical contact with said top and bottom surfaces, and a transmission line connected to the adjacent ends of said sections for feeding said element.

5. A broad-band antenna assembly comprising a corner reflector having two side surfaces which meet to form a corner with top and bottom surfaces inclosing said corner, a center fed radiating element within said reflector, said element having two linearly arranged radiating sections, each section having a large diameter, the adjacent ends of said sections being tapered to a relatively small diameter, said element being disposed so that the longitudinal axis thereof lies in the plane which bisects the angle between said side surfaces, the outer ends of said sections terminating in electrical contact with said top and bottom surfaces, and a transmission line connected to the adjacent ends of said sections for feeding said element.

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