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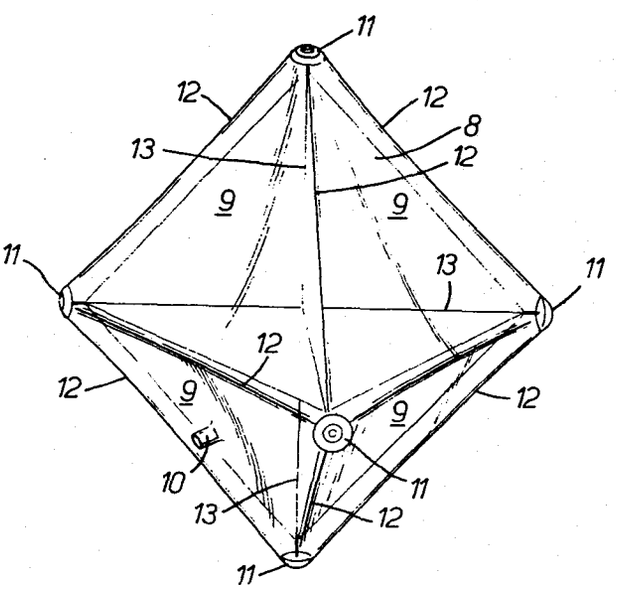
(54) Radar reflector.

(57) A collapsible radar reflector comprising an inflatable bladder of flexible airtight material which is substantially transparent to radar signals and contained within the bladder a radar reflector element of flexible radar reflective material which is secured to the inside of the bladder so as to be deployed consequent upon inflation of the bladder.



EP 0 148 635 A2

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RADAR REFLECTOR

This invention relates to radar reflectors and more especially it relates to collapsible radar reflectors.

Radar reflectors such as corner reflectors are used to provide a significant radar target and accordingly they are used inter-alia by small ships and boats which might otherwise be invisible to radar or at least be difficult to detect by means of radar.

Known radar reflectors tend to be heavy and bulky which is a significant disadvantage for some applications.

It is an object of the present invention to provide a collapsible radar reflector which is relatively light and which in its collapsed state is relatively small and easy to stow.

According to the present invention a radar reflector comprises an inflatable bladder of flexible air tight material which is substantially transparent to radar signals and contained within the bladder a radar reflector of flexible radar reflective material which is secured to the inside of the bladder so as to be deployed consequent upon inflation of the bladder.

The bladder may be constructed to define an octahedron having eight triangular sides of similar size.

The bladder may be constructed from eight panels each of which defines the shape of an equilateral triangle.

The radar reflector may be fabricated to define a corner reflector.

The corner reflector may when the bladder is inflated comprise three mutually orthogonally disposed four sided panels having mutually contiguous diagonals.

The four sided panels of the corner reflector may be formed by twelve triangular panels which define isosceles triangles having two 45° internal angles.

The radar reflector may be strengthened by means of cords which are arranged to extend between adjacent apexes and opposing apexes of the eight triangular sides which define the octahedron, the length of the cords being such as to constrain the bladder when inflated to define an octrahedral shape.

Anchorage means for the cords may be provided at each of the apexes.

The anchorage means may comprise truncated pyramidal or conical anchorage devices having a hole formed in the truncated end for cord anchorage purposes.

The anchorage devices may be made from two complementary parts which stack one within the other whereby the material of the bladder can be sandwiched between them.

In one embodiment of the invention three diametrally arranged cords may be used connected between opposing apexes of the eight triangular sides and twelve chordal cords may be used connected between adjacent apexes of the eight triangular sides which define the octrahedron.

The inflatable bladder may embody an inlet valve.

The inflatable bladder may have associated with it a compressed gas bottle which can be used to inflate the bladder.

The radar reflector may form a part of a marker buoy.

One embodiment of the invention will now be described solely by way of example with reference to the accompanying drawings in which;

Figure 1 is a perspective view of a corner reflector;

Figure 2 is a perspective view of the corner reflector shown in Figure 1 contained within a transparent inflatable octahedral bladder;

Figure 3 is a somewhat schematic front view of a buoy on which a radar reflector is supported; and,

Figure 4 is a perspective view of an anchorage device for use with the bladder of Figure 3.

Referring now to Figure 1 a corner reflector comprises three mutually orthogonally disposed four sided panels 1, 2 and 3 having mutually contiguous diagonals. Each of the panels 1, 2 and 3 is defined by four triangular panels which define isosceles triangles having two 45° internal angles. Thus the panel 1 for example is defined by triangular panels 4, 5, 6 and 7. The twelve triangular panels are fabricated from flexible plastics material which is metal sprayed so as to be reflective to radar signals. Although in the present embodiment the twelve triangular panels are sprayed with metal to provide radar reflectivity it will be appreciated by those skilled in the art that other metallisation processes will also be suitable.

As shown in Figure 2 the corner reflector is enclosed within and secured to the inside surface of a transparent plastics bladder 8 which defines an octahedron and which has eight similar equilateral triangular sides 9. One of the triangular sides 9 is provided with an inlet tube 10 by means of which the bladder is inflated.

In order to strengthen the radar reflector, anchorage devices 11 are used which serve as anchorage points for strengthening cords 12 which are stretched between adjacent ones of the devices 11 and strengthening cords 13 which are arranged to extend between opposing ones of the devices 11. Thus the strengthening cords 12 are in effect chordal cords and the strengthening cords 13 might be described as diametral cords. The diametral cords are contained within the bladder 8 and the chordal cords are also preferably contained within the bladder 8.

The anchorage devices 11 may be made of plastics material and they preferably include a hole or holes for receiving the cords 12, 13, which are secured to them. One kind of anchorage device is shown in Figure 4 which comprises two hollow plastics truncated pyramidal parts 18 and 19 which are complementary and fit one within the other.

In use, the material of the bladder 8 is sandwiched between the two parts 18 and 19 which are provided with holes for the cords 12 or 13. The part 19 is provided with an internal cylindrical pillar 20 which serves to strengthen

it and to which the cords are attached. The devices are fitted within the bladder 8 so its narrow truncated end 20 faces inwardly towards the centre of the bladder 8.

The triangular panels 9 which define the inflatable bladder 8 may be joined together by means of adhesive or by plastics welding techniques such as ultra-sonic welding and the triangular panels which define the radar reflector may be similarly joined. It will be appreciated that since the framework of the reflector is defined by the cords 12 and 13 which are tensioned between the anchorage devices as the bladder is inflated, the plastic panels such as the panels 4, 5, 6 and 7 which define the corner reflector, are held substantially flat whereby good radar reflective surfaces are formed.

A radar reflector according to the present invention may be used on small ships or boats or alternatively it may be used as a radar reflector on a marker buoy as shown in Figure 3.

Referring now to Figure 3 a radar reflector 14 of the kind just before described with reference to Figures 1 and 2 is secured to a buoy 15. The buoy includes an anchorage ring 16 for an anchor cord and an air bottle 17 which can be used for the purpose of inflating the buoy and/or for the purpose of inflating the radar reflector 14. Buoys of the kind just before described with reference to Figure 3 may be used to mark channels or hazards at sea and they have the advantage that until they are required for use they can be stored compactly.

Various modifications may be made to the radar reflector shown without departing from the scope of the invention and for example it will be appreciated that a bladder of any suitable shape may be utilised which includes within its air tight envelope any suitable form of radar reflector. It will also be appreciated that a radar reflector according to the present invention may be used wherever it is required to provide a significant radar reflective target.

CLAIMS

1. A collapsible radar reflector comprising an inflatable bladder of flexible airtight material which is substantially transparent to radar signals and contained within the bladder a radar reflector element of flexible radar reflective material which is secured to the inside of the bladder so as to be deployed consequent upon inflation of the bladder.

2. A collapsible radar reflector as claimed in claim 1, wherein the bladder is constructed to define an octahedron having eight triangular sides of similar size.

3. A collapsible radar reflector as claimed in claim 2, which is strengthened by means of cords which are arranged to extend between adjacent apexes and opposing apexes of the eight triangular sides which define the octahedron, the length of the cords being such as to constrain the bladder when inflated to define an octahedral shape, anchorage means for the cords being provided at each of the apexes.

4. A collapsible radar reflector as claimed in claim 3, wherein the bladder is constructed from eight panels each of which defines the shape of an equilateral triangle.

5. A collapsible radar reflector as claimed in claim 4, wherein the radar reflector element which is fabricated of

radar reflective material is arranged to define a corner reflector.

6. A collapsible radar reflector as claimed in claim 5, wherein the corner reflector, when the bladder is inflated, comprises three mutually orthogonally disposed four sided panels having mutually contiguous diagonals, formed by twelve triangular panels which define isosceles triangles having two 45° internal angles.

7. A collapsible radar reflector as claimed in claim 3, wherein the anchorage means comprise truncated pyramidal or conical anchorage devices having a hole formed in the truncated end for cord anchorage purposes and which are made from two complimentary parts which stack one within the other whereby the material of the bladder can be sandwiched between them.

8. A collapsible radar reflector as claimed in claim 3, wherein three diametrically arranged cords are used connected between opposing apexes of the eight triangular sides and twelve cordal cords are used connected between adjacent apexes of the eight triangular sides which define the octohedron.

9. A collapsible radar reflector as claimed in any preceding claim wherein the inflatable bladder is arranged to embody an inlet valve, having associated with it a compressed gas bottle which can be used to inflate the bladder.

10. A collapsible radar reflector as claimed in any one of claims 1 to 8 arranged to form a part of a marker buoy.

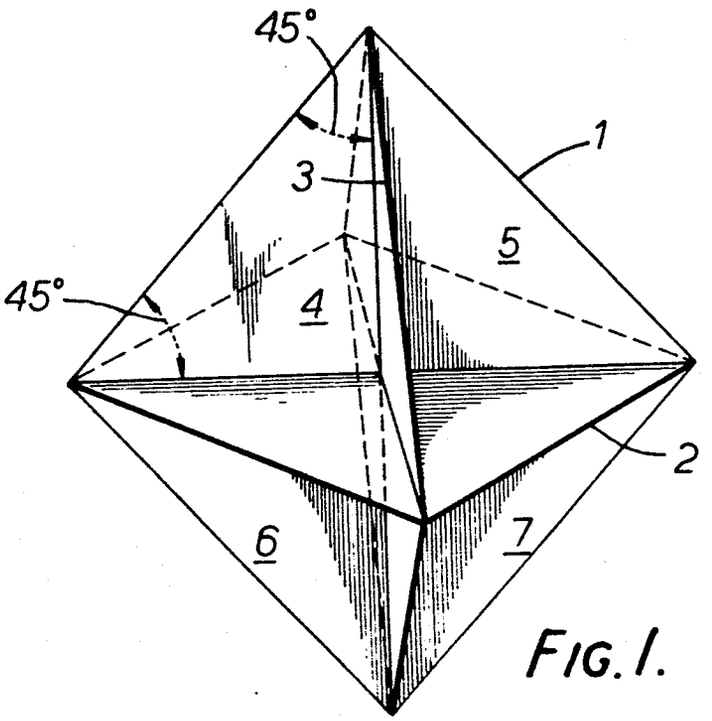

FIG. 1.

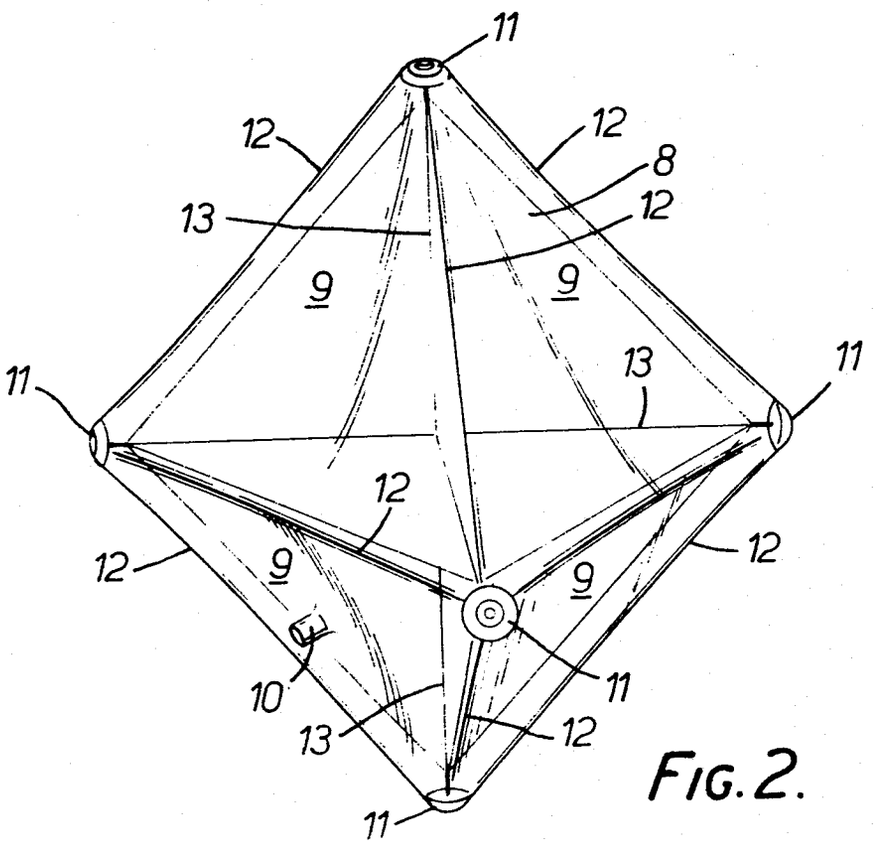

FIG. 2.

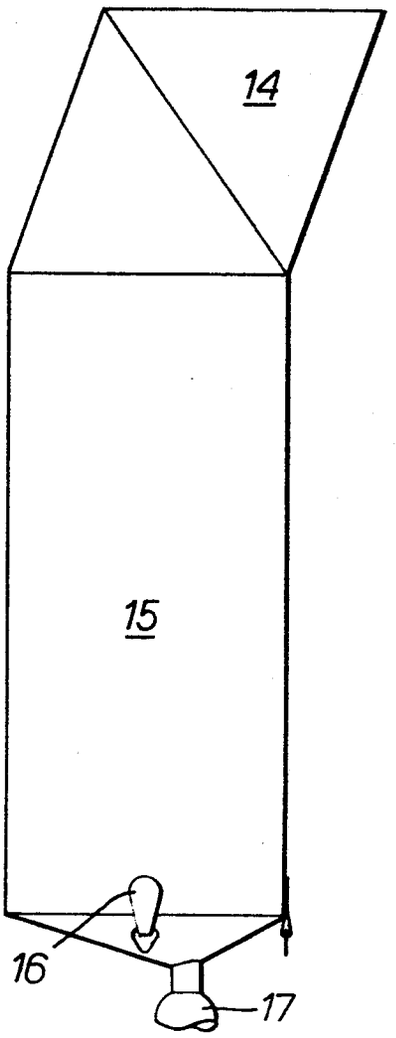

FIG. 3.

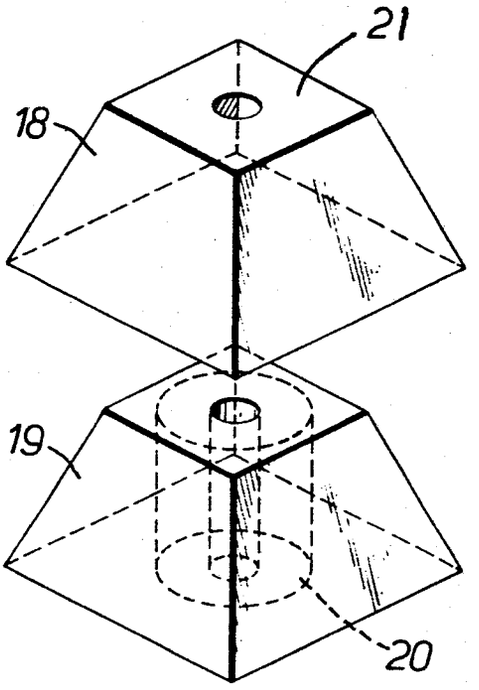

FIG. 4.