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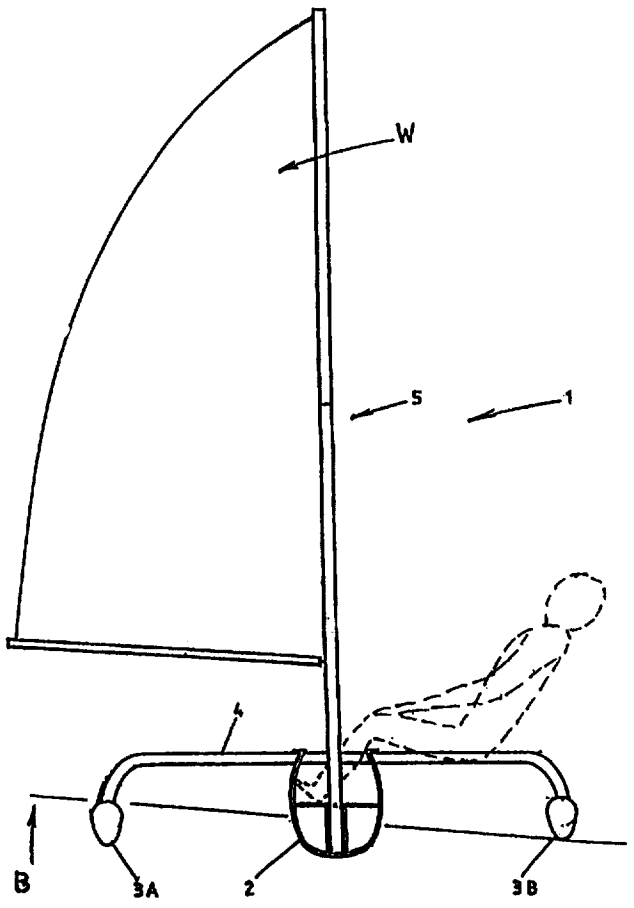
(54) Title: COLLAPSIBLE BOAT

(57) Abstract

This invention relates to a method and apparatus associated with a collapsible boat (1). The boat (1) is preferably configured for use with a sailing rig (5), allowing both sporting and recreational use of the boat. The boat may be collapsed fully to allow all its components to be fitted and secured into the central hull (2) of the boat when not in use.



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COLLAPSIBLE BOAT

TECHNICAL FIELD

This invention relates to a collapsible boat.

BACKGROUND ART

Boats are used by a wide section of the community for recreational pursuits. Sail boating, snorkelling and scuba diving, fishing, personal transportation, competition racing, confidence building and sightseeing are all activities which may require the use of a boat.

Some major disadvantages are associated with a person using, transporting and storing a boat.

Firstly most boats require a specifically adapted trailer on which the boat is supported while a car transports the trailer. Usually a ramp is required to launch a boat from a trailer, limiting the number of places in which a boat may be launched.

In some cases a boat may permanently stay in the water, requiring a berth in a marina, and transportation of the boat occurring only when it is sailed under its own power. This leaves the boat unattended for long periods of time and vulnerable to vandalism, exposed to the elements and subject to increased maintenance.

If a boat is to be towed by a car, the car in most cases needs to be powerful enough to sustain the extra weight of the boat towed.

All these features tend to hamper a boat user. They may either keep their boat in a set berth such as a marina, or purchase a specifically constructed trailer and a powerful motor vehicle to tow the boat around. In the second case the user firstly has to discover the positions of suitable ramps from which to launch the boat.

One recreational boat which addresses some of the problems faced by most boat owners is the windsurfer, or sail board. This device is collapsible, packing up after use and easily able to be transported on the roof of a car or inside a station wagon. The lightweight construction and collapsibility allows more than one wind surfer to be transported on one vehicle.

However, due to their design windsurfers present yet more problems to a person desiring mobility on the water.

Generally, only one person may be carried on a windsurfer at one time. this person requiring special balancing skills and practice to actually be able to sail the board. A windsurfer may only be used for sport sailing, not being adapted to carry cargo or for long sightseeing trips.

The user of a windsurfer must stand while operating the board, be physically strong enough to support the sail while under way, and in most cases be prepared to end up in the water at some time during the voyage.

Windsurfers also rely solely on weather conditions for powering of the boat. The device is completely useless and unstable in calm conditions.

Other devices have been designed to try and improve on their usual disadvantages associated with transporting a boat.

In relation to sailing boats which may fit on trailer, a centre board is usually required to be inserted through the hull and protrudes down into the water.

Centre boards can have two purposes. Firstly they prevent the boat moving sideways while tacking into wind. Secondly, some contain weights which help stabilise the boat when the wind pushes against the main sail. Any boat which includes a centre board is not readily collapsible because the cavity required by the centre board can inhibit available space, and causes design problems for a normally water tight hull.

An alternative method of preventing the boat moving sideways while tacking into wind is to use a trimaran configuration with asymmetrically shaped hulls. When the leeward hull is pushed into the water by the force of the wind acting on the main sail the inboard curved surface of this hull creates a sideways force which opposes the force of the wind.

These hulls can also be used for stabilising the craft in lieu of a weighted centre board.

Previously some collapsible multi-hull craft have been constructed. However when collapsed the craft still occupy a considerable amount of space and usually require a road trailer and may not be stored or transported easily as one compact small unit. The user is once again provided with some difficulty in transporting their boat.

An easily transported and stored multi-hull craft would be a major advantage over any of the prior art available to a boat user today.

A device such as this would provide the user with all the advantages of a normal boat, and remove all the transportation, storage and launch disadvantages associated with a normal boat. Neither would it involve any of the problems experienced by a windsurfer user, and yet enjoy most of the advantages associated with a windsurfer.

It is an object of the present invention to address the foregoing problems or at least to provide the public with a useful choice.

Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

DISCLOSURE OF INVENTION

According to one aspect of the present invention there is provided a boat including a central hull and at least one pontoon wherein in use the pontoon is attached to the central hull, the boat characterised in that the pontoon and central hull are configured so that the pontoon can be positioned at least partially inside the hull when the boat is not in use.

According to another aspect of the present invention there is provided a method of storing a collapsible boat consisting of the components of a central hull and one or more pontoons, the method characterised by the steps of

(a) disengaging the pontoon(s) from attachment to the hull, and

(b) securing the pontoon(s) inside the hull.

A pontoon shall be defined as meaning any type of buoyant float, which may in some respects be similar to a small version of a boat's hull. A pontoon as described may also be a hollow water tight float which is sealed to prevent flooding by water.

In a preferred embodiment of the present invention the central hull may be similar in appearance to a canoe. The hull may provide enough space inside the hull to seat one or more persons, store gear and allow the attachment of a sail.

The main hull of the boat may include a skeg moulded into its shape on each side and configured as a long but shallow hydrodynamic foil. This skeg may be used to improve the boat's upwind pointing ability. It also makes the hull stable when sited on the ground.

In other embodiments of the present invention a canoe type structure may not be used as the central hull. Any body which partially encloses a space and exhibits buoyancy in water may be used as the central hull.

In one embodiment of the present invention the pontoons used may be substantially identical, allowing a pontoon to fit on either the left or right side of the boat.

In a preferred embodiment of the present invention the pontoons used shall be hollow floats which are sealed to prevent the intrusion of water. These floats shall be shorter in length than the central hull, but of a much smaller width than the central hull.

Other embodiments of the present invention may not use hollow floats as pontoons. For example use may be made of small canoe bodies, long pieces of wood, or any other buoyant material.

In a preferred embodiment of the present invention, two pontoons may be used in the construction of the boat. These pontoons may be positioned on either side of the central hull and orientated substantially parallel to the central hull.

In some embodiments of the present invention an attachment means may be used to temporarily attach pontoons to the central hull of the boat.

In a preferred embodiment of the present invention the attachment means used may consist of one or more arms orientated along the width of the central hull and the pontoons. The attachment means may be readily removed from the pontoons and central hull when the boat is not in use.

In a further preferred embodiment the central hull may be attached to the attachment means arms with use of a hooked locking pin and an over centre latch arrangement. The locking pin may pass through the body of the attachment arm and the gunwale of the central hull. The locking pin may then be secured in place with use of a latch arm passing through the pins hooked lower end, the latch arm then being pulled downwards by an over centre latch arm. The hooked locking pin and over centre latch can then hold the attachment arm and hull firmly together.

In one embodiment of the present invention a seat may be attached to the boat using the same hooked locking pin and over centre latch used to attach the attachment arm and boat gunwale together. A seat may be placed on top of the attachment arm with the locking pin passing through the seat and through the attachment arm and gunwale. The locking pin may then be secured with use of a over centre latch.

The front seat in this embodiment may also be used as an upper support for the mast. With the mast anchored on the cockpit floor and on the front seat a strong and stable attachment for the mast is achieved.

In a preferred embodiment of the present invention a pontoon may be attached to an attachment arm with use of a hooked toggle latch. The attachment arm may protrude into the body of the pontoon, with the hook of the latch catching against a striker on the body of the pontoon. The hook may then be pulled against the striker by closing the toggle on the latch.

In some embodiments of the invention a stop may be included on the attachment arm so as to prevent the attachment arm protruding too far into the body of the pontoon.

Other embodiments of the present invention may not use arms to attach the central hull and pontoons together. Other methods of attachment may be used, including solid sheets of material such as plywood, or any other substantially rigid body which can maintain the hull and pontoons in a spaced relationship.

In some embodiments of the present invention a driving means may be included to power the boat when in use.

In a preferred embodiment of the present invention the driving means included in the boat shall consist of a sailing rig. This rig may be attached to the boat at a point on the central hull, to drive the boat by harnessing the power of the wind.

One preferred method of attaching the sail to the mast is by using a pocket luff. This eliminates the requirement for a mast track or mast luff rings. In order to be able to raise or lower the sail separately from the mast (as is not normally the case with pocket luff sails), one preferred method is to use a halyard to raise the sail and secure the sail to the mast by means of a full length luff pocket zipper.

Other embodiments of the present invention may not use a sailing rig as a driving means for the boat. Other driving means possibly used may include paddles, water propeller and engine arrangements, or air propeller and engine arrangements.

One embodiment of the present invention may include an outboard motor and water propeller as the driving means. The motor and propeller may be attached to the attachment means used to connect the pontoon to the central hull.

When not in use the boat may be collapsed, with some if not all of the boat components detaching from each other.

In other embodiments the components may not detach but may be moved relative to each other from an "in use" configuration to a "storage" configuration.

The central hull may be configured so that all the component pieces of the boat when detached or in the storage configuration will fit into the central hull. A means may be provided whereby component portions of the boat may be secured inside the central hull when not in use.

Both seats may also be used to secure firmly all components inside the hull when the boat is in the collapsed configuration. To achieve this the seats may have a specifically shaped underside which contours neatly around the shape of the stored components.

In one embodiment of the present invention the securing means used shall consist of a flexible covering material (for example, canvas) which seals around the top edges of the

central hull. In this manner all the boat components are neatly and securely sealed inside the central hull.

Other embodiments of the present invention may not use a flexible sealing material to secure boat components inside the central hull. Components may be attached to the central hull when not in use by a variety of securing means. For example the securing means may include ties attached to the hull, Velcro™ strips attached to the hull and boat components, magnetically attractive strips attached to hull and boat components, or specific compartments built into the central hull used to secure boat component pieces.

Included in some embodiments of the present invention may be flexible trampoline material which may be attached between the pontoons and central hull when the boat is in use. The trampoline material provides extra seating and support for the user when the boat is on the water.

One preferred method of attaching the trampolines to the attachment arms is by sewing a sleeve in the fore and aft end of each trampoline. The attachment arms may be slid through the sleeve, holding the trampoline in place.

One preferred method to tension each trampoline is by using a series of belt buckles and belts sewn into the seam of the sleeve. The belt may be pulled tight and secured when the required tension is placed on a trampoline.

In an alternative embodiment another method used to tension each trampoline is by use of a series of lace straps and eyes positioned in the trampoline sheeting. The lace straps may be laced through the trampoline eyes and pulled tight to the required tension then tied off, in substantially the same manner as a shoe lace is tensioned and tied.

When the present invention is in use as a wind driven sail boat, trampolines and pontoons come into use. Due to the action of the wind pushing on the sail, sail boats tend to tip in the direction in which the wind is travelling. With symmetrically positioned pontoons such as in a preferred embodiment, the boat is stabilised and supported on either side when tipped from either direction by the wind.

The wind's force pushes a pontoon into the water, allowing the buoyancy of the pontoon to oppose this force in the opposite direction to which the wind is travelling. In this manner the hull of the boat is kept substantially upright.

Trampolines provided between pontoons and central hull also allow the user to position themselves to counterbalance the force of the wind, and assist in stabilising the boat.

In a preferred embodiment of the present invention, one or more seats may be attached to the boat when in use. In some embodiments of the invention seats may be attached to the boat using the same attachment means used to secure the pontoons to the central hull.

The boat may use a free standing rig which will give natural resistance to 'pitch poling' which is a common trait in multi hull boats. Pitch poling occurs when a sail boat runs downwind and into a wave. The boat bow sinks into the wave, and the force of the wind from behind acts to pivot the boat about the bow and capsize the vessel.

One sail rig which may be used in a preferred embodiment is a wishbone boom in lieu of a traditional boom. This eliminates the possibility of the boats user's banging their heads on the boom as the boat tacks, and eliminates the requirement for a kicking strap.

The wishbone boom may be attached to the mast by the means of a pin built into the front end of each half of the boom and fitting into diametrically positioned holes in the mast. These pins are secured in place by a bungee cord (fixed to one half of the boom), tensioning a hook fixed on to the other boom half. The rear end of the boom halves may be connected by a boom joiner (a standard windsurfer item), which plugs into the open ends of the boom halves. The boom is then held in place by tension on the sail outhaul sheet.

Some embodiments of the present invention may include a "free standing rig". This rig does not normally include stays attached to the mast to stop the boom rotating around the mast. In this case if pitch poling is about to occur, the mainsheet is released and the force of the wind is directed to move the boom to the forward side of the mast, dumping wind from the sail and preventing the boat from capsizing.

In a preferred embodiment of the cockpit of the boat may be configured so as to automatically drain water from the boat. The boat may be configured so the cockpit is above the water line, and a one way valve added to the boats floor to drain water from the craft. In this configuration the boat is practically unsinkable.

It is desirable to make the boat rudder retractable, to protect it from damage if it strikes objects such as rocks or beaches.

In a preferred embodiment this is achieved by using a sliding foil which is held in place between the cheeks of a rudder stock. The foil may slide up and down between these cheeks, and is held in its correct position by a block which fits between the rear of the stock cheeks, and is secured in place by a bungee shock cord. If the rudder foil strikes a rock or a beach, the shock cord stretches and allows the force on the rudder foil to be relieved.

In a preferred embodiment rudder stock may be made from square sections of aluminium tube bent to a suitable shape, and joined at their tops and bottoms by plastic blocks.

The present invention as described provides many advantages over the prior art.

The invention provides an extremely versatile water craft. It may be easily sailed by any one with some knowledge of sailing rigs, or paddled/powered by others desiring not to use the boat's sail. The boat may seat two or more people comfortably and still have room to stow their gear.

The boat may be easily boarded by swimmers climbing onto a rounded pontoon. The trampolines afford large sitting areas and the centre cockpit allows the occupants to sit in a naturally comfortable position. There may be four or more separate buoyancy compartments offering redundancy in flotation.

There is no requirement for the sailor to be physically strong or possess special balancing skills. The craft can be used if there is no wind blowing. The design may be such that assembly and disassembly is very quick and simple and therefore does not become a burden. This will especially suit those people who have time restraints.

Including the feature of two pontoons either side of the main hull eliminates the need for a centreboard when sailing the boat. This allows the boat to be used in extremely shallow water without dragging the centreboard on the bottom.

When in its collapsed storage configuration, the boat may be easily transported on the roof rack of a vehicle, possibly with other boats of the same type on the rack. Specifically design trailers may be used to transport up to six more collapsed boats at once, in addition to any others on a towing vehicle's roof rack.

The boat may be easily launched into any body of water, from beaches or lakes, in calm water or into surf.

The invention may be stored easily, collapsing into a compact sealed unit allowing the boat to be stacked against a wall, hung from a wall, or racked underneath the roof of a structure.

Due to its compact collapsed shape and lightweight design the invention is easily transported. No trailers are required to transport the boat, a simple roof rack doing this job.

The invention exhibits a degree of flexibility in the number of uses it may be put to, and the different means of powering it allows. It may be used for an afternoon's sailing, fishing or sightseeing, the user having the choice of paddling, motoring or sailing.

BRIEF DESCRIPTION OF DRAWINGS

Further aspects of the present invention will become apparent from the following description which is given by way of example only and with reference to the accompanying drawings in which:

Figure 1 is a schematic view of one embodiment of the present invention in use;

Figure 2 a sketch of the above embodiment collapsed showing its components detached, and

Figure 3 a sketch of the above embodiment in its storage and transportation configuration, and

Figure 4 illustrates portions of the boats mast and sail showing the luff pocket in the sail as used in one embodiment, and

Figure 5 illustrates a cross-sectional view of the mast and the means used to attach a wishbone boom to the mast as used in one embodiment, and

Figure 6 illustrates the retractable rudder foil as used in one embodiment of the present invention.

BEST MODES FOR CARRYING OUT THE INVENTION

Figure 1 illustrates a boat 1 in accordance with one embodiment of the present invention in use on a body of water.

The boat 1 has a main hull 2 which is flanked on either side by pontoons, represented by hollow floats 3.

Floats 3 are attached to hull 2 with an attachment means represented by arms 4.

Powering means represented by a sailing rig (consisting of parts 5, 8 and 9) are attached to hull 2.

When the boat 1 is in use, the force of the wind, W, may push sailing rig (consisting of 5, 8 and 9) to the left and downwards. This force is countered by the buoyancy B, of pontoon 3A, which stabilises the boat 1.

Figure 2 shows all of the components of boat when detached and ready to be secured inside the central hull 2.

These components consist of two floats, 3A and 3B, main sheet 5, attachment arms 4A and 4B, detachable seating 7A and 7B, collapsible mast and boom 8, main sail 9 and rudder 10.

Figure 3 shows the boat in its collapsed configuration.

All components (not shown) are secured into hull 2 with use of sealing tarpaulin 11.

Figure 4 illustrates a section of the boats mast 41 and the boat sail 42.

The boat sail 42 includes a luff pocket 43 formed with use of a zipper attachment 44. The mast 41 may be enclosed inside the luff pocket 43 and the zipper attachment 44 used to secure the sail in place on the mast.

Figure 5 illustrates a cross-sectional view of the boats mast 51 and the means by which a wishbone boom is attached to it.

The mast 51 includes a hollow tube 52 near its centre. Engaging pins 53 may be slotted into the mast tube 52. The engaging pins 53 are attached to the front ends of either side of a wishbone boom 54.

Also attached to the front end of one side of the wishbone boom 54 is an elastic cord 55. Looped into the elastic cord 55 is a pull ring 56 which may be looped around a protrusion 57 on the opposite side of the wishbone boom 54.

In use, the wishbone boom 54 is attached to the mast 51 by firstly slotting the engaging pins 53 on either side of the wishbone boom 54 into the mast tube 52.

The pull ring 56 attached to the bungee cord 55 is then pulled onto the attachment lug 57 located on one side of the wishbone boom 54.

This attachment scheme allows the wishbone boom to be quickly and easily attached to the mast and secured in place with the pull ring 56 and bungee cord 55.

Figure 6 illustrates a retractable boat rudder as used in one embodiment of the present invention. The rudder foil 61 is sited between the cheeks 62 of a rudder stock 63.

The rudder foil 61 is held in place against one side of the rudder stock 63, and by a sliding block 64 on it's opposite side. The sliding block 64 is attached to both cheeks 62 of the rudder stock 63 with use of a number of bungee cords 65. These bungee cords allow any forces placed on the bottom of the rudder foil 61 to be transmitted through to the bungee cords 62. This allows the rudder foil 61 to move and transmit forces to the bungee cords 65, preventing the rudder foil 61 from being damaged by an impact with a solid object.

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof as defined in the appended claims.

THE CLAIMS DEFINING THE INVENTION ARE:

1. A boat including a central hull and at least one pontoon.

   wherein in use the pontoon is attached the central hull, the boat characterised in that the pontoon and central hull are configured so that the pontoon can be positioned at least partially inside the hull when the boat is not in use.

2. A boat as claimed in claim 1, wherein the hull and at least one pontoon are configured so that a pontoon is removably attached to the hull when in use.

3. A boat as claimed in claim 1, wherein the central hull is shaped as a canoe.

4. A boat as claimed in any previous claim, wherein the central hull includes a skeg.

5. A boat as claimed in any previous claim, wherein the central hull allows all the component portions of the boat to be enclosed in the central hull when the boat is not in use.

6. A boat as claimed in any previous claim, wherein the boat includes a sealing means which may fit over the open portions of the central hull.

7. A boat as claimed in claim 6 wherein the sealing means is a sheet of waterproof material.

8. A boat as claimed in any previous claim, wherein two pontoons are associated with the central hull.

9. A boat as claimed in any previous claim, wherein the boat includes a driving means to drive the boat through a body of water.

10. A boat as claimed in claim 9, wherein the driving means is a sailing rig.

11. A boat as claimed in claim 10, wherein the sailing rig is a free-standing sailing rig.

12. A boat as claimed in claim 11, wherein the free-standing sailing rig includes a wishbone boom assembly.

13. A boat as claimed in any previous claim, wherein the boat includes a seat which forms part of a mast support.

14. A boat as claimed in any previous claim, wherein the boat includes a rudder stock, which allows a rudder foil to move when the rudder foil comes in contact with a solid objection.

15. A boat as claimed in claim 14, wherein the rotor stock is constructed from metallic tubes bent to the required shape.

16. A boat as claimed in claim 15, wherein the metallic tubes used are aluminium tubes.

17. A boat as claimed in claim 10, wherein the sailing rig includes a luff pocket in a sail.

18. A boat as claimed in claim 17, wherein the luff pocket is formed by a zipper attachment which zips one edge of the sail to another portion of the sail.

19. A boat as claimed in any previous claim, wherein at least one pontoon is removably attached to the hull when in use by at least one attachment arm.

20. A boat as claimed in claim 19, wherein an attachment arm is secured to the central hull by using one or more pins passing through the arm, with these pins secured by latches.

21. A boat as claimed in any previous claim, wherein there is provided a trampoline between a pontoon and the central hull.

22. A boat as claimed in claim 21, wherein the trampolines are tensioned using at least one buckle and strap.

23. A method of storing a boat, wherein the boat consists of a central hull and one or more pontoons, the method for storing a boat characterised by the steps of:

a) disengaging the pontoon(s) from attachment to the hull, and

b) securing the pontoon(s) inside the hull.

24. A method of storing a boat as claimed in claim 23, wherein the hull and at least one pontoon are configured so that a pontoon is removably attached to the hull when in use.

25. A method of storing a boat as claimed in claim 23 or 24, wherein the central hull is shaped as a canoe.

26. A method of storing a boat as claimed in any previous claim, wherein the central hull includes a skeg.

27. A method of storing a boat as claimed in any previous claim, wherein the central hull allows all the component portions of the boat to be enclosed in the central hull when the boat is not in use.

28. A method of storing a boat as claimed in any previous claim, wherein the boat includes a sealing means which may fit over the open portions of the central hull.

29. A method of storing a boat as claimed in claim 28 wherein the sealing means is a sheet of waterproof material.

30. A method of storing a boat as claimed in any previous claim, wherein two pontoons are associated with the central hull.

31. A method of storing a boat as claimed in any previous claim, wherein the boat includes a driving means to drive the boat through a body of water.

32. A method of storing a boat as claimed in claim 31, wherein the driving means is a sailing rig.

33. A method of storing a boat as claimed in claim 32, wherein the sailing rig is a free-standing sailing rig.

34. A method of storing a boat as claimed in claim 33, wherein the free-standing sailing rig includes a wishbone boom assembly.

35. A method of storing a boat as claimed in any previous claim, wherein the boat includes a seat which forms part of a mast support.

36. A method of storing a boat as claimed in any previous claim, wherein the boat includes a rudder stock, which allows a rudder foil to move when the rudder foil comes in contact with a solid objection.

37. A method of storing a boat as claimed in claim 36, wherein the rudder stock is constructed from metallic tubes bent into the required shape.

38. A method of storing a boat as claimed in claim 36, wherein the metallic tubes used are aluminium tubes.

39. A method of storing a boat as claimed in claim 32, wherein the sailing rig includes a luff pocket in a sail.

40. A method of storing a boat as claimed in claim 39, wherein the luff pocket is formed by a zipper attachment which zips one edge of the sail to another portion of the sail.

41. A method of storing a boat as claimed in any previous claim, wherein at least one pontoon is removably attached to the hull when in use by at least one attachment arm.

42. A method of storing a boat as claimed in claim 41, wherein an attachment arm is secured to the central hull by using one or more pins passing through the arm, with these pins secured by latches.

43. A method of storing a boat as claimed in any previous claim, wherein there is provided a trampoline between a pontoon and the central hull.

44. A method of storing a boat as claimed in claim 43 wherein the trampoline is tensioned using at least one buckle and strap.

45. A method of storing a boat substantially as herein described with reference to the accompanying drawings.

46. A boat substantially as herein described with reference to the accompanying drawings.

FIG. 1

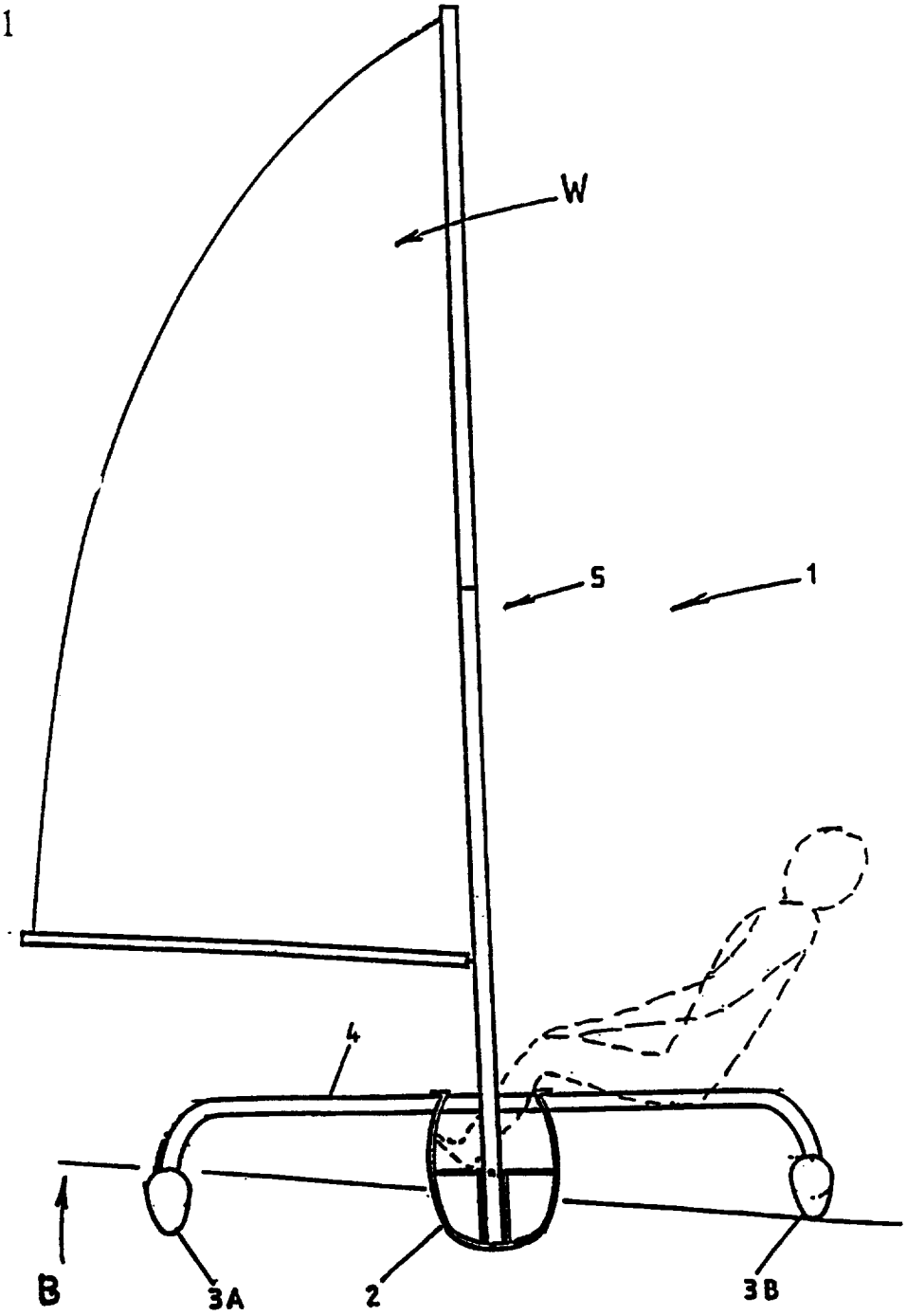
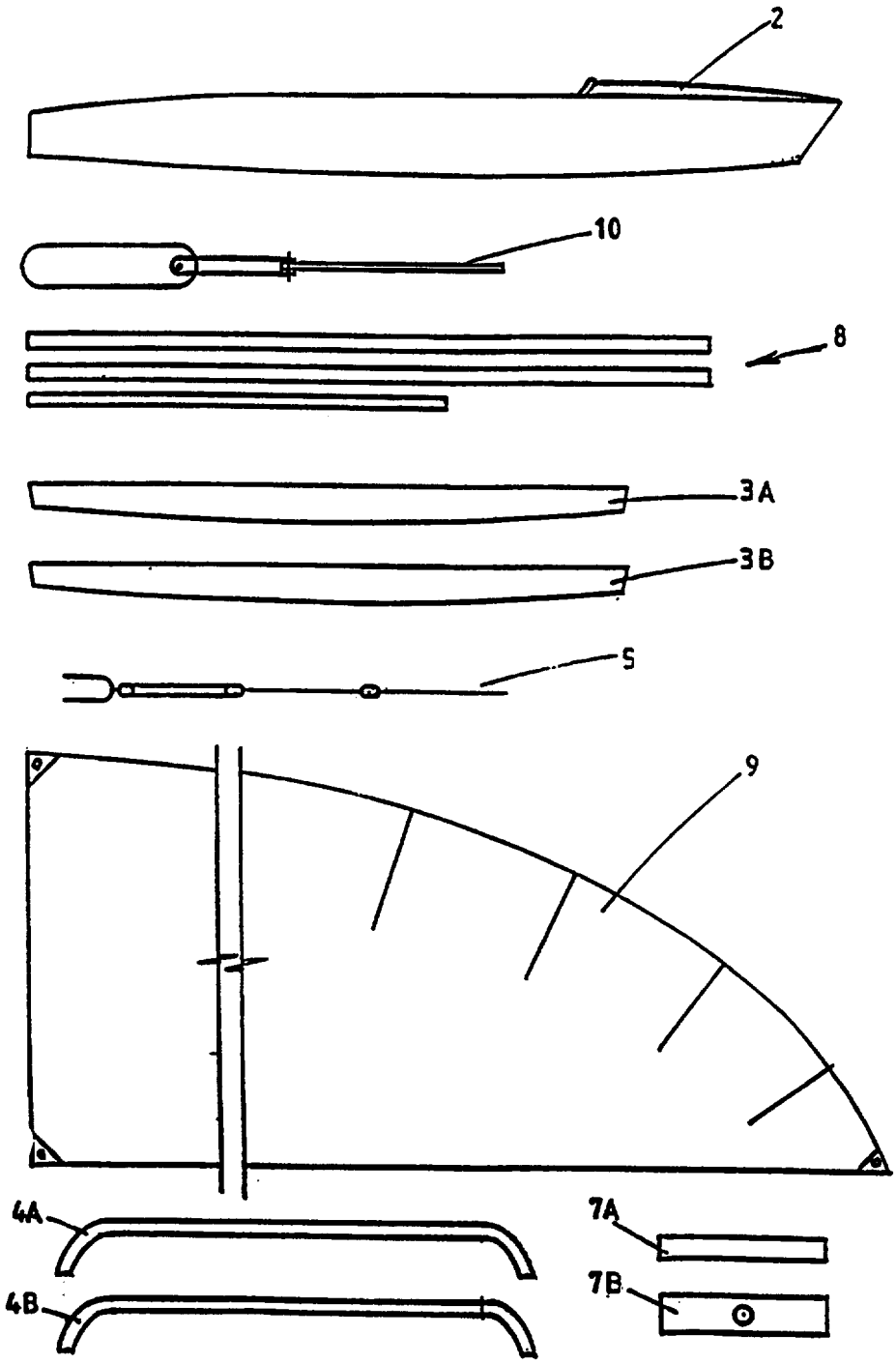


FIG. 2



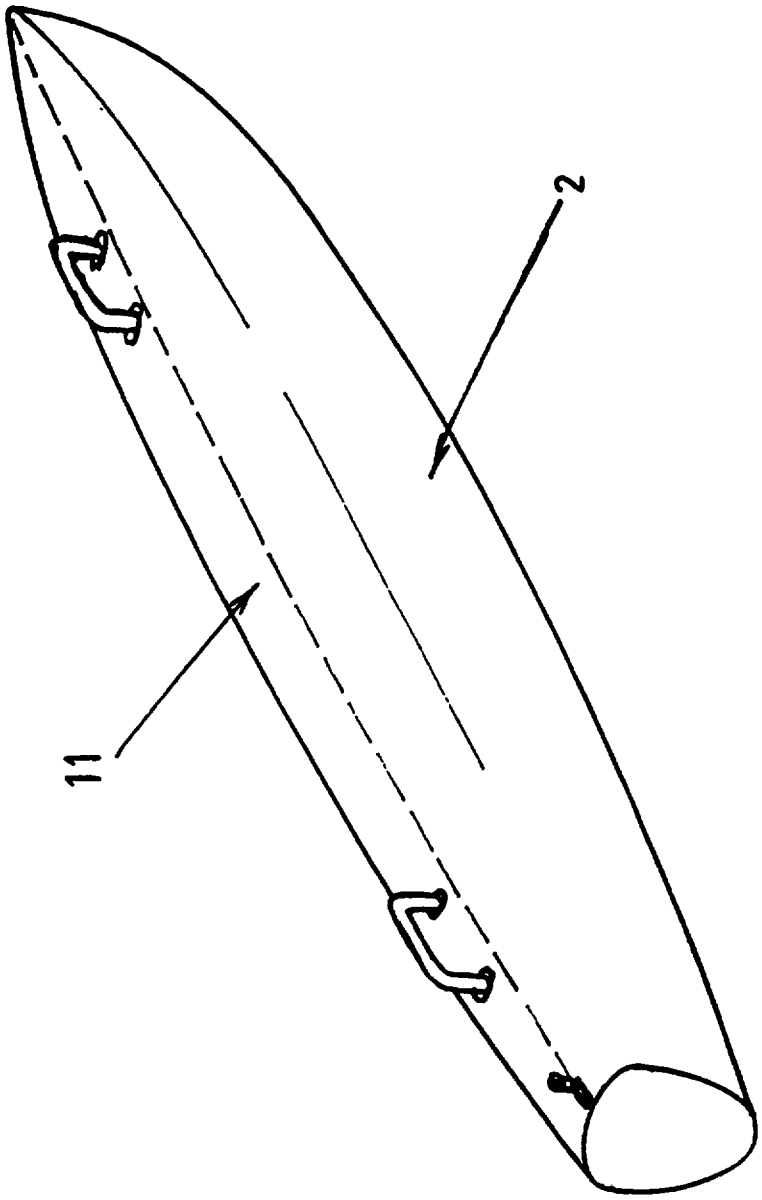


FIG. 3

FIG. 4

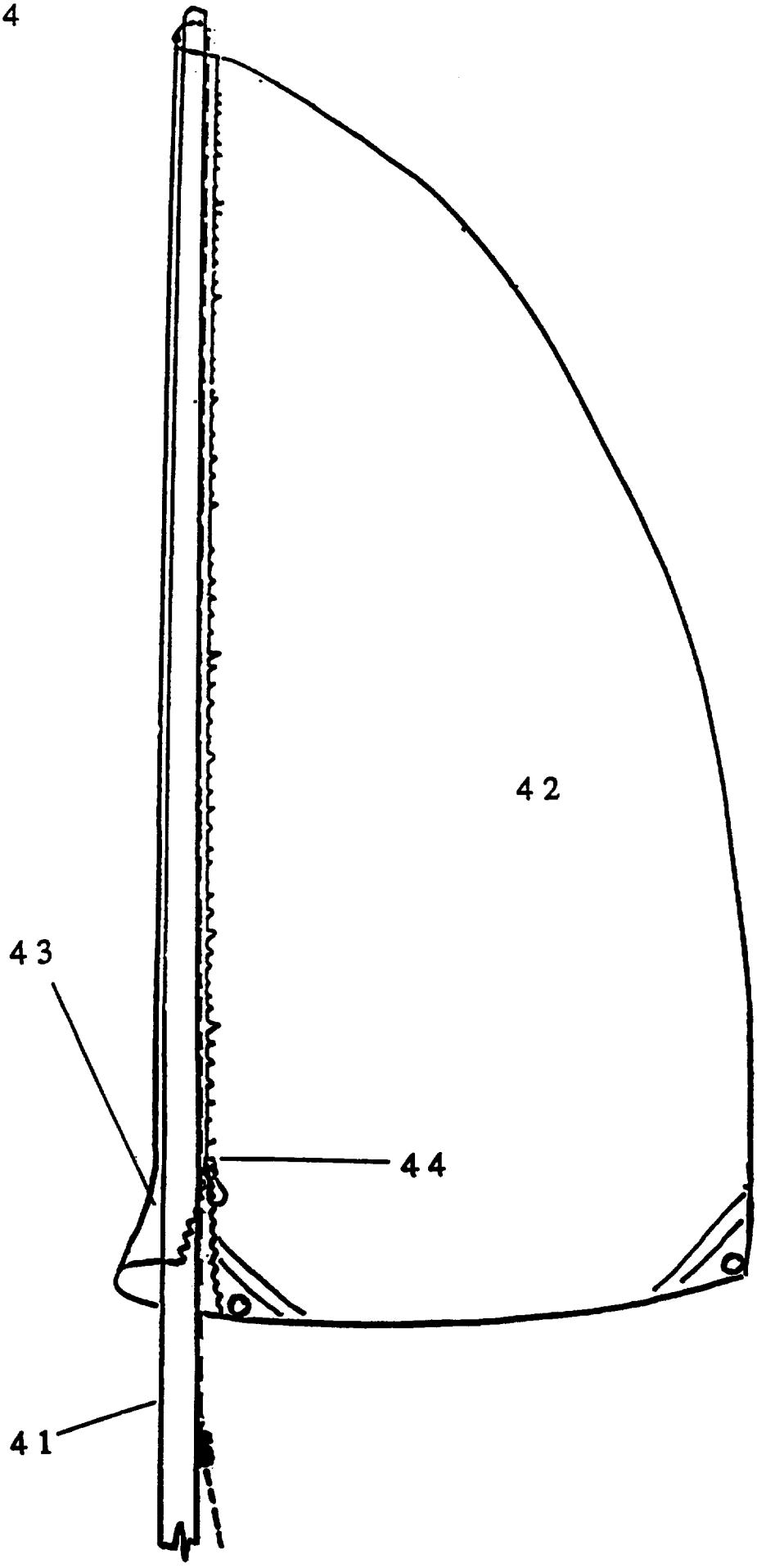
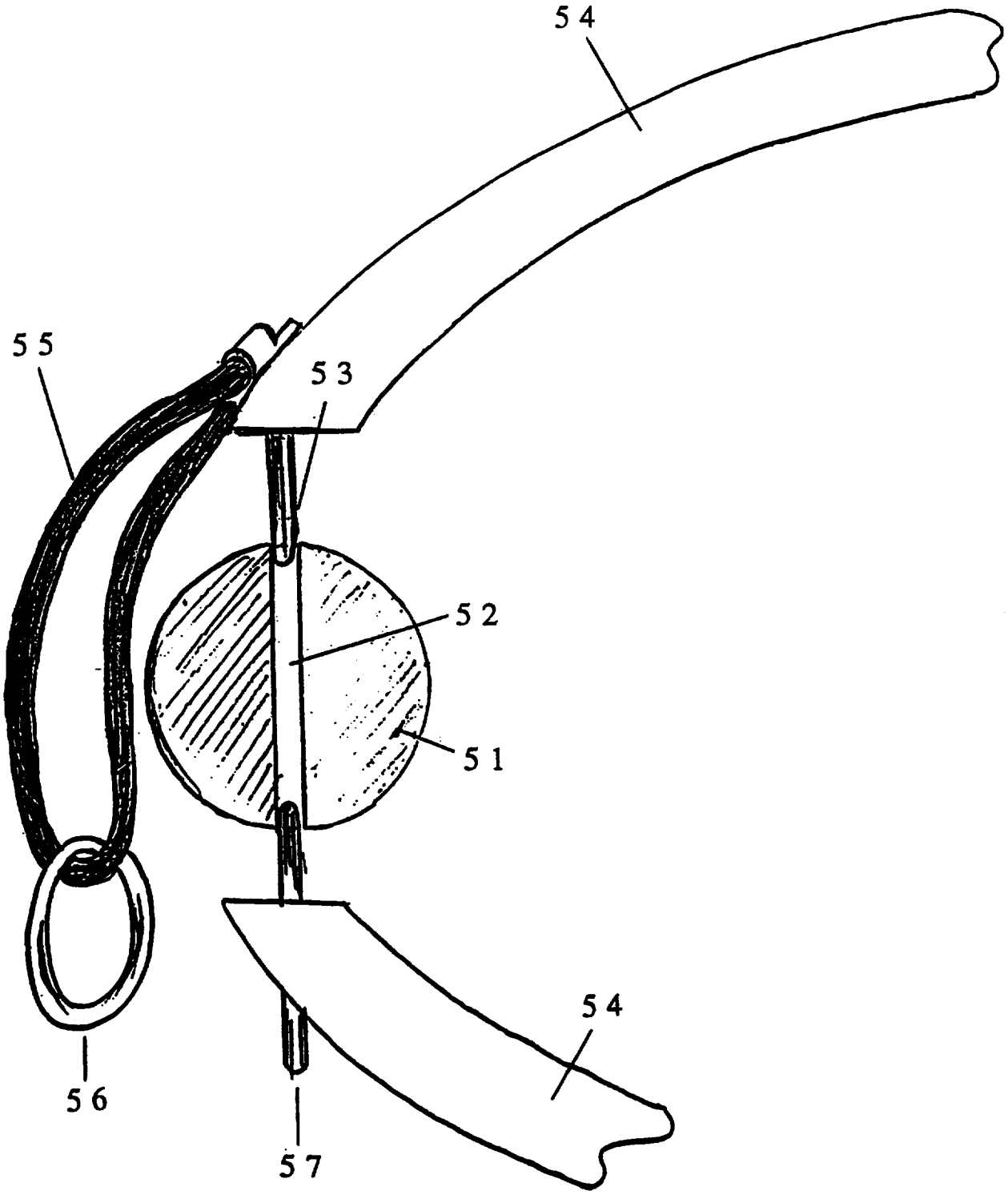


FIG. 5



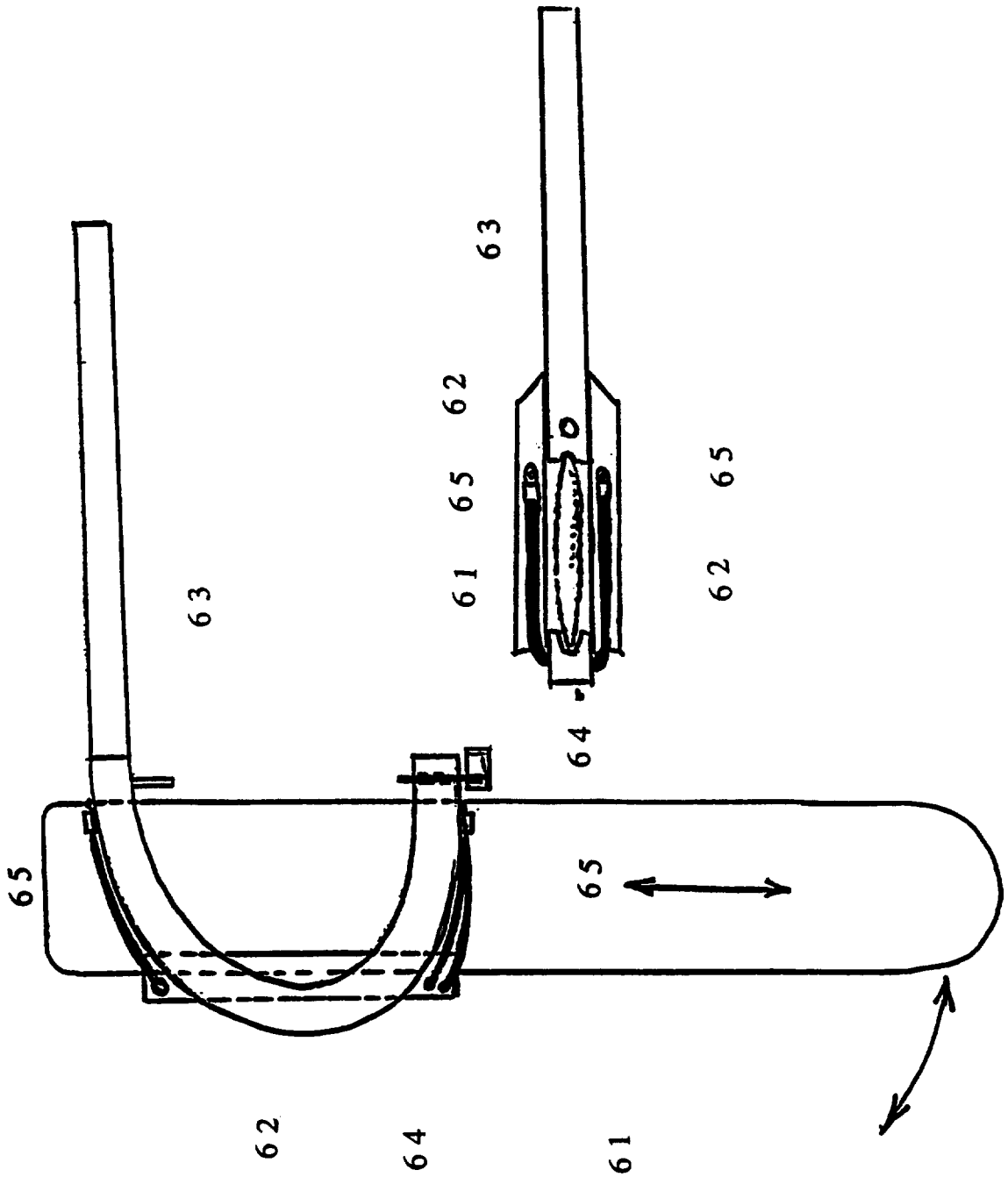


FIG. 6

INTERNATIONAL SEARCH REPORT

Interna al Application No
PCT/NZ 97/00091

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B63B7/04 B63B35/79 B63H25/38 B63B7/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B63B B63H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FR 2 567 839 A (MOURGUE ET HARDY) 24 January 1986 see the whole document --- -/--	1-6, 8-11, 13-17, 19-21, 23-28, 30-33, 35-39, 41-43, 45,46

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

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1

Date of the actual completion of the international search	Date of mailing of the international search report
3 November 1997	06 -11- 1997
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	**Authorized officer** DE SENA, A

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INTERNATIONAL SEARCH REPORT

Intern. al Application No
PCT/NZ 97/00091

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	US 5 477 804 A (CHAN) 26 December 1995 see the whole document	1-6, 8-11, 13-17, 19-21, 23-28, 30-33, 35-39, 41-43, 45,46
Y	DE 43 43 070 A (NOWAK) 22 June 1995 see page 5, left-hand column, line 53 - line 62; figures 7,8	14-16
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