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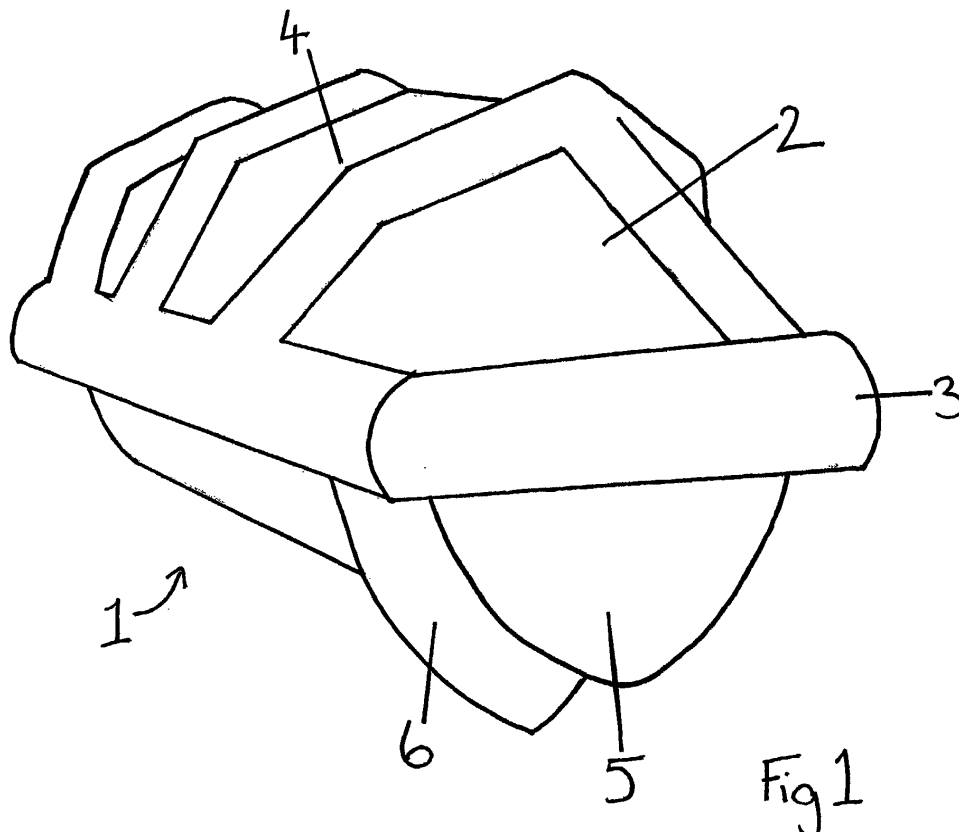
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(54) **Ocean survival unit**

(57) A life raft or ocean survival unit (1) is capable of self-righting upon capsize, even when occupied by one or more survivors. The life raft (1) comprises a hull-shaped ballast chamber (5) which fills with water upon inflation of the life raft and provides added stability to the vessel and in part see self-righting capabilities to the

life raft. Water is sucked in through membrane valves located at the rear of the ballast chamber. The life raft also comprises a canopy (4) and inflatable base section (3), wherein the inflatable base section may be compartmentalised to prevent sinking of the unit in the event of a puncture deflation.



Description

[0001] The present invention relates to the area of life preservation at sea, and in particular the area of life rafts and ocean survival units. This invention provides a life raft which, is suitable for use in calm to reasonably rough seas with a large swell, and also extreme seas with high winds and large breaking waves.

[0002] Life rafts and sea survival units have been used for many years. Commonly, the rafts are comprised of two large inner tubes with a tent-like construction on top. Although advances have been made over the years in materials and adhesive, water filtration systems, may day signaling systems and other features such as insulation, the design of these rafts has changed very little. In addition very few advances have been made to overcome problems of a technological order, such as fundamental issues of entry to the life raft, effective use of space and improved performance in extreme conditions.

[0003] The need for improved designs of life rafts, which are suitable for use in extreme seas and high winds, is even more evident when incidents such as the sinking of the Estonia in 1994 are considered. In this accident, 852 people lost their lives. Many of these fatalities occurred as a result of exposure after survivors of the initial sinking sought refuge on life rafts. In addition a number of the life rafts also capsized. Many current designs of life rafts are not capable of self righting when filled with passengers.

[0004] It is a first object of this present invention to provide an improved ocean survival unit, which has improved buoyancy and stability in extreme seas and high winds. A particular object of the present invention is to provide a life raft, which is capable of self righting, even when loaded with passengers.

[0005] It is a further object of this present invention to provide an ocean survival unit, which provides shelter, warmth and a dry environment when in use. It is a yet further objection of the present invention is to provide an ocean survival unit which has an easily reached entrance and is accessible either from land, another vessel or from the sea.

[0006] A yet further object of the present invention is to provide an ocean survival unit, which is adapted to always point into the wind once inflated. An associated object is to provide a life raft, which is adapted such that the entrance is sheltered from the wind and breaking waves.

[0007] A still further object of the present invention is to provide an ocean survival unit, which reduces the level of sea sickness in passengers. A further object is to provide an ocean survival unit which contains a seating arrangement which maximises comfort and morale.

[0008] A final object of the present invention is to provide an ocean survival unit which when punctured can be repaired without the need for patches.

[0009] According to the first aspect of the present in-

vention there is provided an ocean survival unit capable of up righting when occupied by passengers, the ocean survival unit comprising an inflatable base, a canopy and a ballast chamber located below the inflatable base.

[0010] The ocean survival unit is inflatable.

[0011] Preferably the canopy is supported by a cage structure. The cage structure may be inflatable.

[0012] Preferably the ballast chamber is hull shaped.

[0013] Most preferably the ballast chamber fills with water upon inflation of the life raft.

[0014] Preferably water is drawn, pumped, or sucked into the ballast chamber through one or more membrane valves.

[0015] The one or more membrane valves may be located at the rear of the ballast chamber.

[0016] Most preferably the one or more membrane valves are one way valves. As such, the one or more membrane valves allow water to enter the ballast chamber, but do not allow water to exit the ballast chamber.

[0017] Preferably the ocean survival unit also comprises a plurality of tensile members. Advantageously the plurality of tensile members which prevent the raft collapsing under the weight of the volume of water in the ballast chamber.

[0018] Most preferably the tensile members are rib like structures.

[0019] Preferably the tensile members act as stiffening batons for the ballast chamber.

[0020] Preferably the tensile members runs the length of the ocean survival unit.

[0021] Preferably the tensile members support the floor and seating in the event of the ocean survival unit capsizing.

[0022] Optionally the tensile members work as baffles when the raft is in its correct orientation, reducing the flow of water inside the ballast chamber and therefore reducing roll and the effects of free water.

[0023] Optionally the tensile members provide a rigid flooring system, wherein any one part or section of the floor cannot be compressed, as the membranes will not allow any other part of the floor to expand.

[0024] Most preferably the ocean survival unit has a self draining floor which drains away any water which enters the unit. The self draining floor may be cambered, wherein the lowest part of the unit is to the rear, wherein water can drain from the rear of the unit.

[0025] Preferably the floor of the ocean survival unit comprises a plurality of tubes of varying diameter wherein the tubes of greatest diameter may act as seats.

[0026] The inflatable base of the ocean survival unit may be inflated using one valve. Alternatively, the inflatable base may be inflated using two or more valves.

[0027] Preferably the ocean survival unit can be compactly rolled when not in use.

[0028] The ocean survival unit may be provided and stored in a watertight container when not in use.

[0029] According to a second aspect of the present invention, there is provided an ocean survival unit com-

prising an inflatable base and a canopy, wherein the inflatable base is divided into a plurality of independent inflatable compartments or sections, wherein deflation of one of the compartments or sections does not affect the integrity of the remaining compartments.

[0030] Advantageously if one of the compartments or sections sustains a puncture and undergoes a degree of deflation, the remaining compartments will not be affected, or deflate.

[0031] The inflatable base may be divided into the plurality of compartments or sections by one or more tensile members. The one or more tensile members may be rib like structures.

[0032] Preferably the compartments or sections of the inflatable base are separated by a series of blow out valves which, upon reaching a specified pressure, will blow out and stop the passage of air in any direction.

[0033] Optionally, a deflated compartment or section of the inflatable base can be inflated with expanding foam.

[0034] Preferably the expanding foam is polyurethane foam.

[0035] Preferably the the seating in the ocean survival unit is arranged whereupon the occupants are seated facing each other.

[0036] According to a third aspect of the present invention, there is provided an ocean survival unit which is capable of self righting when occupied by passengers, comprising an inflatable base and a canopy, wherein the unit is accessed via an opening in the vessel, and wherein access into the interior of the life raft is not impeded by a barrier, door or wall at the opening.

[0037] Most preferably there is no barrier between the ocean and the interior of the raft.

[0038] A semi-rigid step may be positioned at the opening to allow easy access to the vessel. The semi-rigid step is preferably provided with hand holds.

[0039] According to a fourth aspect of the present invention there is provided an ocean survival unit, which is capable of self righting when occupied by passengers, comprising an inflatable base and a canopy, wherein the ocean survival unit has an integral drogue.

[0040] Typically the drogue is positioned such that the raft will always point into the wind once inflated. Yet further the drogue acts to maintain the entry point into the ocean survival unit to the rearside. Advantageously this shelters the entry point to the unit from wind, rain and breaking waves.

[0041] Most preferably, the drogue is positioned such that the risk of entanglement in rigging is minimised.

[0042] According to a fifth aspect of the present invention, there is provided an ocean survival unit which is capable of self righting when occupied by passengers, comprising an inflatable base and a canopy, wherein the canopy comprises both transparent sections and opaque sections.

In order to provide a better understanding of the invention, embodiments will now be described by way of ex-

ample only, and with reference to the following Figures in which:

Figure 1 is a perspective view of an ocean survival unit according to the present invention; and

Figure 2 shows the operation of the blow out valves according to this invention.

[0043] An ocean survival unit 1 which is capable of self righting, even when carrying passengers is generally depicted at 1 in Figure 1. The ocean survival unit could also be described as a life raft or life boat. The raft, when not inflated, can be compactly packed away, and quickly inflated when required. A key aspect of the present invention lies in the provision of a ballast chamber 5, which is positioned substantially below inflatable base 3. Upon inflation of the life raft 1, the hull shaped ballast chamber 5 is flooded with water, which provides added stability to the vessel. The ballast chamber also provides the life raft with its self-righting capabilities, even when the vessel is fully occupied. Water is sucked in through membrane valves, which in the preferred embodiment are located at the rear of the ballast chamber 5. Once flooded the ballast chamber 5 provides sufficient mass to maintain a stable vessel, to prevent the raft from being flipped by the wind and to allow the raft to self-right if capsized.

[0044] In one embodiment of the present invention, the life raft is designed such that it is capable of floating on a surface of water and can be entered via an opening in one of the walls of the raft. The interior of the life raft is not closed or partitioned from the sea by any barrier, door or wall. In other words no barrier is required between the interior of the raft and the sea - the raft will remain afloat and is capable of up righting because of its design, regardless of whether a door is included in the design. This facilitates quick entry into the raft, as a person entering does not need to negotiate any barriers, or open a door to access the interior of the raft. The person can simply climb into the raft. However to aid entry a semi-rigid step with associated hand holds may be positioned at the opening.

[0045] The ballast chamber 5 also comprises tensile membranes, which run the length of the vessel, and support the floor and seating, in the event of the life raft capsizing. These tensile membranes stop the volume of water in the ballast chamber 5 from collapsing the raft, and also work as baffles when the raft is in its correct orientation, reducing the flow of water inside the ballast chamber and thus reducing roll and the effects of free water.

[0046] A particularly important aspect of the present invention lies in the integration of a raft stowage/protective casing to the inflated raft. In current life raft designs casing is used purely to protect the raft during stowage, to prevent puncture or damage due to day to day knocks and scrapes. On deployment of current life rafts the solid

casing is discarded and left to float away.

[0047] In the life raft of the present invention the casing is a vital component in operation. As the only truly rigid element in the raft, the casing is segmented into a plurality of ribs which upon inflation concertina out to provide stiffening batons for the ballast chamber walls. In the depicted embodiment seven ribs are included. In a capsize situation, these ribs also suspend the floor section using the series of tensile members, stopping the floor collapsing and crushing the occupants inside.

[0048] The tensile membranes in the ballast chamber 5 provide a rigid flooring system for the occupants of the raft. The presence of the tensile membranes in the ballast chamber 5 means that any one part or section of the floor cannot be compressed, as the membranes will not allow the other parts of the floor to correspondingly expand.

[0049] At present, standard life rafts are attached to a drogue 6, which is essentially a water parachute, via a painter line of approximately 70 plus feet in length. In heavy seas, the waves generate surface currents, which run towards each other at the crest of a wave, and these currents can cause the raft and drogue to move towards each other. This movement of the raft and drogue 6 towards each other creates slack in the painter line, and increases the chances of the raft capsizing due to wind or breaking waves. In the raft described herein, a drogue 6 is an integral part of the raft 1 itself, which means that the chance of capsizing in high seas or high winds is reduced. This also means that the raft 1 is adapted to point always into the wind once inflated. Accordingly the entrance opening is positioned such that it is always at the rearward facing side of the vessel, and therefore is sheltered from wind, rain and breaking waves. This improves access for persons boarding the raft.

[0050] The drogue 6 is designed such that entanglement in any rigging, etc., is minimised. In addition the drogue 6 allows forward movements, and when not propelled will provide suitable resistance in order to point the vessel 1 into the wind, and hence reduce wind drift. Also, when not propelled, the raft 1 will always point into the wind, sheltering rear entry.

[0051] The canopy 4 of the ocean survival unit is provided with both transparent and opaque sections. The transparent sections in the canopy 4 reduce the onset of sea sickness by allowing visual contact with sea's movement, while the opaque sections block visual contact with the oncoming seas, thus reducing trauma, panic or stress.

[0052] The ocean survival unit 1 is also provided with an intuitive seating arrangement, which was designed through a series of user trials. The resulting seating arrangement has individuals seated in a comfortable manner facing each other, and not encroaching into each other's personal space.

[0053] The inflatable base section 3 of the ocean survival unit works in such a way that it can be inflated from only one inlet valve, or two if required.

[0054] Advantageously, the inflatable base section 3 is compartmentalised. Therefore if the ocean survival unit sustains a puncture deflation, any deflation is isolated to that particular area or compartment of the raft. The compartments are separated by a series of blow out valves 7, which upon reaching a specified pressure, will blow out and stop the passage of air in either direction. Therefore all of the compartments can be inflated with air from a single inlet valve, but will become separate from each other when the internal blow out valves 7 are blown to stop the passage of air.

[0055] Figure 2 illustrates the operation of the blow out valves 7 wherein 2(a) shows the valve 7 during raft 1 inflation when the valve is held together by a snap fit feature. Once the inner tubes reach their specified pressure, the design of the valve 7 is such that the snap fit can no longer sustain the connection as can be seen in 2(b). The non-returnable parts of the valve 7 then close due to back pressure (Figure 2(c)) so that the inflated sections are now independent of each other.

[0056] In the event of a puncture appearing in a large or difficult patch or in a number of sections or compartments, it will be appreciated that it might be preferable to repair the puncture. The deflated section(s) or compartment(s) can be reinflated with expanding polyurethane foam. This means there is no need for a patch puncture repair system, and that the repair can be carried out easily on board the vessel.

[0057] Figures 3 to 8 illustrate the inflation process, which the raft undergoes. In Figure 3, case 8 floats on its end, with hinges along the bottom edge. This is achieved by packing a CO₂ cylinder along the hinged side of the container to off-set the center of gravity. Referring to Figure 4, the rollover struts 9 will push the casing open upon deployment, and the floor and main U section of the rollover cage will then snap ribs apart and start extending the raft length ways as shown in Figure 5. As the floor inflates, seen in Figure 6, the structure starts to take shape, water floods through the ballast chamber by the vacuum created by the underside of the floor moving away from the ballast chamber walls. Finally, in Figure 7, near completed inflation the ballast chamber will reach full capacity.

[0058] Further modifications and improvements may be made without departing from the scope of the invention herein intended.

Claims

1. An ocean survival unit which is capable of self-righting when occupied by passengers, the ocean survival unit comprising an inflatable base, a canopy and a ballast chamber located below the surface of the inflatable base.
2. An ocean survival unit as claimed in Claim 1, wherein the canopy is supported by a cage structure.

3. An ocean survival unit as claimed in Claim 2 wherein the cage structure is inflatable.
4. An ocean survival unit as claimed in any one of the preceding Claims, wherein the ballast chamber is hull-shaped. 5
5. An ocean survival unit as claimed in any one of the preceding Claims, wherein the ballast chamber fills with water upon inflation of the ocean survival unit. 10
6. An ocean survival unit as claimed in Claim 5, wherein water is drawn, pumped or sucked into the ballast chamber through one or more membrane valves. 15
7. An ocean survival unit as claimed in Claim 6 wherein the one or more membrane valves are located on the lower surface of the ballast chamber.
8. An ocean survival unit as claimed in Claims 6-7, wherein the one or more membrane valves are one-way valves which allow water to enter, but do not allow water to leave the ballast chamber. 20
9. An ocean survival unit as claimed in any one of the preceding Claims, wherein the ballast chamber comprises a plurality of tensile membranes which prevent the raft collapsing under the weight of the volume of water in the ballast chamber. 25 30
10. An ocean survival unit as claimed in Claim 9 wherein the tensile members are rib like structures.
11. An ocean survival unit as claimed in Claims 9-10 wherein the tensile members act as stiffening batons for the ballast chamber. 35
12. An ocean survival unit as claimed in Claims 9-11, wherein the one or more tensile membranes extend along the length of the vessel. 40
13. An ocean survival unit as claimed in any one of Claims 9 to 12, wherein the one or more tensile membranes support the floor and seating in the event of the ocean survival unit capsizing. 45
14. An ocean survival unit as claimed in any one of Claims 9 to 13, wherein the one or more tensile membranes work as baffles when the raft is in an upright orientation, reducing the flow of water inside the ballast chamber and therefore reducing roll and the effects of free water. 50
15. An ocean survival unit as claimed in any one of Claims 9 to 14, wherein the one or more tensile membranes in the ballast chamber provide a rigid flooring system. 55
16. An ocean survival unit as claimed in Claim 15, wherein the rigid floor cannot be compressed.
17. An ocean survival unit as claimed in any one of the preceding Claims having a self draining floor.
18. An ocean survival unit as claimed in any one of the preceding Claims wherein the floor comprises a plurality of tubes of varying diameter wherein the tubes of greatest diameter act as seats.
19. An ocean survival unit as claimed in any one of the preceding Claim which can be rolled in a compact form when not in use.
20. An ocean survival unit which is capable of self-righting when occupied by passengers, the ocean survival unit comprising an inflatable base and a canopy, wherein the inflatable base is divided into a plurality of independent inflatable compartments or sections, wherein deflation of one of the compartments or sections does not affect the integrity of the remaining compartments or sections.
21. An ocean survival unit as claimed in Claim 20 wherein the inflatable section is compartmentalised or sectioned, such that if the raft sustains a puncture deflation, deflation is isolated to that particular compartment or section of the raft.
22. An ocean survival unit as claimed in Claims 20-21 wherein the inflatable base is divided into the plurality of compartments or sections by one or more tensile members.
23. An ocean survival unit as claimed in Claims 20-22 wherein the compartments or sections of the inflatable base are separated by a series of blow out valves which, upon reaching a specified pressure, will blow out and stop the passage of air in any direction.
24. An ocean survival unit as claimed in any one of Claims 20-23 wherein a deflated compartment or section of the inflatable base can be inflated with expanding foam.
25. An ocean survival unit as claimed in Claim 24 wherein the expanding foam is polyurethane foam.
26. An ocean survival unit which is capable of self-righting when occupied by passengers, said ocean survival unit comprising an inflatable base and a canopy, wherein the unit is accessed via an opening in the unit, and wherein access into the interior of the unit is not impeded by a barrier, door, or wall at the opening.

27. An ocean survival unit as claimed in Claim 26,
wherein there is no barrier between the interior of
the unit and the ocean.
28. An ocean survival unit as claimed in Claims 26-27, 5
wherein a semi-rigid step is positioned at the open-
ing to allow easy access to the vessel.
29. An ocean survival unit which is capable of self-right- 10
ing when occupied by passengers, the ocean sur-
vival comprising an inflatable base and a canopy,
wherein the ocean survival unit has an integral
drogue.
30. An ocean survival unit as claimed in Claim 29, 15
wherein the drogue is positioned such that the raft
always points into the wind when inflated, and
wherein the entry point into the ocean survival unit
is positioned at the rear and is sheltered from the
wind, rain and breaking waves. 20
31. An ocean survival unit capable of self-righting when
occupied by one or more persons, the ocean sur-
vival unit comprising an inflatable base and a can-
opy, wherein the canopy comprises both transpar- 25
ent and opaque sections.

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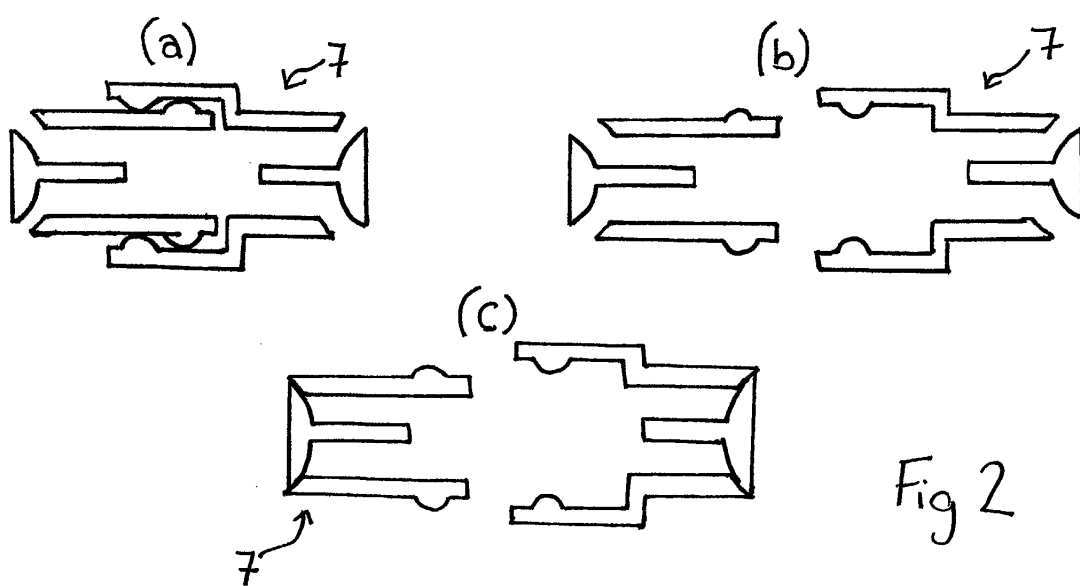
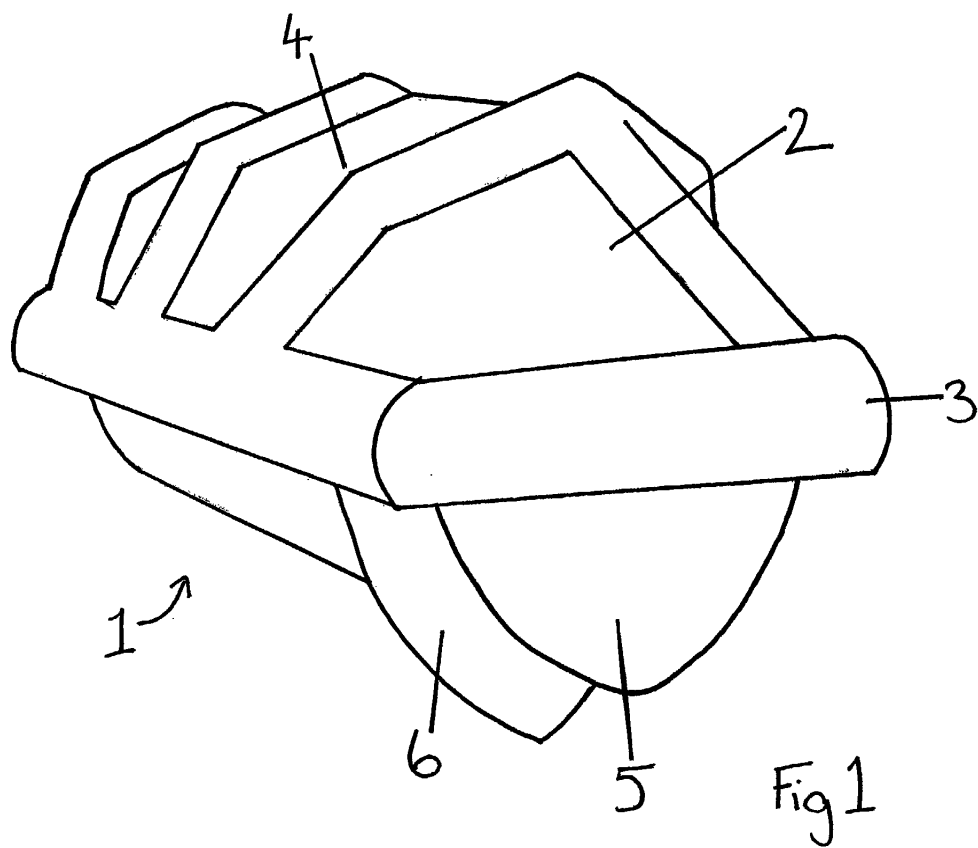




FIG 3



FIG 4



FIG 5

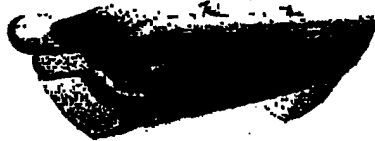


FIG 6



FIG 7

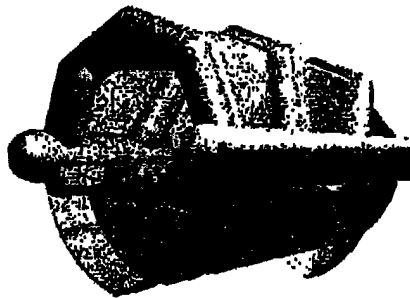


FIG 8.