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W. BEUERMANN
RADIO BEACON SYSTEM
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Fig. 1

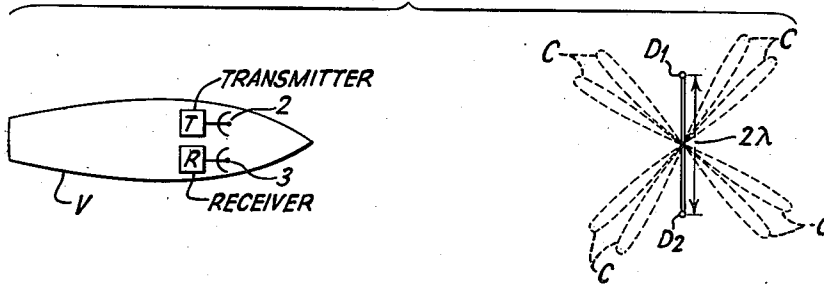


Fig. 2

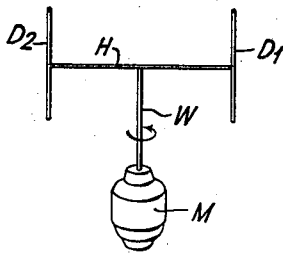


Fig. 3

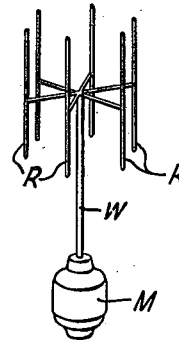
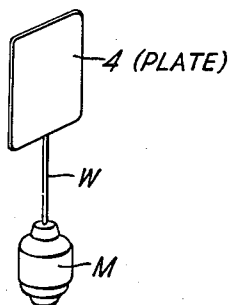


Fig. 4



INVENTOR
WILHELM BEUERMANN
BY *W. S. Swier*
ATTORNEY

UNITED STATES PATENT OFFICE

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RADIO BEACON SYSTEM

Wilhelm Beuermann, Berlin, Germany, assignor
to Telefunken Gesellschaft für Drahtlose Tele-
graphie m. b. H., Berlin, Germany, a corpora-
tion of Germany

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12 Claims. (Cl. 250—11)

The present invention is concerned with a very simple radio beacon arrangement.

For the identification or marking of certain points, it has been general practice in the prior art to establish special transmitters or so-called marker beacons at suitable points, these transmitters being provided with aerials for radiating a carrier wave having a characteristic modulation. A great number of arrangements along this line have been disclosed in the earlier art. However, each of these known arrangements comprises a modulator which is in need of permanent attendance.

The reflector scheme of the present invention is free from the drawbacks just mentioned. The reflector radio beacon here disclosed comprises a rotating antenna arrangement having a radiation diagram which may be characterized as having a definite number of radiation lobes.

My invention is illustrated in the accompanying drawing in which:

Figure 1 shows a map of a certain area to be covered by a radio beacon system;

Fig. 2 shows a rotatable reflector-antenna;

Fig. 3 shows a modification of the arrangement of Fig. 2, and

Fig. 4 shows still another modification.

Figs. 1 and 2 show a typical embodiment of this idea. The reflector on the right-hand side of Fig. 1 comprises two dipoles D_1 and D_2 being mounted a distance equal to 2λ apart. The directional or radiation characteristic of this array possesses eight lobes C. The two dipoles are mounted on the vertical shaft of a motor, and are continuously rotated thereby.

In the diagram of Fig. 1 it is assumed that the rotating reflector antenna system D_1 — D_2 is fixed in some predetermined location and that the energy to be radiated thereby originates at a transmitter T located on board a moving craft. The observer is provided with a receiver R also located on board said craft. The radiations from the transmitter T are preferably made sharply directional by means of an antenna system 2 of any well known type. Alternatively a non-directional transmitting antenna may be used but in this case shielding means would be provided between the transmitting antenna 2 and receiving antenna 3 so that the latter may not be influenced by direct radiations from the transmitter. The receiving antenna 3 may also be made sharply directional in the same manner.

When the antenna 2 is aimed in the direction of the reflector D_1 — D_2 and the energy is thus reflected back to the receiving antenna 3, a sig-

nal will be received the characteristics of which depend upon the radiation pattern of the rotating antenna system as well as upon the number of revolutions per minute of the rotating antenna. It is apparent that the strength of the signals will also vary in accordance with the orientation of the respective lobes C of the radiation pattern in the direction of the receiving antenna 3.

The number of lobes in the radiation pattern can be varied in two ways. Firstly, the distance between the dipoles D_1 and D_2 need not necessarily be exactly 2λ but may bear some other relation to the wave length of the radiant energy beam from the transmitter 2. Secondly, the number of dipoles in the rotating antenna system may be made more than two as illustrated in Fig. 3.

In the embodiment of my invention which provides only two dipoles in the rotating reflector system, as shown in Fig. 2, these dipoles may be supported by a horizontal cross-arm H at the center of which is a vertical supporting shaft W which comprises an extension to the shaft of a motor M.

In the multiple array of dipoles R, as shown in Fig. 3, each dipole is preferably supported by a horizontal arm radiating from the vertical rotary supporting shaft W. In this case the number of lobes in the radiation pattern is dependent upon the distance at which the dipoles are spaced apart and upon the number of dipoles in the full array as well as upon the wave length that is chosen for operation of the system.

In a third embodiment of the invention, as shown in Fig. 4, the plurality of dipole antennas is replaced by a single vertically disposed metallic plate 4. As this plate is rotated two lobes of a radiation pattern are likewise rotated. The axis of these lobes is, of course, perpendicular to the plane of the plate.

Other embodiments of my invention will readily suggest themselves to those skilled in the art in view of the above description.

I claim:

1. A radio beacon system comprising a source of radiant energy, a receiver having a directional antenna located adjacent said source and shielded from the direct rays of said energy, a reflecting antenna system located in the path of said direct rays and also in a suitable position for reflecting said rays toward the directional antenna of said receiver, said reflecting antenna system comprising a plurality of vertically disposed dipoles the axes of which are equidistant from a center of rotation, and means for rotating said reflecting antenna system continuously, thereby to rotate

the field intensity diagram thereof and hence to produce periodic amplitude variations in the response of said receiver to energy radiated from said source and reflected by said reflecting antenna system.

2. A beacon system according to claim 1 and further characterized in that said reflecting antenna system comprises only two dipoles.

3. A beacon system according to claim 1 and further characterized in that said reflecting antenna system is adapted to produce a field intensity diagram having eight lobes.

4. A radio beacon system comprising a rotatable metallic reflecting antenna arrangement having a non-uniform directive characteristic, means for rotating said reflecting arrangement continuously, a radiant energy transmitter carried aboard a moving craft, said transmitter having an antenna system for projecting said energy toward said reflecting arrangement, means for determining the direction of said reflecting arrangement from said craft, said means comprising a receiver mounted on said craft and having a directional antenna system which is orientable in the direction of said reflecting arrangement, said receiver being responsive to variations in the intensity of said radiant energy reflected toward the receiving antenna by said reflecting arrangement.

5. A beacon system in accordance with claim 4 and further characterized in that said reflecting arrangement comprises a multiplicity of at least three symmetrically disposed vertical dipoles.

6. A beacon system in accordance with claim 4 in which said reflecting arrangement comprises a flat metallic plate.

7. A system for the location of a geographic point with respect to a remote point of observation, which comprises, a radio transmitter and a radio receiver both adjacent said point of observation, means for shielding said receiver from the direct influence of energy radiation from said transmitter, an antenna array at said geographic point, said array having a non-uniform field intensity pattern, means for causing continuous rotation of said field intensity pattern about a vertical axis, means for directionally propagating unmodulated energy from said transmitter by scanning the horizon with a directional beam until said beam strikes said antenna array, and means in said receiver for producing a pulsating response to such of said energy as is reflected back by said antenna array.

8. In a radio beacon system including an antenna array rotatable on a vertical axis and having a non-uniform field intensity pattern, said antenna array being conductively isolated from other radio apparatus, the method of determining the direction in which said antenna array stands with respect to the locus of propagation of unmodulated radiant energy, which comprises, directing a beam of said energy in different directions until it strikes said antenna array and is reflected back thereby, receiving said reflected energy at a point adjacent the point of propagation, and detecting periodic amplitude variations in the receiving response due to the rotation of the non-uniform field intensity pattern of said antenna array.

9. A radio beacon system comprising an array of parallel linear antennae mounted in fixed relation to one another, means for continuously revolving said antennae through a common orbit about an axis parallel to the antenna axes means for directing unmodulated radiant energy toward said antenna array from a remote point, and a receiver adjacent said remote point, said receiver being sensitive to modulation of said radiant energy produced by re-radiation thereof by said antenna array.

10. A system in accordance with claim 9 in which said vertical antennae are constituted by two dipoles each mounted for revolution in an orbit whose radius is substantially equal to the wave length of the energy to be re-radiated.

11. A radio beacon system comprising a metallic reflecting device having a non-uniform directional characteristic, means for continuously rotating said device on a vertical axis, and a mobile station for finding the direction of said device, said station comprising means remote from said reflecting device for propagating unmodulated radiant energy toward said device, which energy is reflected by said device with cyclically variable intensity in an opposite direction, said station comprising further means adjacent the energy-propagating means for receiving and detecting the cyclic variations in the reflected radiant energy.

12. A system in accordance with claim 11 and further characterized in that said metallic reflecting device is a vertically disposed flat plate mounted for rotation on a vertical axis which stands adjacent the median lines of its two faces.

WILHELM BEUERMANN.