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E. GERHARD
RADIO BEACON SYSTEM
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Fig. 1

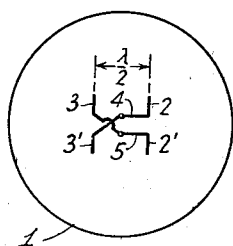


Fig. 2

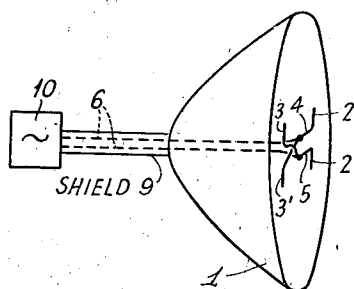


Fig. 4

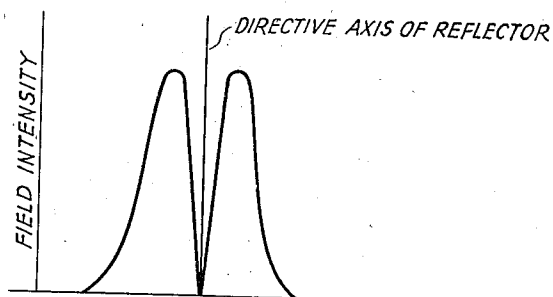
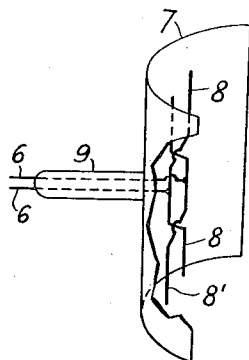


Fig. 3



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RADIO BEACON SYSTEM

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8 Claims. (Cl. 250—11)

This invention relates to radio beacon systems and more particularly to a system of that type which utilizes ultra-short waves for direction finding purposes. If two concentrated energy beams are directed at a slight angle one to the other, then, as is well known, a minimum field intensity zone may be produced midway between the axes of the two beams.

It is an object of my invention to provide a beacon system in which the field intensity gradient may be more sharply defined than by means heretofore known. Other objects and advantages of my invention will be made apparent in the following detailed description in which reference is made to the accompanying drawing comprising the following figures:

Fig. 1 shows a front view of a dipole antenna array wherein the respective dipoles are disposed symmetrically about the axis of a paraboloidal reflector;

Fig. 2 shows such a paraboloidal reflector in perspective, together with the antenna array and other parts of a complete beacon system which are shown more or less diagrammatically;

Fig. 3 shows a modification of my invention in which the dipole antennas are suitably positioned with respect to the focus of a reflector having a parabolic cylindrical surface; and

Fig. 4 shows a typical field intensity diagram of the directed beams to be produced in carrying out my system.

Referring to Figs. 1 and 2, I show a concave reflector 1 which may, if desired, be a surface of revolution formed by rotating a parabolic figure about its axis. To one side of the axis I preferably position a dipole antenna consisting of two radiating members 2 and 2' respectively. Another dipole antenna having radiating members 3 and 3' is symmetrically disposed on the opposite side of the focus of the reflector. The spacing between the two dipoles is preferably one-half a wave length of the energies to be radiated. Radiating members 2 and 3' are interconnected. The radiators 2' and 3 are also interconnected.

A transmission line consisting of the two conductors 6 is connected between a suitable source of energy 10 and the cross-connections 4 and 5 between the dipoles. Shielding means 9 are provided about the transmission line in order that radiation from the transmission line may be avoided.

The arrangement shown in Figs. 1 and 2 lends itself to the efficient radiation of ultra-high frequency energy, that is to say, for example, waves of the order of less than one meter in length and

even down to a very few centimeters in length. It will be seen also that the energy radiated from the members 2 and 2' respectively will be in phase opposition, and likewise the energy from the members 3 and 3' will be in phase opposition. Due to the fact that these radiating members lie in planes separated from the focus of the reflector by substantially a quarter wave length, there is produced a radiation pattern somewhat as shown in Fig. 4. This pattern has two peaks equi-distant from the axis of the concave reflector. In between these peaks there is a very sharp reduction of field intensity so that a very well defined zone of minimum field intensity exists.

A modification of my invention is shown in Fig. 3 wherein the antenna array is disposed to one side and to the other of a focal line about which a reflector having a parabolic cylindrical surface is placed. The reflector is designated 7 and the antenna array is constituted by a plurality of radiating members 8 and 8'. The members 8 are fed with energy from one of the conductors 6 whereas the radiators 8' are fed from the other of the conductors 6. The beacon system shown in Fig. 3 may be positioned with its axis vertical, if desired, and in this case the directive properties will be suitable for direction finding longitudinally of the earth's surface. If, however, the focal axis of the system is made horizontal then the two directive axes of the beams can be inclined at any desired angles of inclination to the earth's surface. Such beams would be suitable for landing purposes in aerial navigation.

Other modifications of my invention will readily occur to those skilled in the art, for which reason it should be understood that the invention itself is limited only according to the scope of the claims.

I claim:

1. A radio beacon system comprising an ultra-short wave generator, a two-conductor transmission line connected to the output terminals of said generator, a pair of parallel dipoles each having one radiating member permanently connected to one of the conductors in said transmission line and another radiating member permanently connected to the other of said conductors, the radiating members connected in common to each said conductor being in diagonal opposition, a radiation-preventing shield surrounding said transmission line, and a paraboloidal reflector having its focus substantially centrally disposed with respect to said dipoles, the radial distance

of each radiating member from said focus being substantially one quarter wave length of the energy to be radiated.

2. A radio beacon system comprising an ultra-short wave generator, a two-conductor transmission line connected to the output terminals of said generator, a pair of parallel linear antenna arrays, each array consisting of two separated radiating members and one intermediate radiating member, the separated members of each array being connected to the intermediate member of the other array, and each intermediate member being connected to a respective one of the conductors in said transmission line, a radiation-preventing shield surrounding said transmission line, and a reflector disposed about said radiating members and having a parabolic cylindrical surface the focus of which is substantially centrally disposed with respect to said antenna arrays and being spaced therefrom by a distance substantially equal to one quarter wave length of the energy to be radiated.

3. In a radio beacon system of the type wherein ultra-short wave energy is caused to be directed by a paraboloidal reflector in two beams at a slight angle one to the other, the method of separating said beams by a sharply defined vertical zone of minimum field intensity which comprises establishing points of radiation substantially a quarter wave length horizontally removed from and oppositely disposed with respect to the focus of said reflector, feeding energy to be radiated continuously to all of said points, and radiating the energy contra-phasally from such of said points as are correspondingly situated on opposite sides of said vertical zone.

4. In a radio beacon system of the type wherein ultra-short wave energy is caused to be directed by a parabolic cylindrical reflector in two beams at a slight angle one to the other, the method of separating said beams by a sharply defined vertical zone of minimum field intensity which comprises establishing points of radiation substantially a quarter wave length horizontally removed from and oppositely disposed with respect to the focal plane of said reflector, feeding energy to be radiated continuously to all said points, and radiating the energy contra-phasally from points lying at the same level on opposite sides of said focal plane.

5. A directive beam system for radiating energy in two beams comprising a dipole antenna having two co-axial arms, a second dipole antenna having two co-axial arms disposed substantially in parallel relation to the first said arms, means including a bi-filar transmission line having each conductor suitably connected to a respective pair of arms disposed in diagonal opposition with respect to a directive axis which lies midway between the axes of the two said beams, so that

the energies applied to mutually opposed parallel arms in the two antennas are contra-phasal, and a concave reflector having a focal axis which extends perpendicularly in respect to the plane in which both said dipoles are disposed, said axis intersecting the center of symmetry of the two dipoles.

6. An ultra-short wave beacon system having two parallel antenna systems each comprising a plurality of coaxial radiating members of substantially equal length, a concave wave reflector having a focus disposed in a line mid-way between and parallel to said antenna systems for producing a radiation diagram having two zones of high field intensity separated by a planar zone of low field intensity, said line lying in said planar zone, means for continuously energizing all of said radiating members, and means for producing phase opposition between the energies respectively applied to the radiating members of the two antenna systems occupying corresponding positions on opposite sides of said line within which said focus is disposed.

7. A directional radio system comprising an ultra-short wave apparatus, a two-conductor transmission line connected to terminals of said apparatus, a pair of parallel dipoles each having one arm permanently connected to one of the conductors in said transmission line and another arm permanently connected to the other of said conductors, the arms which are connected in common to each said conductor being in diagonal opposition, an isolating shield surrounding said transmission line, and a paraboloidal reflector having its focus substantially centrally disposed with respect to said dipoles, the center of each dipole being substantially disposed at a radial distance from the focus of said reflector equal to one quarter of the wave length at which said system is intended to be operated.

8. A directional radio system comprising an ultra-short wave apparatus, a two-conductor transmission line connected to terminals of said apparatus, a pair of parallel linear antenna arrays, each array consisting of two separated linear conductors and one intermediate linear conductor, the separated conductors of each array being connected to the intermediate conductor of the other array, and each intermediate conductor being connected to a respective one of the conductors in said transmission line, an isolating shield surrounding said transmission line, and a reflector disposed about said antenna arrays and having a parabolic cylindrical surface, the focus of which is substantially centrally disposed with respect to said antenna arrays, and being spaced therefrom by a distance equal to one quarter of the operating wave length.

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