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ANTENNA FEED

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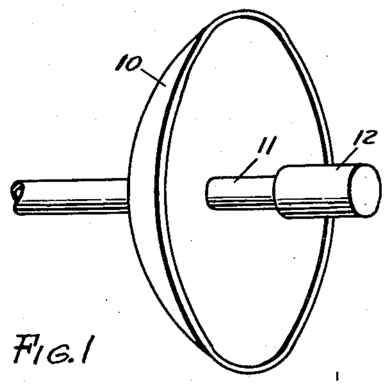

FIG. 1

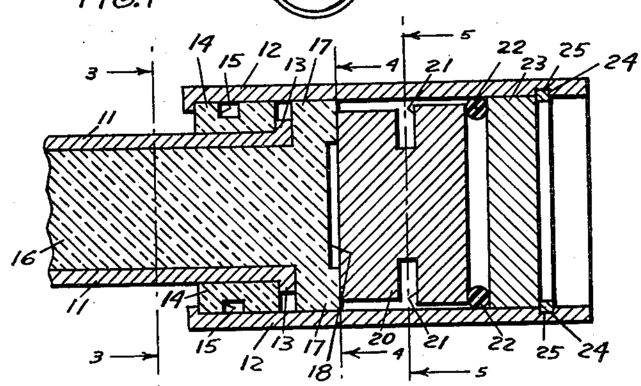

FIG. 2

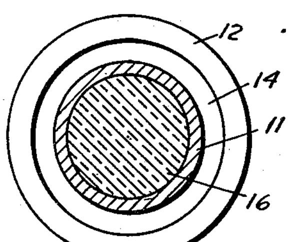

FIG. 3

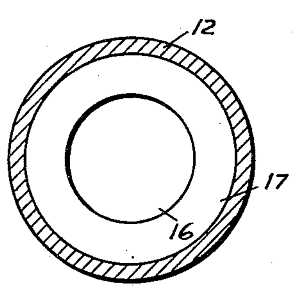

FIG. 4

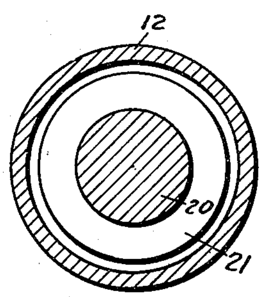

FIG. 5

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7 Claims. (Cl. 343—781)

This application relates to a feed for a parabolic antenna, and more particularly to the type that propagates energy from the end of a wave guide against a flat reflector and back against a parabolic reflector.

In this type of antenna it is desirable to have the feed as close to a point source as possible. There is also a problem of impedance matching.

In the present invention this is accomplished by mounting a conductive sleeve coaxially about the end of the wave guide and separated from it. Within the sleeve is mounted a block of metal not in contact with the sleeve and formed with a matching groove. The block is supported between two pieces of insulating material, one formed with a matching recess and placed at the aperture of the wave guide, and one separating the block from a metallic plate closing the end of the sleeve. The metallic block is so mounted and its matching groove is so dimensioned that it presents a non-contacting short at the operating frequency across the sleeve so that the propagated energy is reflected back and through the space between the guide and sleeve.

Other and further advantages of this invention will be apparent as the description thereof progresses, reference being had to the accompanying drawing wherein:

Fig. 1 is an isometric view of an antenna utilizing the invention;

Fig. 2 is a longitudinal section of one embodiment of the feed of the invention;

Fig. 3 is a section taken along the line 3—3 of Fig. 2;

Fig. 4 is a section taken along the line 4—4 of Fig. 2; and

Fig. 5 is a section taken along the line 5—5 of Fig. 2.

In Fig. 1 the reference numeral 10 designates the reflector of a microwave antenna shaped as a paraboloid having a centrally located opening within which is mounted a section of wave guide 11 shown as circular, although it may also be rectangular. This wave guide is mounted along the axis of the paraboloid reflector. The wave guide terminates in a coaxial sleeve.

The details of this sleeve are best shown in Figs. 2, 3, 4 and 5. The wave guide 11 terminates in an aperture surrounded by a flange 13 that extends outwardly along the inner surface of a ring 14 of insulating material formed with a slot 15 at its outer periphery, which is dimensioned so as to give the most advantageous match between free space and the interior of the sleeve. Its dimensioning also affects the pattern of the propagated energy. For this purpose the ring 14 may extend back from the opening in the sleeve along the outside of the wave guide. The wave guide 11 is filled with a solid insulating material 16, such as polystyrene, having a dielectric constant that permits the wave guide to propagate radio frequency energy with the same efficiency as a considerably larger wave guide so that the feed may be of the smallest possible dimensions and operate as nearly as possible as a point source. The feed of this invention will operate in the manner shown without the

dielectric filling for the wave guide, but not as efficiently as with this filling. The dielectric filling is formed with an enlargement 17 at its outer end that is of the same diameter as the inner diameter of the sleeve 12. This enlarged end is formed with a cylindrical recess 18 of a diameter and depth sufficient to make a good match across the discontinuity between the dielectric filling and a conductive cylindrical piece 20 which is formed with a notch 21 about its periphery so dimensioned as to present a short circuit across the sleeve 12 to radio frequency energy propagated from the wave guide 11 without actually touching the walls of the sleeve. It is held in this position by a neoprene rubber O ring 22 and a metal disc 23 of the same diameter as the inside diameter of the sleeve 12. This disc 23 is in turn held in position by a snap ring 24 of metal that fits into a notch 25 in the inner wall of the sleeve 12.

Energy propagated down the guide 11 is reflected back from the metal cylinder 20 through the opening between the guide and the sleeve 12 in the region occupied by the dielectric ring 14 which is transparent to radio frequency energy and strikes the paraboloid reflector 10, and is again reflected out into free space in the desired pattern. The resulting structure produces a feed for the paraboloid antenna that is weather proof, relatively easy to construct, easy to disassemble for cleaning and adjusting, and with dimensions that are easily adjusted for use with different design parameters.

This invention is not limited to the particular details of construction, materials and processes described, as many equivalents will suggest themselves to those skilled in the art. It is accordingly desired that the appended claims be given a broad interpretation commensurate with the scope of the invention within the art.

What is claimed is:

1. In combination, a concave main reflector having an axis, a vertex, and a focus, said focus lying on said axis, a wave guide of circular cross section extending through the vertex of said reflector and along said axis, said guide having an end aperture, and a flat circular reflector located in the region of the focus facing said aperture and said main reflector, said flat reflector being larger in area than said aperture, a conductive sleeve mounted concentric with the axis of the wave guide and supporting the flat reflector without making conductive contact with said flat reflector, said flat reflector being formed with a peripheral notch so dimensioned as to present substantially a short circuit across said sleeve to radio frequency energy propagated in said guide.

2. In combination, a concave main reflector having an axis, a vertex, and a focus, said focus lying on said axis, a wave guide of circular cross section filled with a dielectric material extending through the vertex of said reflector and along said axis, said guide having an end aperture, and a flat circular reflector located in the region of said focus facing said aperture and said main reflector, said flat reflector being larger in area than said aperture, a conductive sleeve mounted concentric with the axis of the wave guide and supporting the flat reflector without making conductive contact with said flat reflector, said flat reflector being formed with a peripheral notch so dimensioned as to present susbtantially a short circuit across said sleeve to radio frequency energy propagated in said guide.

3. In combination, a concave main reflector having an axis, a vertex, and a focus, said focus lying on said axis, a wave guide of circular cross section filled with a dielectric material extending through the vertex of said reflector and along said axis, said guide having an end aperture formed with a flange, and a flat circular reflector located in the region of said focus facing said aperture and

said main reflector, said flat reflector being larger in area than said aperture, a conductive sleeve mounted concentric with the axis of the wave guide and supporting the flat reflector without making conductive contact with said flat reflector, said dielectric filling of said wave guide extending outward from said aperture to make supporting contact with said sleeve, said flat reflector being formed with a peripheral notch so dimensioned as to present substantially a short circuit across said sleeve to radio frequency energy propagated in said guide.

4. In combination, a concave main reflector having an axis, a vertex, and a focus, said focus lying on said axis, a wave guide filled with a dielectric material extending through the vertex of said reflector and along said axis, said guide having an end aperture, and a flat reflector in the region of the focus facing said aperture and said main reflector, said flat reflector being larger in area than said aperture, a conductive sleeve mounted concentric with the axis of the wave guide and supporting the flat reflector without making conductive contact with said flat reflector, said flat reflector being formed with a peripheral notch so dimensioned as to present substantially a short circuit across said sleeve to radio frequency energy propagated in said guide.

5. In combination, a concave main reflector having an axis, a vertex, and a focus, said focus lying on said axis, a wave guide filled with a dielectric material extending through the vertex of said reflector and along said axis, said guide having an end aperture formed with a flange, and a flat reflector in the region of the focus facing said aperture and said main reflector, said flat reflector being larger in area than said aperture, a conductive sleeve mounted concentric with the axis of the wave guide and supporting the flat reflector without making conductive contact with said flat reflector, said dielectric filling of said wave guide extending outward from said aperture to make supporting contact with said sleeve, said flat reflector being formed with a peripheral notch so dimensioned as to present substantially a short circuit across said sleeve to radio frequency energy propagated in said guide.

6. In combination, a wave guide having an end aperture, a flat reflector facing said aperture, said flat reflector being larger in area than said aperture, and a conductive sleeve mounted concentric with the axis of the wave guide and supporting the flat reflector without making conductive contact with said flat reflector, said flat reflector being formed with a peripheral notch so dimensioned as to present substantially a short circuit across said sleeve to radio frequency energy propagated in said guide.

7. In combination, a wave guide of circular cross section filled with a dielectric material having an end aperture formed with a flange, a flat reflector facing said aperture, said flat circular reflector being larger in area than said aperture, and a conductive sleeve mounted concentric with the axis of the wave guide and supporting the flat reflector without making conductive contact with said flat reflector, said dielectric filling of said wave guide extending outward from said aperture to make supporting contact with said sleeve, said flat reflector being formed with a peripheral notch so dimensioned as to present substantially a short circuit across said sleeve to radio frequency energy propagated in said guide.

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