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[54] **METALLIZED CHANNEL GUIDE ANTENNA**

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[51] **Int. Cl.** **H01q 13/00**

[58] **Field of Search** 343/705, 708, 783, 343/785, 786

[56] **References Cited**

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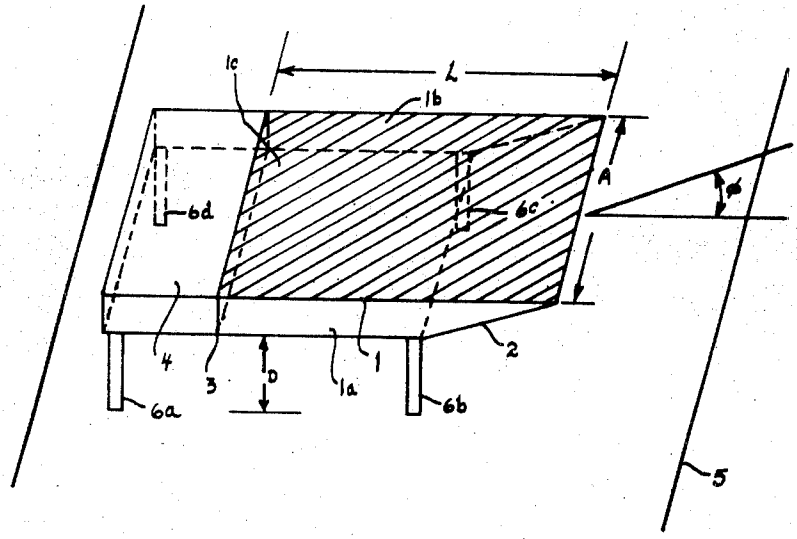
Primary Examiner—Eli Lieberman

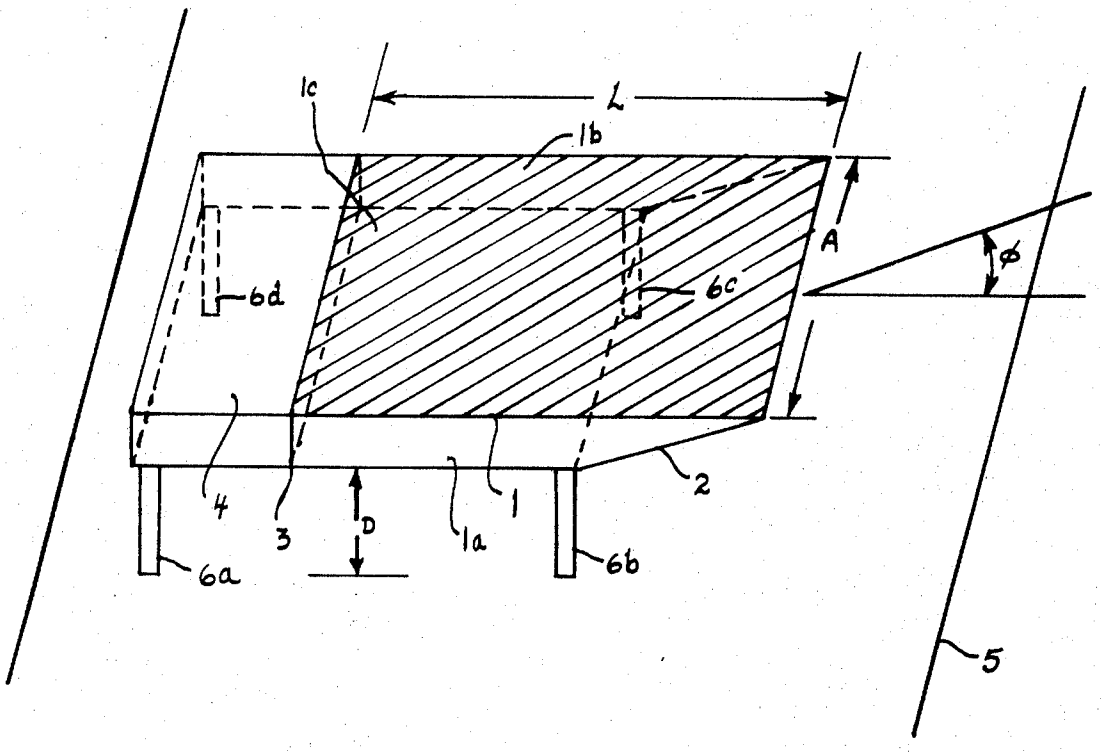
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[57] **ABSTRACT**

A metallized channel guide antenna is utilized for providing coverage in a sector near the horizon. The antenna has a dielectric slab with metallized sides and bottom forming a waveguide. The waveguide is mounted a fixed distance above a cylindrical ground plane and in combination therewith results in coverage at the horizon.

5 Claims, 1 Drawing Figure




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METALLIZED CHANNEL GUIDE ANTENNA

BACKGROUND OF THE INVENTION

In the prior art, the flush mounted channel guide antenna is a well known surface wave structure consisting of a solid dielectric waveguide of rectangular cross section embedded in a metallic channel with one end of the dielectric and channel tapered to launch the radiation efficiently at the end of the dielectric. The other end of the channel guide antenna is connected to the RF source by means of some conventional device to launch a surface wave in the channel. Typically, the launcher might be an open end waveguide, horn, or wire launcher as described in a number of texts, and is not a feature of the present invention. The channel guide is described in Jasik, *Antenna Engineering Handbook*, Chapters 16–24 and page 16–47, and in W. Rotman "Metal-Clad, Progressive Phase, Dielectric Aerials," AFCR1 (Air Force Cambridge Research Lab) Report E5081, November 1951.

The **1.** invention includes a metallized channel guide which differs from the flush mounted channel guide in that the flush ground plane is absent and the antenna is mounted above (but not flush with) at a preselected distance from the cylindrical ground plane to taper coverage to the horizon. This offers many advantages over the use of a dielectric rod antenna for the same application because the launcher radiation for the dielectric rod is not shielded and can itself be reflected from the ground plane.

One of the features of the present invention is the use of the distance separating the channel guide antenna and cylindrical ground plane. When properly adjusted, this spacing produces constructive interference at the horizon and allows the design of a constant gain antenna over a sector.

The combination of the channel guide antenna and the spaced cylindrical ground plane may be utilized as a low profile antenna to replace, for example, a horn antenna in a station keeping radar system. It may also be ideal for mounting on the fuselage of an aircraft (or airborne object) for obtaining coverage at the horizon.

SUMMARY OF THE INVENTION

A metallized channel guide antenna is provided. The antenna is comprised of a dielectric slab with metallized sides and bottom and spaced a fixed distance above a cylindrical ground plane. The distance is chosen so as to provide the proper coverage at the horizon. The dielectric slab is tapered at one end to launch the radiation efficiently therefrom. The other end is connected to an RF source by a feed to launch a surface wave in the metallized channel guide antenna.

DESCRIPTION OF THE DRAWINGS

A single FIGURE of the preferred embodiment is shown which includes in combination a metallized guide dielectric slab, a feed for the slab, and a cylindrical ground plane for the slab.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Now referring in detail to the single FIGURE, there is shown solid dielectric slab **1** which has a rectangular cross section. The dielectric slab may be of the conventional material utilized in dielectric type antennas. End **2** is tapered to launch the radiation efficiently at the

end of the dielectric. End **3** is connected to an RF source by means of feed **4.** Feed **4** may be a conventional open ended waveguide, horn, or wire launcher capable of launching a surface wave in dielectric slab **1.** Sides **1***a*, **1***b*, and bottom **1***c* of dielectric slab **1** are metallized by any conventional process such as coating with conducting epoxy. The combination of dielectric slab **1** and feed **4** is mounted above cylindrical ground plane **5** and spaced therefrom at a predetermined distance D by insulating spacers **6***a*–**6***d*. The distance D is chosen so as to provide proper coverage at the horizon ($\phi = 0$). It is well known that the channel guide antenna on a ground plane of zero length has the peak of its radiation pattern raised from the horizon, but the present invention permits the selection of D so that the energy scattered from the cylinder reinforces the radiation at $\phi = 0$. The net result is that a sector type beam is formed with nearly constant gain from $\phi = 0$ to as much as $\phi = 50°$.

THe present invention provides a much improved coverage at the horizon and offers many advantages over the use of a dielectric rod antenna for the same application. This is because the launcher radiation for the dielectric rod is not shielded and can itself be reflected by the ground plane, thus resulting in holes in the elevation plane field pattern. Since this radiation originates at the launcher instead of at the surface wave center, its phase center is widely separated from that of the surface wave and the holes in the elevation pattern can appear at very small angles as D is increased. However, when the channel guide is used the source radiation is shielded by the metallized channel bottom and therefore is not scattered in the main beam direction by the cylindrical ground plane. Only some of the surface wave radiation is reflected by the ground plane, and since that has the same phase center as the main beam D may be chosen to achieve reinforcement at and near $\phi = 0$.

One working model that has been constructed has $L = 7$ inches, D = three-fourths inch, $A = 2.840$ inches, and about a 3.5 inch taper for end **2.** This antenna model provides sector coverage from $\phi = 0$ to $\phi = 70°$ with gain within 4 db of the peak which is at the horizon. The element gain is 9 db.

What is claimed is:

1. A metallized channel guide antenna comprised of a dielectric slab having first and second ends, a rectangular cross section, first and second sides, and a bottom, said first and second sides, and said bottom being metallized, said second end having a preselected tpaer to efficiently permit launching of radiation therefrom, a feed connected to said first end, said feed receiving radio frequency energy and launching a surface wave in said dielectric, a cylindrical ground plane below the combination of said dielectric slab and said feed, said combination being spaced a preselected distance from said cylindrical ground plane so that the energy scattered from said cylindrical ground plane reinforces the radiation at the horizon to provide a sector type beam with nearly constant gain.

2. A metallized channel guide antenna as described in claim **1** including insulating means to space said combination from said cylindrical ground plane.

3. A metallized channel guide antenna as described in claim **1** wherein said feed is comprised of a waveguide.

4. A metallized channel guide antenna as described in claim **1** wherein said feed is comprised of a horn.

5. A metallized channel guide antenna as described in claim **1** wherein the metallized bottom of said dielectric slab is positioned adjacent to said cylindrical ground plane.

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