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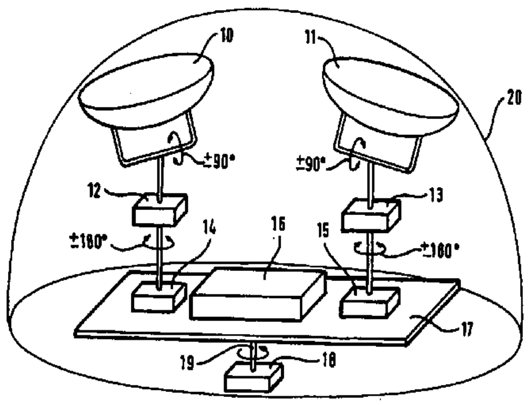

(57) Abstract

The invention concerns an antenna system, comprising at least two antennae (10, 11), each antenna (10, 11) capable of independently pointing in any solid angle direction. The invention is characterised in that the antennae (10, 11) are mounted on a common support (17) co-operating with means (18) rotating said common support, said rotation means (18) being activated to prevent one of the antennae (10, 11) from being masked by the other antenna (10, 11). The invention is useful for tracking moving satellites.

A B S T R A C T

ANTENNA SYSTEM, IN PARTICULAR FOR POINTING AT NON-GEOSTATIONARY SATELLITES

The invention concerns an antenna system including at least two antennas (10, 11), each of said antennas (10, 11) being capable of pointing independently of the other(s) in any direction within a solid angle. According to the invention, the antennas (10, 11) are mounted on a common support (17) co-operating with rotation means (18) for rotating the common support (17), the rotation means (18) being activated to prevent masking of one of the antennas (10, 11) by another of the antennas (10, 11). The invention applies in particular to tracking non-geostationary satellites.

Translation of the title and the abstract as they were when originally filed by the Applicant. No account has been taken of any changes that may have been made subsequently by the PCT Authorities acting ex officio, e.g. under PCT Rules 37.2, 38.2, and/or 48.3.

AN ANTENNA SYSTEM, IN PARTICULAR FOR POINTING AT NON-GEOSTATIONARY SATELLITES

The field of the invention is that of antenna systems, in particular for pointing at non-geostationary satellites. To be more precise, the present invention concerns a system with at least two antennas capable of pointing independently of each other in any direction within a solid angle.

In the context of the present invention, a terrestrial transmission system is considered, e.g. as installed on the roof of a building. The system includes at least two antennas, for example parabolic antennas, designed to communicate with, i.e. to transmit to and/or receive from, non-geostationary satellites. The antennas are close together (i.e. co-located) for reasons of overall size and/or to reduce the lengths of the connections to a single modem and/or so that they can be located under the same protective radome. The two antennas can be steered independently of each other in azimuth and in elevation, i.e. each is mounted on a separate support.

The problem that arises with a system of the above kind is that one antenna may mask the other antenna(s), as shown in Figures 1 and 2, because of the position of the satellites, and in particular when their elevation is low. The antennas are considered to be located in the same horizontal plane, i.e. at the same height.

In Figure 1, which is a simplified plan view of a system with two co-located parabolic antennas, the two antennas 10 and 11 are pointing in opposite directions and neither of them can transmit or receive signals because they mask each other. In Figure 2, the antennas 10 and 11 are pointing in the same direction and the antenna 11 is therefore masking the antenna 10.

To avoid such masking, it is possible to move the antennas a greater distance apart, the requirements for compactness are then no longer satisfied. Also, it is no longer possible to protect them by a common radome.

One object of the present invention is to remedy the above drawbacks.

To be more precise, one object of the invention is to provide an antenna system including at least two antennas each of which is capable of pointing independently of the other(s) in any direction within a solid angle, the system enabling the antennas to be co-located without masking each other.

The above object, and others that become apparent below, are achieved by an antenna system including at least two antennas, each of the antennas being capable of pointing independently of the other(s) in any direction within a solid angle, the system being characterized in that the antennas are mounted on a common support co-operating with rotation means for rotating the common support, the rotation means being activated to prevent masking of one of the antennas by another of the antennas.

Rotation of the common support enables the antennas to be disposed beside each other for aiming in the same direction or opposite directions.

The antennas used can be circular or elliptical parabolic antennas, i.e. passive antennas, or active antennas made up of patches.

The rotation means are preferably adapted for rotation of ±45° relative to a median position.

The antenna system is advantageously covered by a radome and the invention applies in particular to tracking non-geostationary satellites.

Other features and advantages of the invention become apparent in the course of the following description of a preferred embodiment of the invention which is given by way of illustrative and non-limiting example only and with reference to the accompanying drawings, in which:

- Figures 1 and 2 are simplified plan views of a system with two co-located parabolic antennas,

- Figure 3 shows an antenna system according to the present invention, and

- Figure 4 is a simplified plan view of an antenna system of the invention including elliptical antennas.

Figures 1 and 2 have already been described in connection with the prior art.

Figure 3 shows an antenna system in accordance with the present invention. Here there are two circular parabolic antennas (10 and 11). Each antenna is mounted on a support and can be pointed independently of the other in any direction within a solid angle by means of elevation positioning means 12, 13 (each of which can rotate the antenna with which it co-operates by ±90° in elevation, for example) and azimuth positioning means 14, 15 (each of which can rotate the antenna with which it co-operates by ±180° in azimuth, for example). Common transmit/receive means 16 are connected to the antennas 10 and 11.

According to the invention, the antennas 10 and 11 are mounted on a common support 17 co-operating with means 18 for rotating the common support 17. To be more precise, the azimuth positioning means 14, 15 of the antennas 10 and 11 are here mounted on the common support 17. The rotation means 18 are activated to prevent one antenna masking the other antenna. For example, the rotation means comprise a motor coupled directly to a shaft 19 fixed to the common support 17. The common support 17 is rotated through ±45° relative to a median position when future impediment of one antenna by the other antenna is predicted, for example. The prediction can be based on analyzing the ephemeris or on analyzing data from encoders which encode the positions of the antennas 10 and 11. This automatically assures that neither antenna is ever masked by the other antenna, whether they are facing in substantially opposite directions (Fig.1) or in substantially the same direction

(Fig.2).

The antennas can equally well be active antennas.

The invention enables the antenna system to be placed under a common protective radome 20, which then has a compact overall size.

To limit further the overall size of the antenna system of the invention, the antennas can be oval or elliptical, as shown in Figure 4. This figure is a simplified plan view of the antenna system of the invention with the antennas 21 and 22 under the radome 20 aimed at the zenith. The surface areas of the antennas 21 and 22 are equal to those of the antennas 10 and 11, in order to provide the same performance. The radome 20 is smaller (around 20% smaller) than that shown in Figure 3.

The invention applies in particular, although not exclusively, to tracking non-geostationary satellites.

CLAIMS

1 An antenna system including at least two antennas each of said antennas being capable of pointing independently of the other(s) in any direction within a solid angle, wherein said antennas are mounted on a common support co-operating with rotation means for rotating said common support said rotation means being activated to prevent masking of one of said antennas by another of said antennas.

2 A system according to claim 1, wherein said antennas are parabolic antennas.

3 A system according to claim 1, wherein said antennas are active antennas.

4 A system according to any of claims 1 to 3, wherein said rotation means are adapted to effect a rotation of ±45° relative to a median position.

5 A system according to any of claims 1 to 4, wherein it is covered by a radome

6 A system according to any of claims 1, 3, 4 or 5, wherein said antennas are elliptical.

7 A system according to any of claims 1 to 6, wherein it is applied to tracking non-geostationary satellites.

8. An antenna system substantially as herein before described with reference to the accompanying drawings.

FIG.1

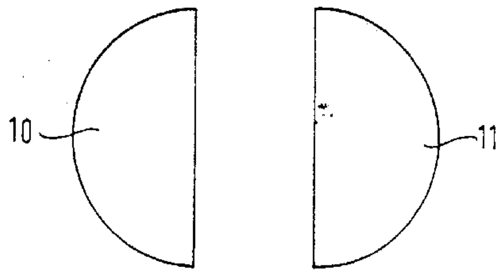

FIG.2

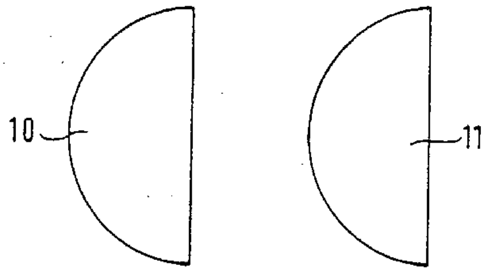

FIG.4

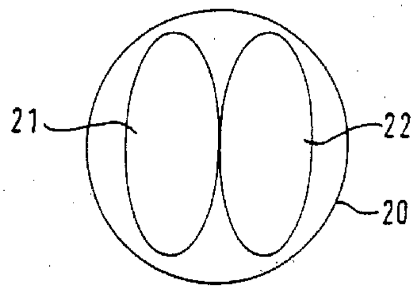

FIG.3