

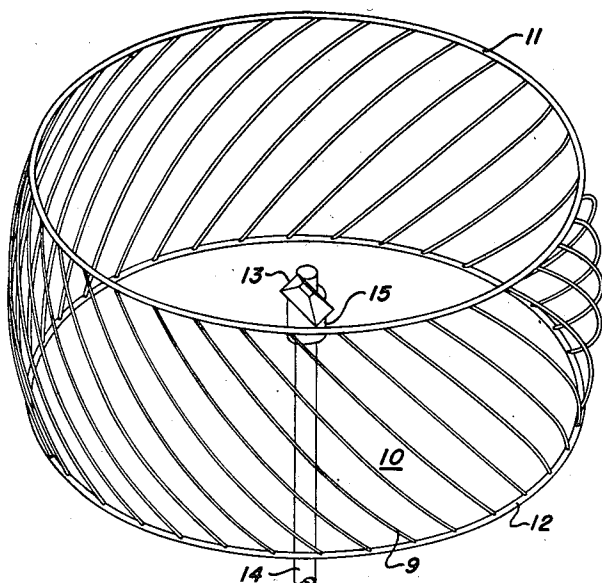
May 20, 1958

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2,835,890

DIRECTIONAL ANTENNA

Filed Oct. 10, 1951



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1

2,835,890

DIRECTIONAL ANTENNA

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Application October 10, 1951, Serial No. 250,645

2 Claims. (Cl. 343-754)

This invention relates to antennas and, more particularly, to a high-frequency directional antenna of the scanning type such as used in radar systems.

The antennas of the prior art which have highly directional characteristics and are capable of scanning, generally utilize a reflecting element and a small radiator, both of which are rotated or reciprocated in an arc as a unit. This type of antenna has many desirable characteristics but has an objectionable mass in those applications wherein the antenna must scan through a selected arc with great rapidity. In such applications, the windage and inertia of the reflector result in the necessity for very heavy mechanisms to drive the device and, in addition, demands considerable driving energy.

It is an object of the present invention to provide a highly directional antenna of the scanning type in which the reflecting structure is stationary and only the radiator itself need be moved to provide the scanning function.

The novel features which are characteristic of this invention are set forth in particularity in the appended claims. A preferred embodiment of the invention itself, both as to its organization and method of operation together with further objects and advantages thereof may best be understood by reference to the following description taken in connection with the accompanying drawing made a part of this specification.

The objects of this invention are obtained by the utilization of a plurality of metallic slats arranged in the configuration of a spherical zone. The slats are parallel to each other and are disposed at an angle of 45 degrees to the great circle at the equator of the spherical zone. The radiator is supported at the geometric center of the spherical zone and is inclined at an angle of 45 degrees in the same direction as the reflecting slats which it faces.

It is noted that the spherical zone shape is preferred particularly if scanning in vertical planes is to be a function. However, it is apparent that the reflector will be operative as long as it is a complete cage having reflecting elements at approximately 45°. In fact, if scanning is to occur only in the horizontal plane, a cylindrical cage is practical.

Referring to the figure of the drawing, the slats are denoted by the numeral 9, and by the use of a plurality of such slats, the spherical zone, denoted by the numeral 10, is generated. The slats terminate in an upper supporting ring 11 and a lower supporting ring 12.

The antenna 13 is supported in the center of the re-

2

flecting cage and is shown to be disposed at the same angle as those slats which it is facing. The antenna is supported on the usual transmission line or wave guide 14 by means of the usual scanning and/or nodding mechanism 15. In this connection, although a radiator horn is shown, any type of radiator such as a line source beginning at one-half the spherical zone radius from the center may be used with the only requirement being that the phase front be proper and the direction of the electric field radiated be at the same 45 degree angle as that of the slats which it faces (over the region illuminated).

The energy radiated by the antenna will be reflected from that part of the reflector which the antenna faces. The energy so reflected will travel across to the opposite side of the spherical zone where the slats are no longer parallel to the electric vector of the radiation field but are now normal to it. The reflected energy will therefore readily pass through this opposite side of the reflector.

It is apparent that the reflector may be incorporated in the structure of a radome.

In order to provide for desirable characteristics of directivity, the shape of the reflecting slats may be such that the projection of any slat on a vertical plane may be spherical, parabolic or cosecant-squared.

The device of this invention has been constructed for X-band frequencies, having a 20-inch spherical surface and a line-source feed. This arrangement results in a beam of 8° by 8° with -13 db side lobes.

From the foregoing description, it is seen that this invention provides a directional antenna of the scanning type which has reduced many fold the inertia and windage of the moving system.

What is claimed is:

1. An antenna comprising the combination of a reflector having an plurality of parallel metallic elements in the form of an annular cage having the shape of a zone of revolution and in which the said elements are inclined at 45 degrees to the axis of the cage, a rotatable scanning element operatively connected and rotatable with the scanning mechanism within the confines of said zone of revolution disposed generally parallel to the metal elements which it faces and having a plane of electrical polarization generally parallel to the metallic elements which it faces and generally normal to oppositely disposed metallic elements.

2. An antenna as claimed in claim 1 wherein the radiating element is supported by nodding means.

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