July 29, 1952 D. L. JAFFE 2,605,420

PRESSURIZED ANTENNA FEED

Filed Jan. 8, 1946

FIG. 1

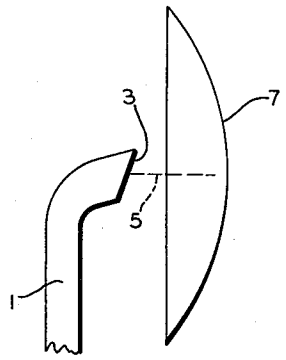



FIG. 2

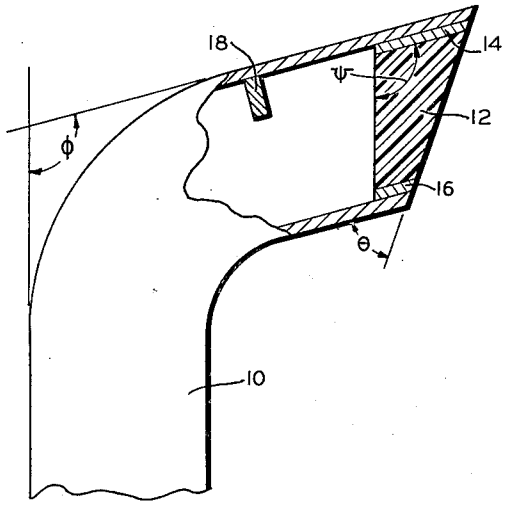
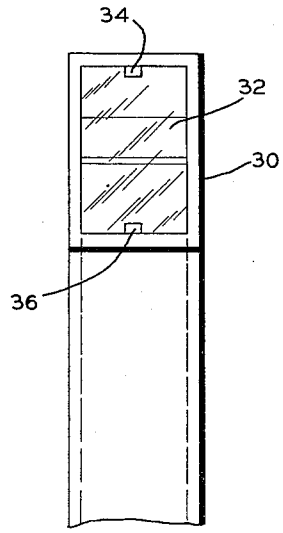



FIG. 3

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## PRESSURIZED ANTENNA FEED

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2 Claims. (Cl. 250—33.65)

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This invention relates to pressurized feed horns for micro-wave reflector type antennas and provides a more efficient energy feed from the end of a wave guide into a reflector than those heretofore used.

To maintain efficiency of a wave guide it is desirable that it be sealed and pressurized to prevent entrance of moisture and dirt into the interior of the guide. To obtain efficient flow of energy from the wave guide end to the reflector, and reflection therefrom, a proper impedance matching is required between the feed horn and the reflector, and preferably over a relatively broad band of frequencies in the neighborhood of the frequency at which it is to be operated.

It is the object of this invention to provide a feed horn for a micro-wave antenna reflector which can be pressurized and which will be relatively broad band and which will reduce spurious reflections. Other objects and features will appear in the following detailed description taken together with the drawing.

Fig. 1 is a sketch showing relation of the feed horn to an associated reflector.

Fig. 2 is a side view partly in section of a pressurized horn constructed in accordance with the principles of this invention; and,

Fig. 3 is a face or front view.

Referring to Fig. 1, there is shown a rectangular wave guide 1 for conducting energy of the $TE_{01}$ mode, said guide being bent obliquely so as to feed energy from the end 3 thereof along the direction indicated by line 5 into a reflector 7, the feed end 3 being located substantially at the focus of the reflector 7, and so that line 5 is substantially the axis of the reflector 7.

The character of the horn feed is given in detail in Fig. 2, which shows the rectangular wave guide 10 bent through an oblique angle $\varphi$, adjusted so that the axis of the reflector (not shown) lies in the plane of the E vector.

The end of the bent guide is also bevelled or cut off obliquely rather than on the plane normal to itself. Inserted in the open end of the guide is a dielectric wedge 12, the outer face thereof making an acute angle $\theta$ with the upper wave guide face, and the inner face of said wedge 12 making an obtuse angle $\psi$ with the upper wave guide face, as shown in the drawing. The wedge 12 is made of a suitable low loss dielectric such as polystyrene and is held in place by any suitable means, for example, by brass tongues and grooves 14 and 16. The angle $\varphi$ is determined by the radius of the bend which should be greater than the wavelength in the guide.

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A matching iris is provided by the web 18 which extends across the wave guide from the top thereof. A combination of the angles $\theta$ and $\psi$ is experimentally determined so that the antenna admittance and the characteristic wave guide admittance are equal over a wide range of wave length.

Fig. 3 shows the end view of the feed horn as it would appear from the reflector, and includes the guide 30, matching iris 32, tongues 34 and 36 serving to hold in place the dielectric wedge (here indicated as transparent) in the mouth of the guide.

The dielectric wedge serves the function of weather proofing the guide and permitting pressurization thereof. It also broad bands the impedance match of guide to reflector. It has been found also that when the guide is cut obliquely and closed with a wedge or lens of dielectric material, that spurious reflections are greatly reduced in the radiation pattern of the antenna.

What is claimed is:

1. An antenna system comprising, in combination, a paraboloidal reflector having an axis and a focus, and a feed for said reflector comprising a section of rectangular wave guide having broad and narrow walls and open at one end, the edges of said open end defining a first plane which is oblique to the narrow walls of said guide and normal to the broad walls of said guide, said section of wave guide being oriented with said open end facing said reflector and located substantially at the focus thereof with said first plane disposed obliquely to the axis of said reflector, and a solid dielectric wedge positioned within said open end and sealing said guide, the outer face of said wedge lying in said first plane and the opposite face of said wedge lying in a second plane normal to the broad walls of said guide and at an acute angle with respect to said first plane, said section of wave guide being oriented with the longitudinal axis thereof disposed at an acute angle to the axis of said reflector.

2. In combination with a paraboloidal reflector having an axis and a focus, a feed system for said reflector comprising a rectangular wave guide disposed substantially perpendicularly to the axis of said reflector and bent near one end such that the longitudinal axis of the bent portion of said guide is disposed at an acute angle to the axis of said reflector, said wave guide having broad and narrow walls and being terminated in an open end facing said reflector, said open end being positioned substantially at the focus of said reflector, the edges of said open end defining a first plane which is oblique to the

narrow walls of said guide and normal to the broad walls of said guide, and a solid dielectric wedge positioned within the open end of said guide and sealing said guide, the outer face of said wedge lying in said first plane and the inner face of said wedge lying in a second plane normal to the broad walls of said guide and at an acute angle to said first plane, said wedge permitting pressurizing of said wave guide and providing impedance matching between said wave guide and said reflector.

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