

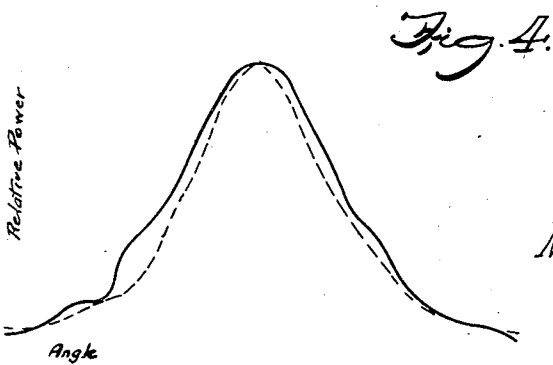
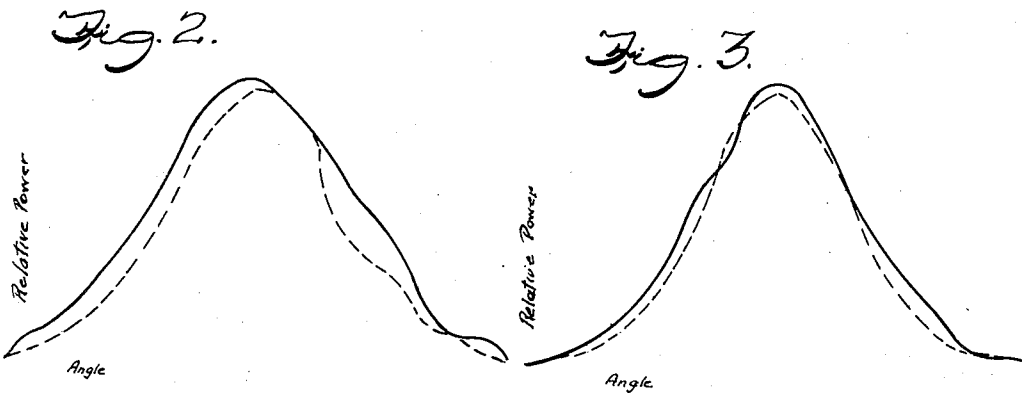
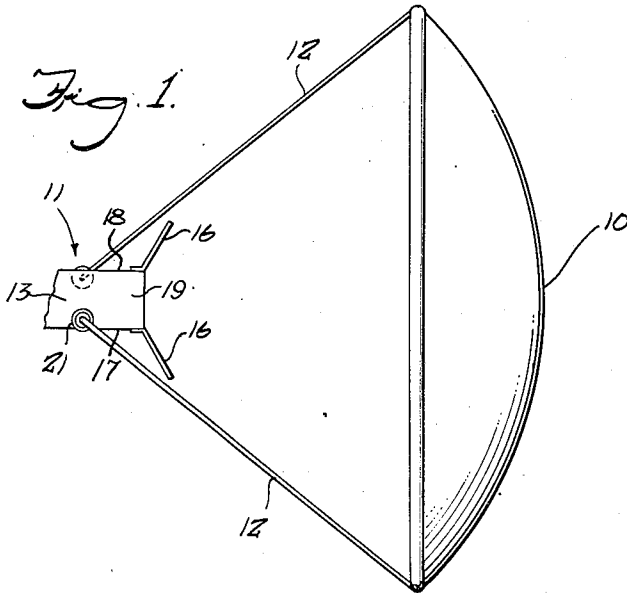
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ANTENNA FEED SYSTEM

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ANTENNA FEED SYSTEM

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This invention relates to a broad band feed for antennas, and more particularly to a combination feed for a reflector dish-type antenna.

The problem of illuminating a reflector dish so as to cause the reflector to propagate waves in a desired pattern is an old one.

The present invention provides an improved feed arrangement for dish-type antennas by adding two flaps to the open end of the illuminating wave guide extending at an obtuse angle to the direction of propagation.

The use of flanged mouth surfaces in connection with wave guide feeds for reflector dishes is not broadly new. D. W. Fry and F. K. Goward discuss the use of semi-flanges made by extending the wide sides or the narrow sides of the guide in a direction perpendicular to the wave guide axis in "Aerials for Centimetre Wave-Lengths," University Press, page 50. Applicant has tried this type of feed, but has found the test patterns to be unsatisfactory since they were not uniform. It was found that when the long sides of the wave guide were extended, and the resulting surfaces bent forward in the direction of propagation through the guide, only then was a controlled beam obtained having equal primary illumination in both planes. The resulting structure has an impedance characteristic which can be readily matched over a broad band while maintaining the pattern relatively uniform over the entire band.

There has also been some work done on the use of ordinary wave guide flanges to improve the illuminating pattern, but this is obviously a different scheme than applicant's.

Accordingly, it is an object of this invention to provide a new and improved combination feed for a reflector dish-type antenna.

Another object of this invention is to provide an improved combination feed which is simple in mechanical configuration and inexpensive to produce.

A further object of this invention is to provide an improved combination feed, the impedance of which can be readily matched over a broad band while maintaining the pattern relatively uniform over such band.

Other objects and advantages of the invention will be apparent during the course of the following description when read in connection with the accompanying drawings, wherein:

Figure 1 is a partial side view of the wave guide feed and the dish reflector; and

Figures 2, 3 and 4 are combination feed primary radiation patterns as obtained at 1700, 2000, and 2400 megacycles for a test model embodying the novel combination feed of this invention.

Referring now more particularly to Figure 1, there is shown a reflector dish 10 having a combination feed 11 mounted near its focal point by means of support rods 12. The combination feed 11 consists of a rectangular wave guide section 13 connected to a suitable source of oscillations which are to be radiated. Two rectangular

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flaps 16 extend at an obtuse angle to the direction of propagation from the long sides 17 and 18 of the open wave guide section end. The support rods 12 are connected to the short sides 19 of the wave guide section 11 by means of mounting bosses 21. In a typical embodiment, the wave guide has a height of 2.31 inches and a width of 4.46 inches. The flap 16 extends 2½ inches at an angle of 30° to the normal from the wave guide walls 17 and 18. The primary radiation response patterns for that combination feed are shown in Figures 2, 3 and 4. Figure 2 shows the response pattern as obtained at 1700 megacycles, Figure 3 shows the response pattern as obtained at 2000 megacycles, and Figure 4 shows the response pattern as obtained at 2400 megacycles. The solid line patterns are those obtained for the H plane radiation, while the dotted line patterns are those obtained for the E plane radiation.

In the previous art it has been common to choose the focal length of the reflector dish, and then attempt to fashion the feed so as to provide the proper illumination over the dish surface and have the proper relative magnitude at the edges of the reflector dish. This usually results in feed complications and a loss of impedance and pattern band width.

In this case there is chosen distinctly the simplest electrical structure that will provide pattern uniformity. There the focal length of the reflector is set to the appropriate dimension for satisfactory edge illumination. In this way the greatest impedance and pattern band width is obtained.

While there has been shown and described an invention in connection with certain specific embodiments, it will, of course, be understood that it is not wished nor intended to be limited thereto since it is apparent that the principles herein disclosed are susceptible of numerous other applications, and modifications may be made in the structural arrangement and in the instrumentalities employed without departing from the spirit and scope of this invention as set forth in the appended claims.

I claim as my invention:

1. In combination with a dish-type reflector, a broad band antenna feed comprising a wave guide of rectangular cross-section having an open end, two rectangular flaps extending at 30° to the normal from the long sides of said open wave guide end, said flaps having a width not greater than the length of the short sides of the wave guide, said open wave guide end being directed to propagate high frequency waves towards said dish-type reflector.

2. In combination with a dish-type reflector, a broad band antenna feed comprising a wave guide section, a wave generator at one end of said wave guide section, two flaps extending at 30° to the normal from the long sides of the other end of said wave guide section, said flaps having a width not greater than the length of a short side of the wave guide section, said other end of said wave guide section being directed to propagate the high frequency waves supplied by said wave generator towards said dish-type reflector.

3. In combination with a dish-type reflector, a broad band antenna feed comprising a wave guide section, two flaps extending at obtuse angles to the direction of propagation from the long sides of the end of said wave guide section, said flaps having a width of the order of the dimension of the short side of the wave guide section, said end of said wave guide section being directed to propagate the high frequency waves towards said dish-type reflector.

4. In combination with a dish-type reflector, a broad band antenna feed comprising a quadrangular wave guide section having an open end, two quadrangular flaps ex-

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tending at substantially 30° to the plane of the open end and from the long sides of the open end of said wave guide section, said flaps being no wider than the length of a short side of the wave guide section, said open end of said wave guide section being directed to propagate the high frequency waves towards said dish-type reflector.

5. In combination with a dish-type reflector, a broad band antenna feed comprising a quadrangular wave guide section having an open end, two rectangular flaps extending at 30° to the plane of the open end and from the long sides of said open wave guide section end, said flaps being no wider than the length of a short side of the wave guide section, said open wave guide section end being oriented relative to said reflector to cause said reflector to reflect the high frequency waves supplied thereto by said wave guide section.

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6. In combination with a dish-type reflector, a broad band antenna feed comprising a quadrangular wave guide section having an open end, two rectangular flaps extending at obtuse angles to the direction of wave propagation from the long sides of the open end of said wave guide section, said flaps each being less in width than the dimension of the short side of the wave guide section, said open end of said wave guide section being oriented relative to said reflector to propagate the high frequency waves in a controlled beam towards said dish-type reflector with equal primary illumination in both planes.

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