Dec. 26, 1950 L. E. SWARTS, JR 2,535,331

WAVE GUIDE ANTENNA

Filed Feb. 27, 1945

FIG. 1

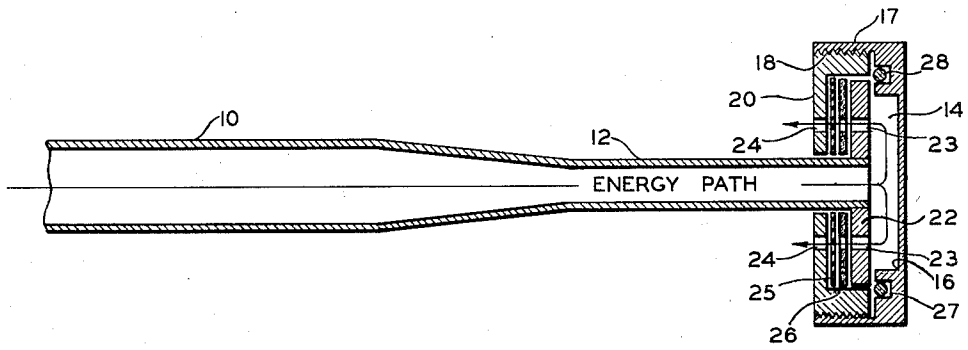


FIG. 3

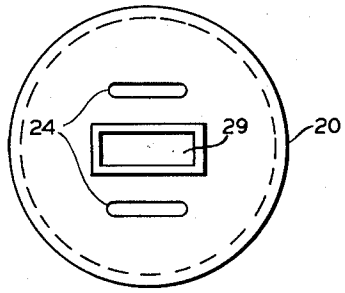
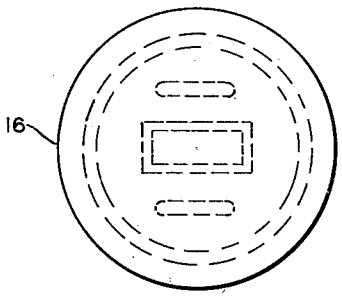


FIG. 2



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WAVE GUIDE ANTENNA

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1 Claim. (Cl. 250—33.63)

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The present invention pertains in general to electrical apparatus, and more particularly to means for adapting wave guides to feed electromagnetic energy to parabolic type reflectors.

It has been found that with high frequency radio waves, as with light, a sharply directive beam of electromagnetic energy may be obtained by use of a parabolic type reflector having a dipole or other radiating means located at its focus. Particularly at those frequencies where wave guides are in general use for the conduction of electromagnetic energy, it is often found convenient to feed a parabolic reflector directly from a wave guide. Since the wave guide generally enters from the convex side of the paraboloid, some method must be used to reverse the direction of energy propagation so as to direct the radiation from the end of the wave guide toward the paraboloid.

A second problem of importance exists in that the operation of the wave guide should be rendered more or less independent of variations in atmospheric conditions external to the set. It has been found advantageous for this purpose to pressurize wave guide systems. That is, the wave guide is sealed and the interior is supplied with dehydrated air at greater than atmospheric pressure. This serves to render the wave guide less susceptible to internal arcing and to precent deterioration of the interior surfaces of the wave guide due to moisture.

To achieve these objectives, the wave guide may be terminated in a resonant cavity, the lateral dimensions of which are larger than those of the wave guide itself. This permits apertures to be placed in that part of the rear wall of the cavity which extends beyond the wave guide. These apertures when covered with some insulating material, such as mica, will permit electromagnetic energy to be radiated backward toward the paraboloid. The amount and effectiveness of pressurization possible will depend on the tightness of the seal between the various parts of the resonant cavity and the mica insulation.

The impedance match of the wave guide system is determined by the relative size of the wave guide, the width of the radiating openings, and the depth of the cavity through which the wave guide and openings connect.

Accordingly, one object of the present invention is to so design a cavity termination for a wave guide that adequate and efficient pressurization will be possible. Another object of the invention is to design said cavity termination so that it offers a suitable impedance match for the wave guide.

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The present invention contemplates providing efficient sealing of the resonant cavity by constructing it so that it is circular in a plane perpendicular to the axis of the wave guide. This permits the front plate of the resonant cavity to be threaded so that it may be screwed to the remaining portion, thus producing equal pressure around the entire circumference. The depth of the cavity is made such that when the front plate is screwed completely into place, the wave guide will have a proper termination.

For a further understanding of the invention, together with other objects and features thereof, reference is had to the following detailed description taken in connection with the accompanying drawings in which:

Fig. 1 shows a cutaway view of the invention;

Fig. 2 shows a front view of the invention as seen from a point on the axis of the wave guide; and

Fig. 3 shows a rear view of the invention as seen from another point on the same axis.

Referring now more particularly to Fig. 1, we see represented a rectangular wave guide 10 tapered near the end into a section 12 of smaller dimensions, which feeds electromagnetic energy into the cavity 14. This cavity is circular in a plane perpendicular to the axis of the wave guide. The front of the cavity is formed by circular plate 16, having a threaded peripheral flange 17, arranged to screw onto a similarly threaded flange 18 of circular plate 20.

The rear wall of the cavity is formed by circular plate 22, which is soldered to section 12 of the wave guide, and which has two apertures 23. Plate 20 has two similar apertures 24, which are in such a position as to be directly opposite apertures 23. Between plate 20 and plate 22 there are placed a mica disc 25 and a sealing gasket 26 of fibre or the like, the latter having two holes so placed as to coincide with apertures 23 and 24. Plate 16 has a circumferential slot 27 which coincides with the junction between plates 20 and 22. A torus 28 of neoprene or similar material is inserted in this slot to complete more effectively the seal between plates 16, 20, and 22.

Fig. 2 is a front view of plate 16, showing its circular shape in the plane perpendicular to the axis of the wave guide.

Fig. 3 is a rear view of plate 20, showing apertures 24, and the rectangular slot 29 through which section 12 of the wave guide passes.

To assemble the device, plate 20 is first slipped over the rectangular wave guide section 12, and is followed by mica disc 25 and gasket 26, all three of which are then moved back from the end

of the guide, so that plate 22 may be soldered to the guide. After plate 22 is soldered in place, torus 28 is inserted in slot 27, and plate 16 is then screwed in place over plate 20. This has the effect of tightening the seal of the gasket, and also causes the torus 28 to complete the seal between plates 20 and 22 and between plates 16 and 20. Since the solder makes an effective seal between parts 12 and 22, the seal is now complete. Plate 16 is so constructed that when it has been screwed completely into place over plate 20, the depth of cavity 14 is such that it offers the proper impedance to the wave guide.

While there has been described what is at present considered a preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made while remaining within the spirit of the invention, and it is aimed in the appended claim to cover all such changes as fall within the true scope of the invention.

What I have claimed to have invented is:

In an electrical apparatus for the conduction and radiation of electromagnetic energy, a wave guide; a radiating means coupled to said wave guide, said radiating means comprising a circular back plate having two lateral apertures and a central aperture fitting over and attached to

the end of said wave guide; a second circular plate having a circumferential threaded flange, said second circular plate having two lateral apertures so placed as to coincide with the lateral apertures of said circular back plate and a central aperture fitting over said wave guide; a sheet of insulating material and a sealing gasket placed between said back plate and said second circular plate; a circular front plate placed opposite the open end of said wave guide and having a circumferential threaded flange adapted to screw onto said flange of said second circular plate, said circular front plate having further a circumferential slot; and a sealing annulus fitting into said circumferential slot.

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