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BY A. P. C.

E. GERHARD
DIRECTIONAL ANTENNA WITH SUPPRESSED LOBES OR EARS
Filed April 17, 1941

Serial No. 388,936

2 Sheets-Sheet 1

Fig. 1

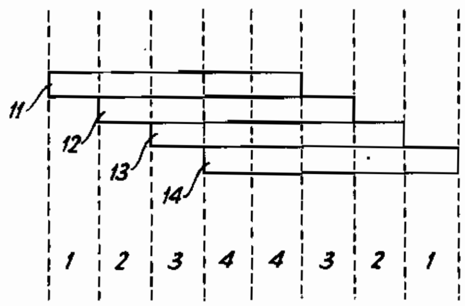


Fig. 2

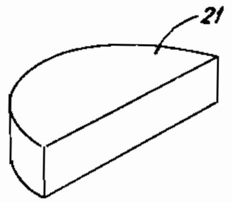


Fig. 3

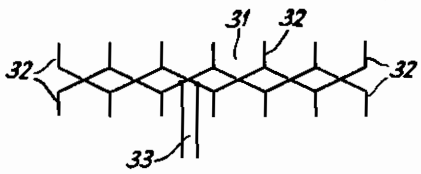
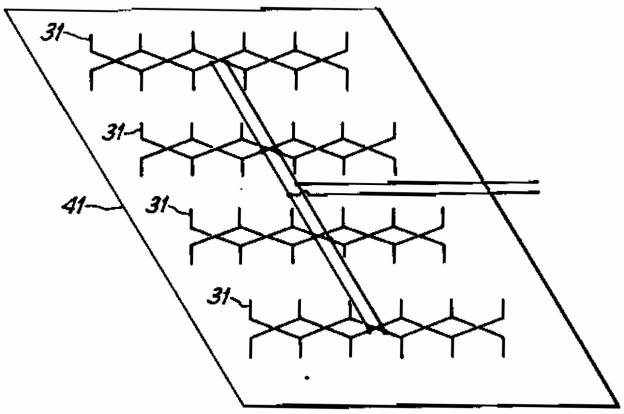


Fig. 4



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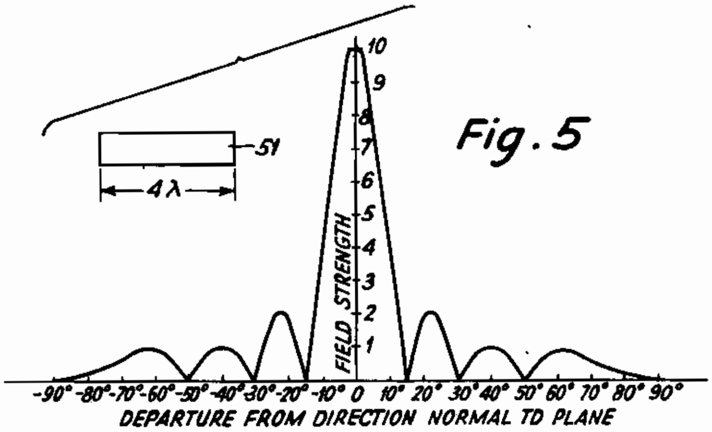

Fig. 5

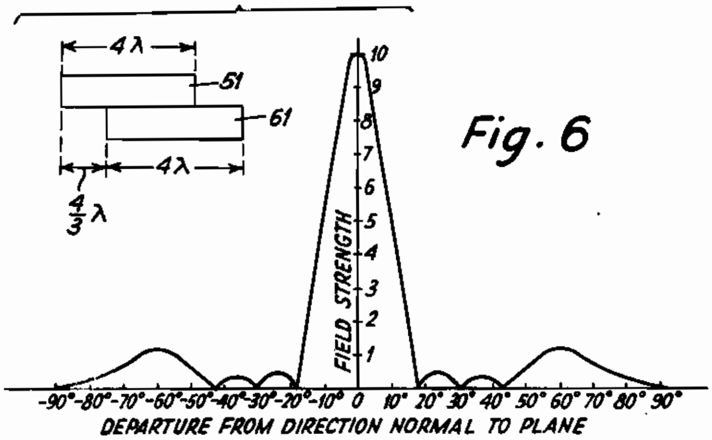

Fig. 6

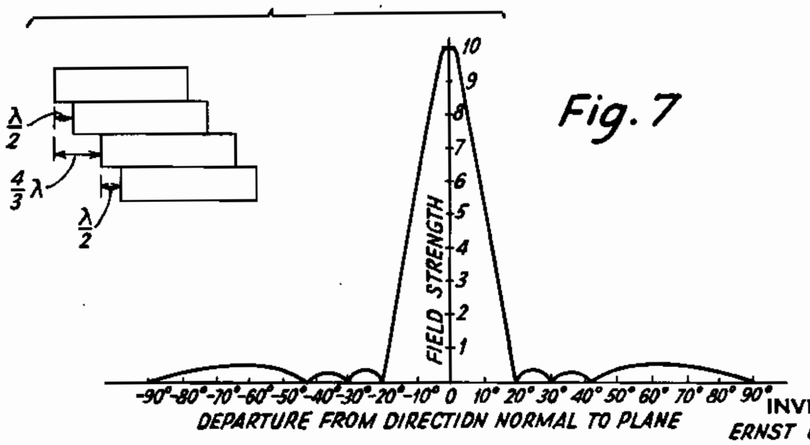

Fig. 7

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ALIEN PROPERTY CUSTODIAN

DIRECTIONAL ANTENNA WITH SUPPRESSED LOBES OR EARS

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Application filed April 17, 1941

It is known in the prior art to suppress undesirable secondary or lateral radiations known as lobes or ears (that is, secondary maxim) which arise in connection with the operation of a directional antenna (sheet antenna, parabola reflector, etc.) by making the current-covering or distribution of the entire antenna area not uniform, but in such a way that it declines in conformity with a definite law in the direction towards the edges of the surface.

According to the invention, the secondary maxima or lobes, for instance, of the horizontal diagram are suppressed by arranging several aerials being staggered in reference to one another in the horizonal sense below one another whereby any desired distribution of current of the antenna surface or area is obtainable, say, in horizontal direction as illustrated by the schematic embodiment, Figure 1.

The antenna shown in Figure 1 may be cylindric parabola reflectors, say, of the kind shown in Figure 2, or sheet radiators comprising a plurality of dipoles, for instance, of the kind shown in Figure 3, a plurality of which, mounted in one plane staggered in reference to one another, are assembled to result in a rhombic antenna, say, as shown in Figure 4. Figures 4 to 7 illustrate theoretically determined horizontal diagrams corresponding to the sheet antenna shown alongside the patterns. Figure 2 shows a perspective view of a cylindric parabola reflector **21** which may be used as the radiators **11–14** shown in Figure 1. The energizing antenna within the reflector is not shown but may be of any conventional type.

Figure 3 shows a broadside array **31** composed of a plurality of individual dipoles **32** so energized by transmission line **33** as to simulate a uniform current sheet. The individual radiating units **31** shown in Figure 3 may be combined as shown in Figure 4 in the practice of the present invention. The combination simulates a rhombic radiating sheet **41**. Due to the longitudinal stagger of the units **31** the desired radiation pattern is obtained.

Figure 5 shows the horizontal diagram of a plain sheet antenna **51** with uniform current distribution of 4λ width, λ being the operating wavelength.

Figure 6 shows the diagram corresponding to an antenna comprising two surfaces **51** and **61**, each of 4λ width, being staggered in reference to each other a distance equal to 4/3λ according to the invention. It will be noticed that the first and the second maxima are largely suppressed. Figure 7, finally, shows the diagram of an antenna comprising four sheets, each of 4λ width, being staggered in respect to one another. The arrangement results from staggering two schemes as shown in Figure 6 an amount equal to λ/2 in respect to each other. In this case, also, the third maximum has been suppressed appreciably.

In the exemplified embodiment of Figure 1 four sheet antennae **11**, **12**, **13**, **14**, all of which are to have a uniform current covering or distribution, are placed underneath one another. The flux of energy through the vertical sheet elements (indicated by the dash-lines) is proportional to the antenna surface contained in these surface elements. The energy flux is numerically indicated, in relative terms, for each surface element. By a predetermined horizontal shift and horizontal size or expansion of the various antenna surfaces indicated in Figure 1, any desired energy distribution in horizontal sense is attainable, with the result that either only the first maximum or only maxima of a higher ordinal number or else again all of them may be suppressed. The energy distribution required for each case is ascertainable by calculation by the application of known methods.

It will be understood that what has been shown in the exemplified embodiment for the horizontal direction applies naturally to any other direction, say, also the vertical diagram or space pattern.

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