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(56) Documents Cited
EP 0419888 A1 **WO 92/11179 A1**
FR 002591556 A **US 4750448 A**

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(54) Abstract Title
Boat with a rigid hull and a shaped buoyant collar

(57) A boat has a rigid hull 14 and a buoyant collar 50 where the collar is shaped such as to form a bow Fig 7a of substantially V-section. The collar may be shaped to form a substantially continuous line with the hull at the transition 56 between the collar and the hull. Aft of the bow section Fig 7b the boat may have a substantially V-section formed partly by the outer surface of the hull and partly by an outboard surface of the collar 54. The collar may be formed from a core of closed cell foam with a plastic skin and may be adhered to the outer surface of the hull.

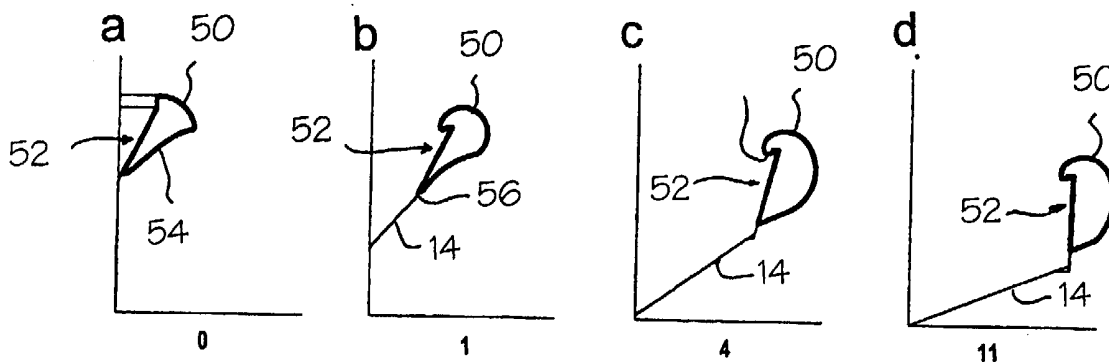


FIG.7.

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FIG.1.

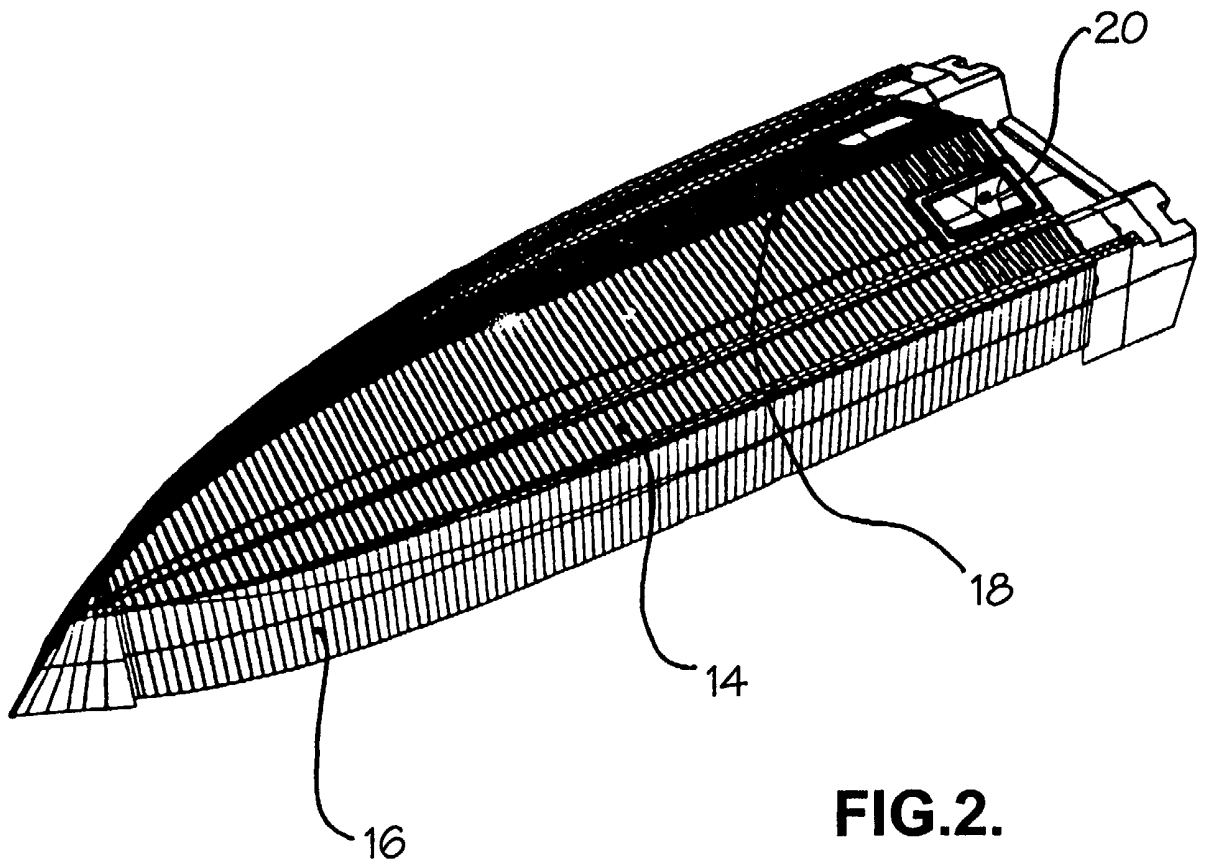
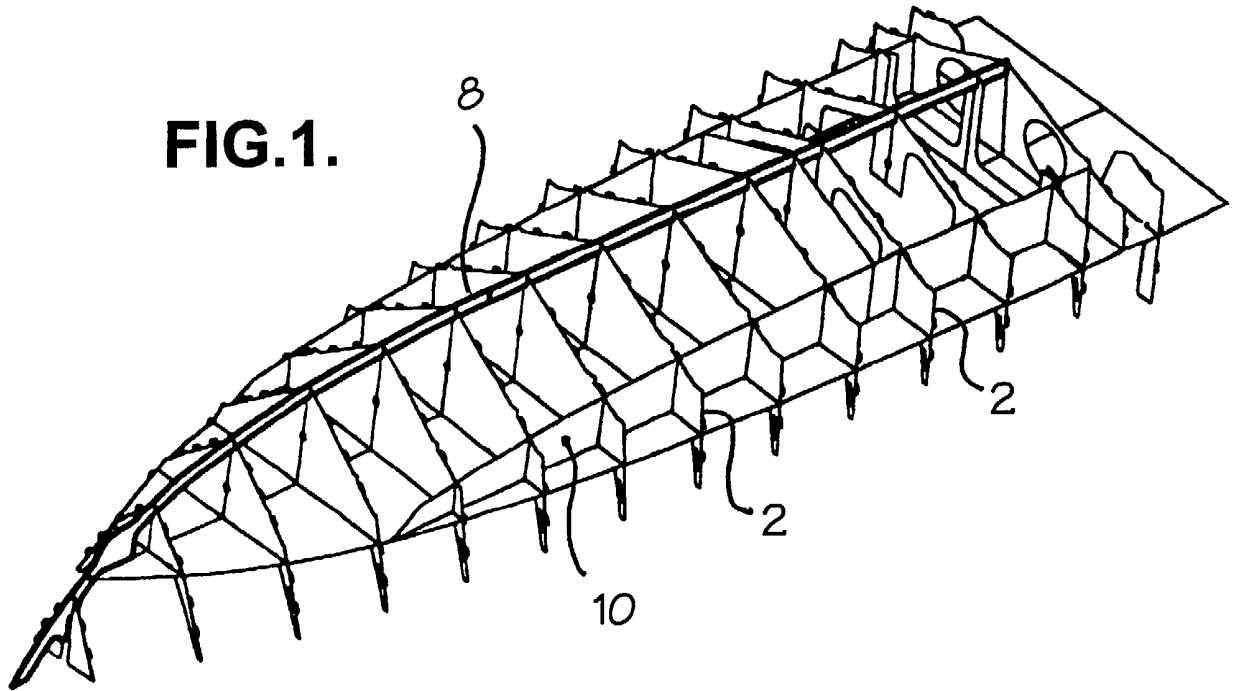


FIG.2.

FIG.3.

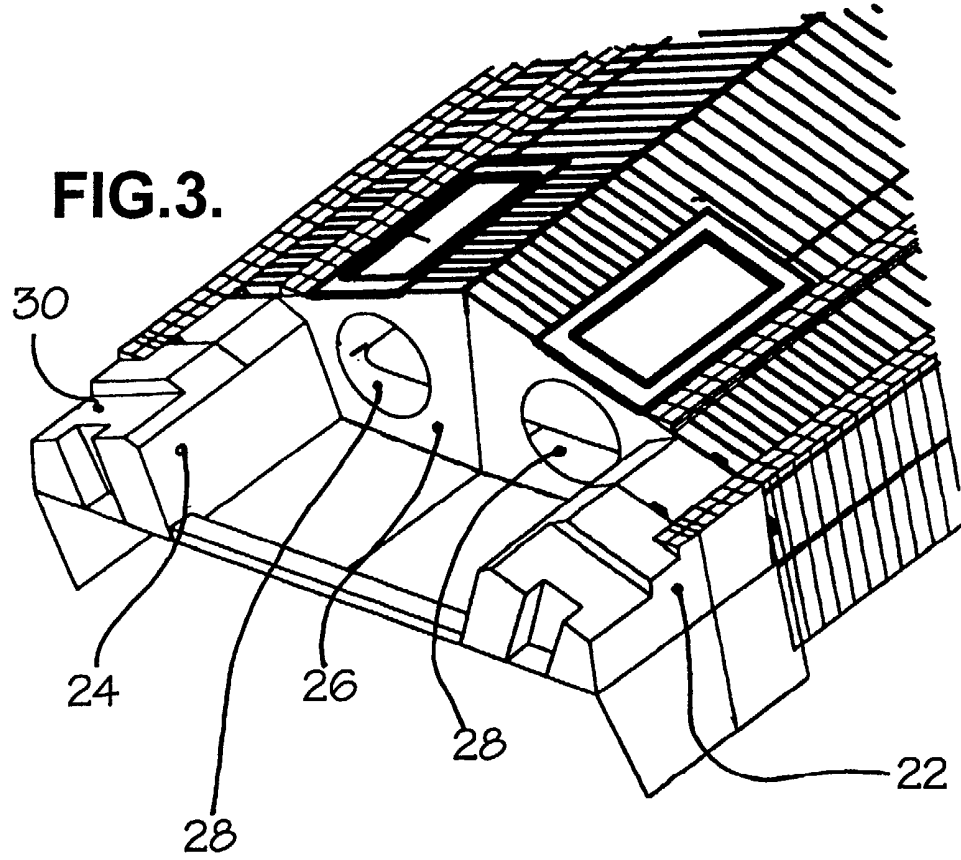
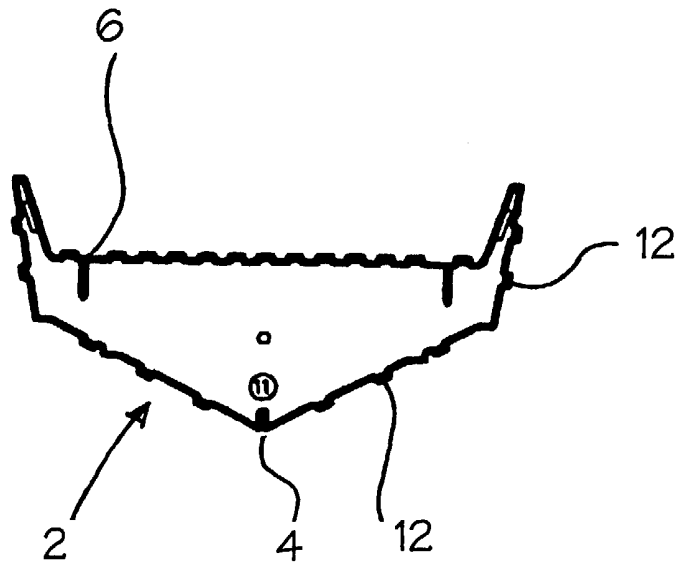


FIG.4.



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FIG.5.

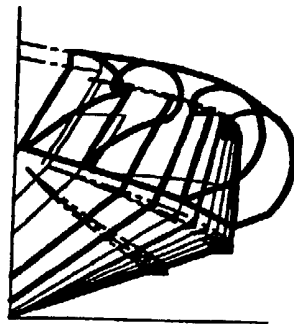
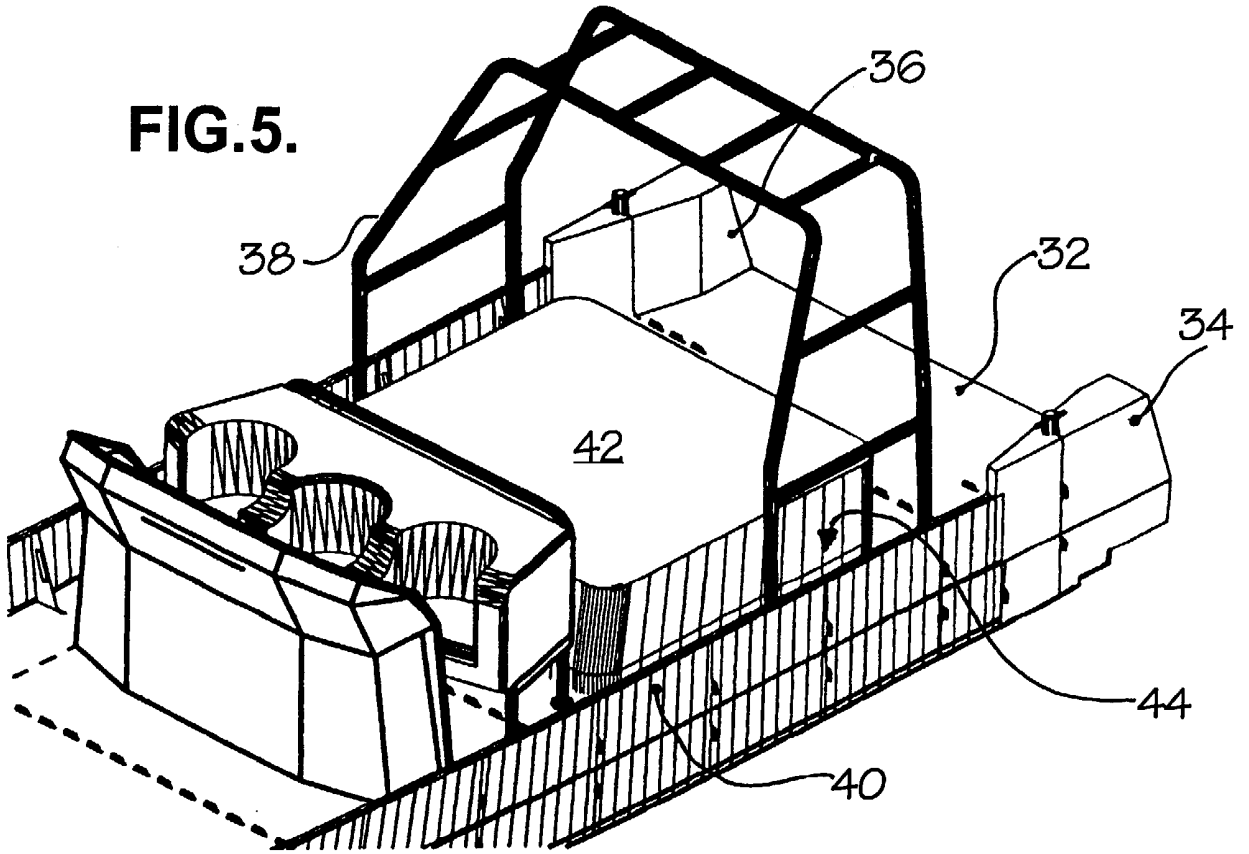


FIG.6.

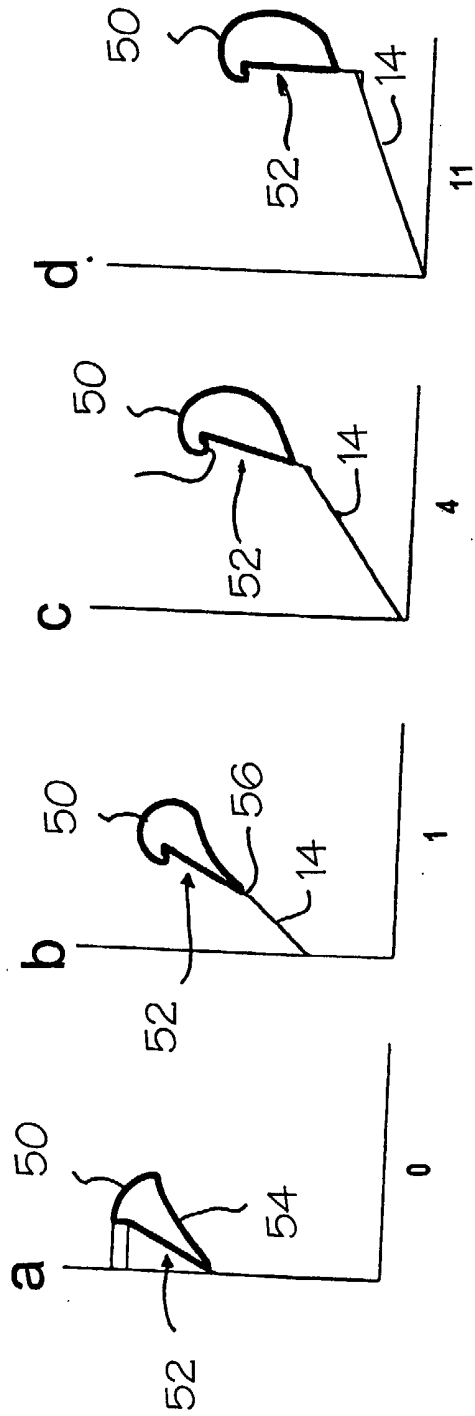


FIG.7.

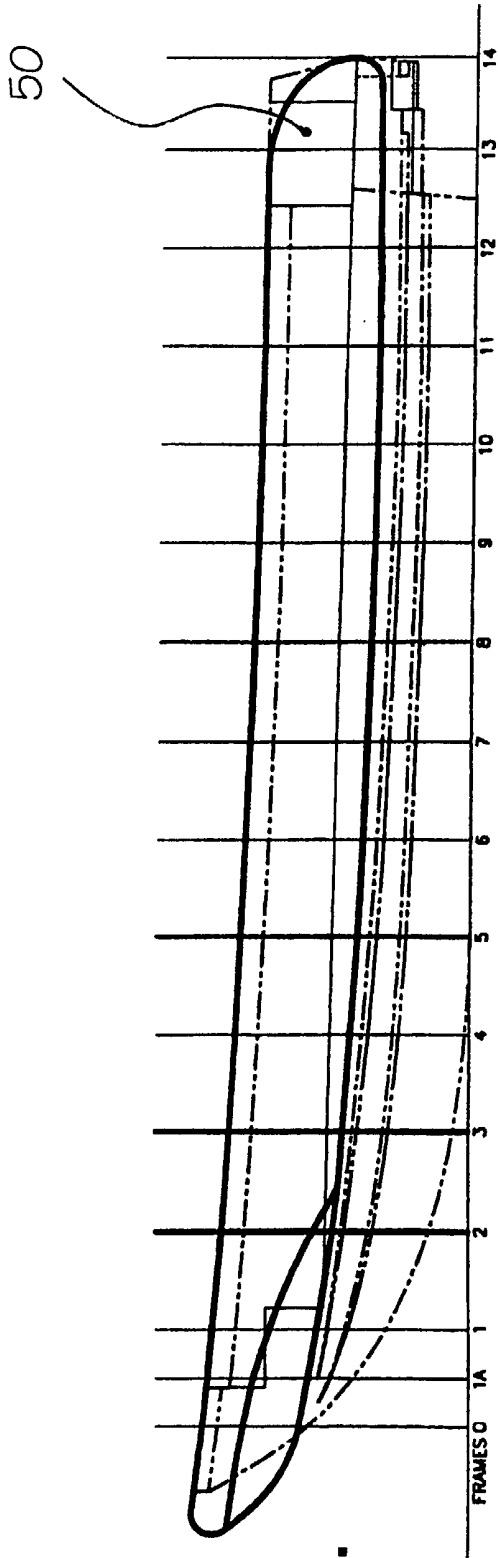


FIG. 8.

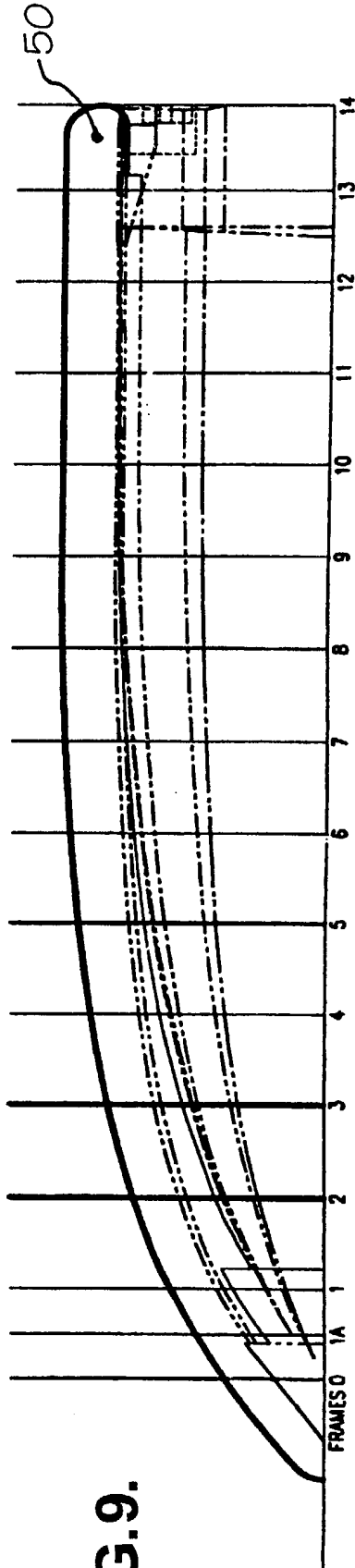


FIG. 9.

DESCRIPTIONBOAT

The present invention is concerned with boats and more specifically with boats of the type having a rigid hull provided with a buoyant collar.

A well known example of this type of boat is the R.I.B. (Rigid/Inflatable Boat). These have a hull of rigid construction plus an inflatable buoyant collar which is attached around the rigid hull's upper periphery. The inflatable collar is of generally circular section and sits atop the periphery of the hull, being secured thereto by some form of mechanical engagement.

The inflatable collar is a high maintenance item requiring periodic inspection, pressure checking and repair of any leaks.

To overcome such difficulties it is known to use instead a collar formed of closed cell foam with a polyethylene outer skin. The foam, rather than air pressure, maintains collar volume and shape. Maintenance requirements are reduced. The term R.I.B. is used to refer also to boats using such foam collars.

Unfortunately R.I.Bs using inflatable and foam collars both suffer from disadvantages in performance, particularly because of the shape resulting from the rigid hull/collar combination. Both inflatable and foam collars are conventionally of generally circular section. Typically the outer surface (lying toward the water) of the collar meets the outer surface of the rigid hull at an angle, often an internal angle. Under way, the transition between collar and rigid hull can thus effectively form a channel along which water can flow. Pressure in this region can be reduced (in a manner somewhat analogous to reduction of pressure in a venturi), the effect being

to tend to pull the boat downwardly and to make it more difficult for the hull to plane.

Furthermore the hull shape resulting from the generally circular collar atop the rigid hull is undesirably prone to slamming - bouncing up over a wave rather than slicing through it. In the extreme, this can result in a bow over stern capsize (pitch pole). It also exerts large forces on the collar, tending to detach the collar from the rigid hull, which can cause structural failure.

The present invention is intended to overcome or at least to alleviate one or more problems associated with known R.I.B.s.

In accordance with a first aspect of the present invention, there is a boat comprising a rigid hull and a buoyant peripheral collar, wherein the collar is shaped such as to form a bow of substantially "V" section.

By shaping the collar in this manner, improvements in performance are achieved as compared with the R.I.B.s described above.

The "V" section bow of the boat according to the present invention reduces slamming, enabling the boat to pierce waves and providing a softer ride. Any tendency toward bow over stern pitch poling is reduced. This formation of the collar also helps to throw spray clear of the boat.

The bow section of the collar is preferably shaped to form a substantially continuous line with the rigid hull at the transition between the collar and the rigid hull.

As compared with conventional R.I.B.s, in which the circular section collar

meets the hull in an angle, this again provides performance advantages.

The collar preferably comprises foam. More preferably, the collar comprises a plastics skin upon a core of closed cell foam.

Bow portions of the collar on both sides of the boat's longitudinal centre line preferably both have a wedge cross section. Hence together these two portions, on either side of the boat, form the required "V". The "V" section may also be partly formed by the outer surface of the rigid hull itself, between opposed portions of the collar. At the transition between the collar and the rigid hull, the shape of both is preferably such as to form a substantially continuous curve.

The outer surface of the bow portion of the collar preferably has a concave curve in cross section.

Further aft, the collar preferably has a "D" cross section. This can provide large volume for the sake of buoyancy. Additionally this large volume is rapidly immersed upon heeling of the boat when not under way, thereby assisting stability.

In an especially preferred embodiment of the present invention, the rigid hull has a hull wall a portion of which projects upwardly within the collar. Hence the collar can be seated against an outer surface of this portion of the hull wall, which allows for very robust mounting of the collar. It also proves a convenient manner of mounting a collar having a bow section according to the first aspect of the present invention.

Security of mounting of the collar to the rigid hull can be improved by providing the collar with a lip for engagement with an upper edge of the rigid hull. This lip can be such as to overhang the hull's upper edge (gunwhale).

The collar may be mounted on the rigid hull by use of adhesive. As compared with known mechanical means of mounting the collar, this can be more constructionally convenient and can facilitate replacement of sections of the collar - a damaged collar section can be removed and, after scraping away of residual adhesive from the hull, a replacement adhered in place.

Preferably the rigid hull is of egg box construction. The term is known to those skilled in the art.

At the aft of the rigid hull there are provided, in accordance with an especially preferred embodiment of the present invention, a laterally separated pair of hull extensions which are at least partly submerged in use. These provide additional buoyancy aft of the boat's normal transom position. They can be formed as buoyancy chambers projecting aft from a bulkhead.

Preferably a propulsion outlet is disposed between the hull extensions. Hence the outlet is protected to some degree by the extensions, and the centre of buoyancy can be moved aft relative to the propulsion unit.

It is particularly preferred that the hull extensions are shaped to provide dynamic lift. This is advantageous in preventing the bow angle from increasing excessively during the transition to full planing.

The hull extensions may have respective trim tabs. Trim tabs can be used to help keep the bow down in heavy seas and to trim the boat under a cross wind or uneven loading.

The boat preferably has an aft recovery platform. The platform preferably takes the form of an aft area of deck close to water level. This provides an area for

the crew to work on, especially when for example recovering people or equipment from the water. In embodiments also having aft hull extensions, these can provide buoyant support to the platform, which is preferably disposed above the hull extensions. In this way submersion of the platform, eg due to loading with weight during recovery of people or equipment from the water, can be resisted.

In accordance with a second aspect of the present invention there is a boat comprising a rigid hull and a buoyant peripheral collar, wherein the collar is adhered to an outer surface of the hull.

The outer surface of the hull to which the collar is adhered is preferably formed by a hull wall portion within the collar.

The boat according to the second aspect of the present invention may have any of the preferred features described with reference to the first aspect.

In accordance with a third aspect of the present invention, there is a boat comprising a rigid hull and a buoyant peripheral collar, wherein the outer surface of the collar forms, at least in the bow region, a substantially continuous line with the outer surface of the rigid hull.

A specific embodiment of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig. 1 illustrates in perspective and from beneath the bulkheads and spine of the rigid hull of a boat embodying the present invention, the hull's exterior skin being omitted;

Fig. 2 is a corresponding view of the rigid hull, this time with its exterior skin in place;

Fig. 3 illustrates in perspective, from aft and beneath, the aft portion of the rigid hull;

Fig. 4 is a plan view of a bulkhead used in the rigid hull;

Fig. 5 illustrates, in perspective and from above, an aft portion of the rear of the boat;

Fig. 6 illustrates, from the front, the section of the rigid hull and of the collar at several stations along the length of the boat;

Figs. 7 a - d separately and respectively illustrate corresponding stations; and

Figs. 8 and 9 illustrate, from the side and from above respectively, the lines of the rigid hull/collar combination.

The construction of the rigid hull will be described first of all, with reference to Figs. 1 to 5. The collar is omitted from these drawings.

The egg box construction of the rigid hull can be appreciated from Figs. 1 and 4 in particular. Bulkheads 2, one example of which is illustrated in Fig. 4, are formed with slots such as 4 and 6 to interlock with correspondingly slotted longitudinal members 8 and 10 forming the spine of the hull. The bulkheads and portions of the spine are formed with projections 12 for receipt in correspondingly formed openings in the rigid hull's exterior skin 14 (Fig. 2). Hence the entire construction slots together. After welding the projections 12 can be faired with the hull exterior.

The major hull components can be plasma cut from aluminium sheet.

The rigid hull shape is best appreciated with reference to Fig. 2. A seating surface 16 extends around the hull for receiving the collar (to be described below). The hull's longitudinally extending centre portion forms a "V" section 18 which is deep (i.e. has an acute angle) toward the bow. The "V" section becomes shallower (approximately a 10 degree "V" angle) toward the stern, giving extra dynamic lift in this region to compensate for negative lift at intakes 20 of the boat's "jet" propulsion.

Fig. 3 most clearly shows two hull extensions 22, 24 extending backwardly from the region of an underwater transom plate 26 through which are formed outputs 28 of the "jet" propulsion. The hull extensions are formed as buoyant chambers. Their lowest and outermost surfaces are continuous with the adjacent surfaces of the rigid hull. The hull extensions are laterally separated such that the propulsion outlets 28 can be accommodated therebetween.

Trim tabs (not shown) may be mounted upon respective lower surfaces 30 of the hull extensions 22, 24.

Turning now to Fig. 5, it can be seen that the boat has an aft recovery platform 32 disposed above and between the hull extensions 22, 24. The boat has an open transom so that a man overboard can be recovered on to the aft of the recovery platform without the need to raise him (or her) over transom or gunwhale. The buoyancy contributed by the hull extensions 22, 24 helps to keep the recovery platform 32 above water level even when loaded. Furthermore, it can be seen that the hull extensions 22, 24 beneath the water line lead to buoyant chambers 34, 36 above the waterline, providing extra aft buoyancy in the event that the aft of the boat is submerged.

An "A" frame 38 is provided just forward of the recovery platform.

The open transom configuration of the boat allows any water which is shipped to rapidly escape at the stern. Between hull wall 40 and a deck house 42 are formed passages in regions 44 allowing water to flow aft along the deck to reach the stern and so flow away.

Seating for three persons is provided at 46, behind an instrument console 48.

Turning now to Figs. 6 to 9, the collar 50 will be described.

Figs. 7 a - d show most clearly the mode of attachment of the collar 50 to the rigid hull, and also the changing cross section of the collar. As has been mentioned above, the collar is mounted on a seating surface 16 of the rigid hull. To this end the collar has a corresponding seating surface 52. The two surfaces are glued together to mount the collar 50 upon the rigid hull. Security of mounting of the collar 50 upon the rigid hull is improved by an inwardly turned lip 51 which embraces the gunwhale of the rigid hull.

Fig. 7a shows the collar cross section at front station 0 (note that the numbering of stations in Fig. 7 corresponds to the numbering of stations 0-14 in Figs. 8 and 9, which are the longitudinal positions of bulkheads of the rigid hull). In this region the collar 50 has a wedge section, broader at the top than at the bottom. Its outer face 54 is a slightly concave curve, steeply angled to the horizontal so that portions of the collar on either side of the boat together present a deep "V" section to water through which the boat moves. The advantages of this shape, as compared with the round section collar of conventional R.I.B.s, have been explained above.

Slightly further aft at station 1 (Fig. 7b) it can be seen that the "V" section is

formed not only by the collar but also by the skin 14 of the rigid hull between opposed portions of the collar. The shape of the collar 50 in this region is such that at the transition 56 between the collar and the rigid hull a substantially continuous line is formed.

Still further aft at stations 4 and 11 the collar is seen to have a more bulbous "D" section, providing large volume.

As well as the hydrodynamic advantages resulting from the "V" section formed by the collar and by the rigid hull, the illustrated formation of the collar provides the following advantageous features:

- a. large volume is submerged rapidly as the boat heels at rest, improving stability;
- b. dynamic lift is provided when the boat is under way and heavily loaded;
- c. the curved lip, curving over the rigid hull's gunwhale, gives padding and protection.

The illustrated collar 50 is manufactured from closed cell foam - polyethylene foam is most suitable. Typically 6 laminates of foam sheet are used. These are cut to shape then glued up in sections roughly 1.5 metres long. The laminates are vertical. The collar is sprayed with suitable plastics - e.g. polyurethane - to form an exterior skin which, depending on customer requirements, can be as much as 18 mm thick. Along the length of the collar are several such 1.5 metre sections. Where adjacent sections meet they interlock in a male/female manner and are also glued together. Any slight gaps between two adjacent sections are filled.

CLAIMS

1. A boat comprising a rigid hull and a buoyant peripheral collar, wherein the collar is shaped such as to form a bow of substantially "V" section.
2. A boat as claimed in claim 1, wherein a bow section of the collar is shaped to form a substantially continuous line with the hull at the transition between the collar and the hull.
3. A boat as claimed in claim 1 or claim 2, wherein the collar comprises foam.
4. A boat as claimed in claim 3, wherein the collar comprises a plastics skin upon a core of closed cell foam.
5. A boat as claimed in any of the preceding claims, wherein bow portions of the collar on both sides of a longitudinal centre line of the boat have a wedge cross section.
6. A boat as claimed in any of claims 1 to 5, wherein, aft of the bow section, the boat has a substantially "V section" which is partly formed by the outer surface of the rigid hull and partly by an outboard surface of the collar.
7. A boat as claimed in claim 6, wherein at the transition between the collar and the hull, the shapes of the collar and hull are such as to form a substantially continuous smooth curve therebetween.
8. A boat as claimed in any of claims 1 to 6, wherein the outer surface of the bow portion of the collar has a concave curve in cross-section.
9. A boat as claimed in any of claims 1 to 8, wherein an aft portion of the collar has a "D" cross-section.

10. A boat as claimed in any of claims 1 to 9, wherein the rigid hull has a hull wall, a portion of which projects upwardly within the collar.

11. A boat as claimed in any of claims 1 to 10, wherein the collar is provided with a lip for engagement with an upper edge of the rigid hull.

12. A boat as claimed in claim 11, wherein the lip overhangs the upper edge (gunwhale) of the hull.

13. A boat as claimed in any of claims 1 to 12 wherein the collar is mounted on the rigid hull by means of an adhesive.

14. A boat as claimed in any of claims 1 to 13 wherein the rigid hull is of "egg box" construction.

15. A boat as claimed in any of claims 1 to 14, wherein, at the aft end of the hull, there is provided a laterally separated pair of hull extensions which are arranged to be partly submerged in use.

16. A boat as claimed in claim 15, wherein the hull extensions are formed as buoyancy chambers projecting aft from a bulkhead.

17. A boat as claimed in claim 16, wherein a propulsion outlet is disposed between the hull extensions.

18. A boat as claimed in claim 17, wherein the hull extensions are shaped to provide dynamic lift.

19. A boat as claimed in claim 16, 17 or 18, wherein the hull extensions carry respective trim tabs.

20. A boat as claimed in any of claims 1 to 19 wherein the hull has an aft recovery platform.

21. A boat comprising a rigid hull and a buoyant peripheral collar, wherein the outer surface of the collar forms, at least in the bow region, a substantially continuous line at its transition with the outer surface of the rigid hull.

22. A boat comprising a rigid hull and a buoyant peripheral collar, wherein the collar is adhered to an outer surface of the hull.

23. A boat substantially as hereinbefore described, with reference to and as illustrated in the accompanying drawings.



INVESTOR IN PEOPLE

Application No: GB 0015202.5
Claims searched: 1 to 20

Examiner: Richard Collins
Date of search: 18 April 2001

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): B7A ADN.

Int Cl (Ed.7): B63B 7/02, 7/06, 7/08.

Other: Online EPODOC, JAPIO WPI.

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	US 4750448 A (HENNEBUTTE) see figures 1 and 4.	-

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.



Application No: GB 0015202.5
 Claims searched: 22

Examiner: Richard Collins
 Date of search: 18 April 2001

Patents Act 1977
Further Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): B7A ADN.

Int Cl (Ed.7): B63B 7/02, 7/06, 7/08.

Other: Online EPODOC, JAPIO WPI.

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0419888 A1 (WIKING SCHLAUCHBOOT) see adhesive surface 2 in figure.	22
X	WO 92/11179 A1 (HARMAN) see adhesive tape in figures and abstract	22
X	FR 2591556 A (FOMBELLE) see figures and abstract.	22

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.