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B63H 5/08

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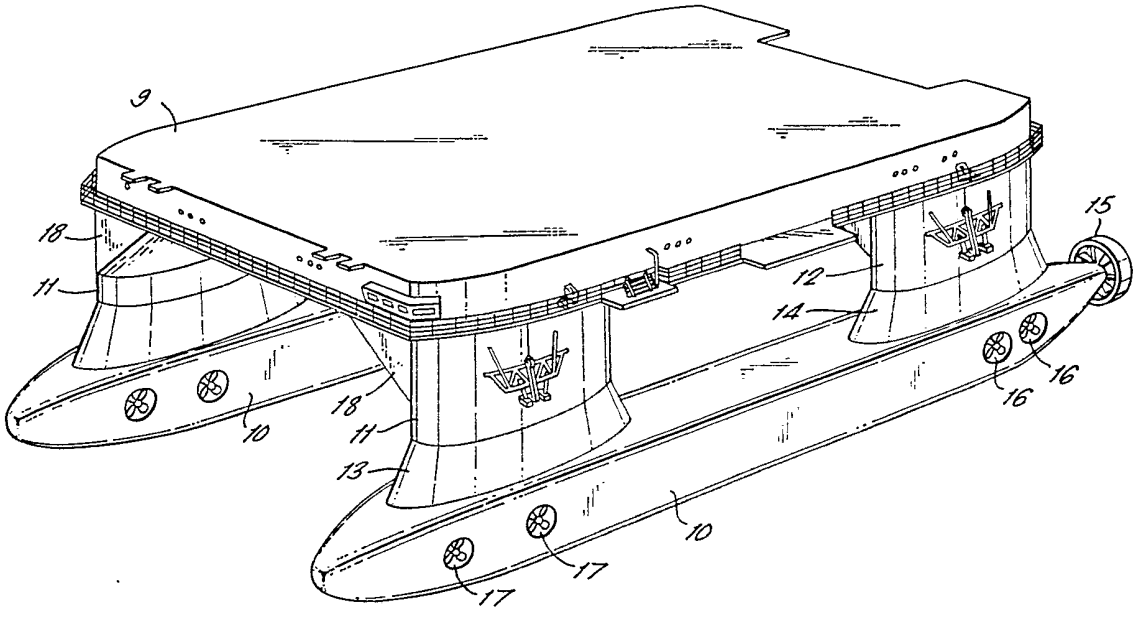
GB 1438916
GB 1277494
GB 1260831
GB 1035275

(58) Field of search
B7A
B7V

(54) Multi-hulled vessel

(57) The disclosure relates to a multi-hulled vessel having two submerged streamlined pontoons (10) extending parallel to one another having propulsion units (15, 17) and each having two upstanding structural columns (11, 12) supporting a deck (9) carrying a payload above the water surface. The normal vessel waterline extends through the columns which are of streamlined and preferably are of elliptical cross-section to minimise fore and aft and also transverse drag.

FIG. 1.



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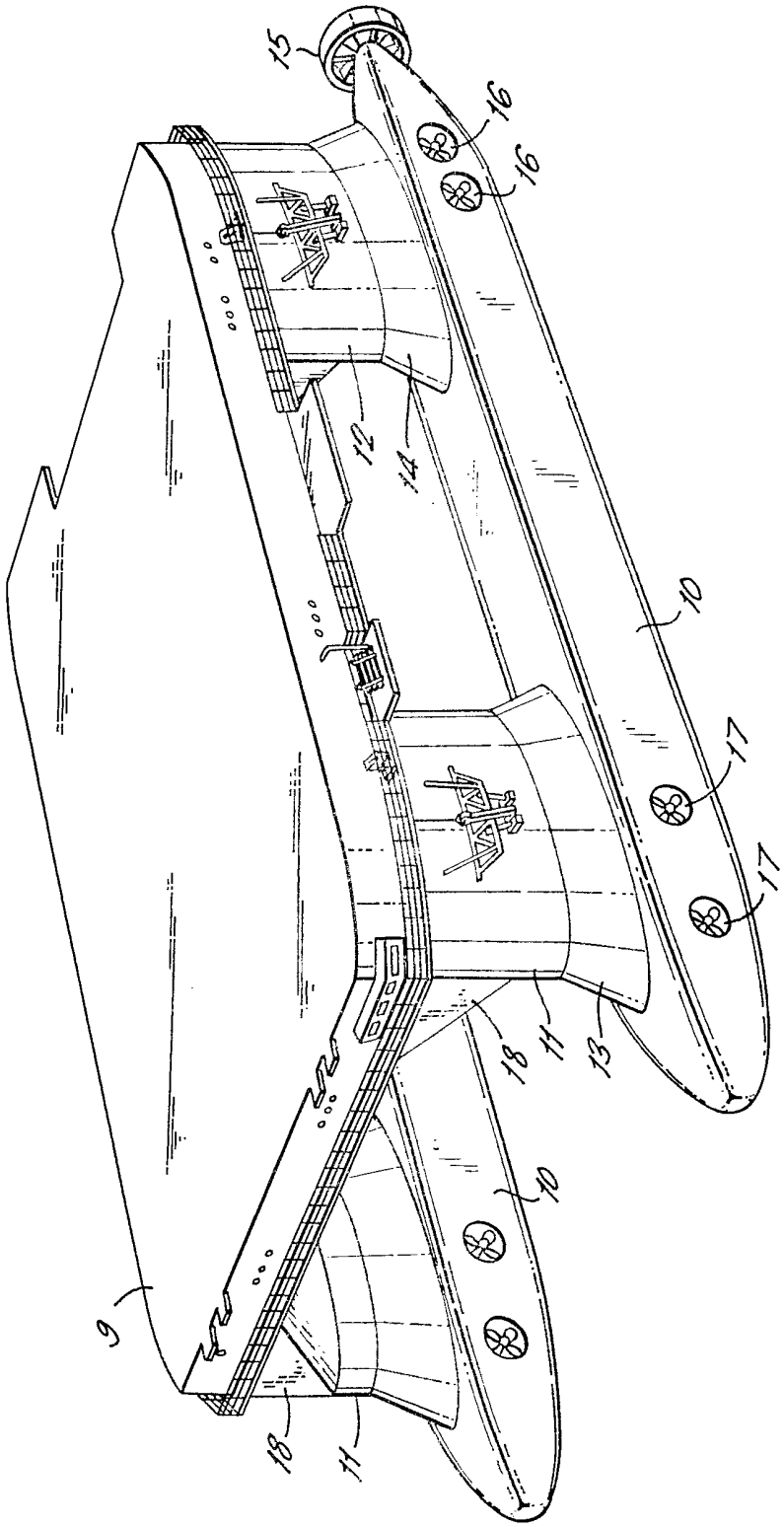


FIG. 1.

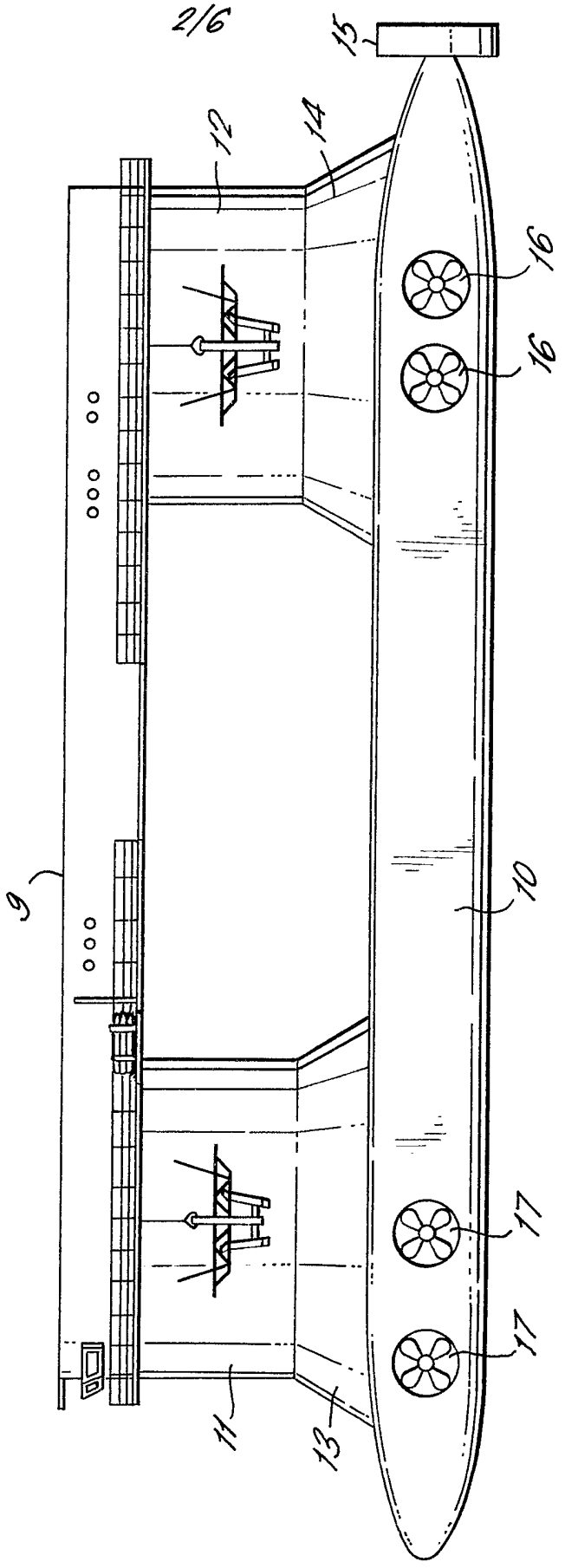


FIG. 2.

FIG. 3.

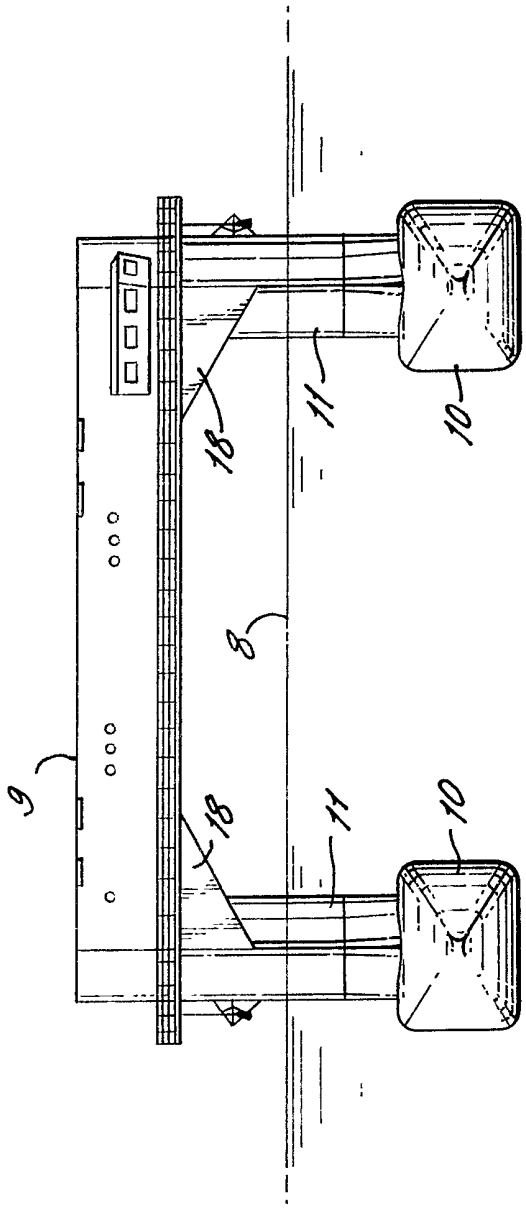
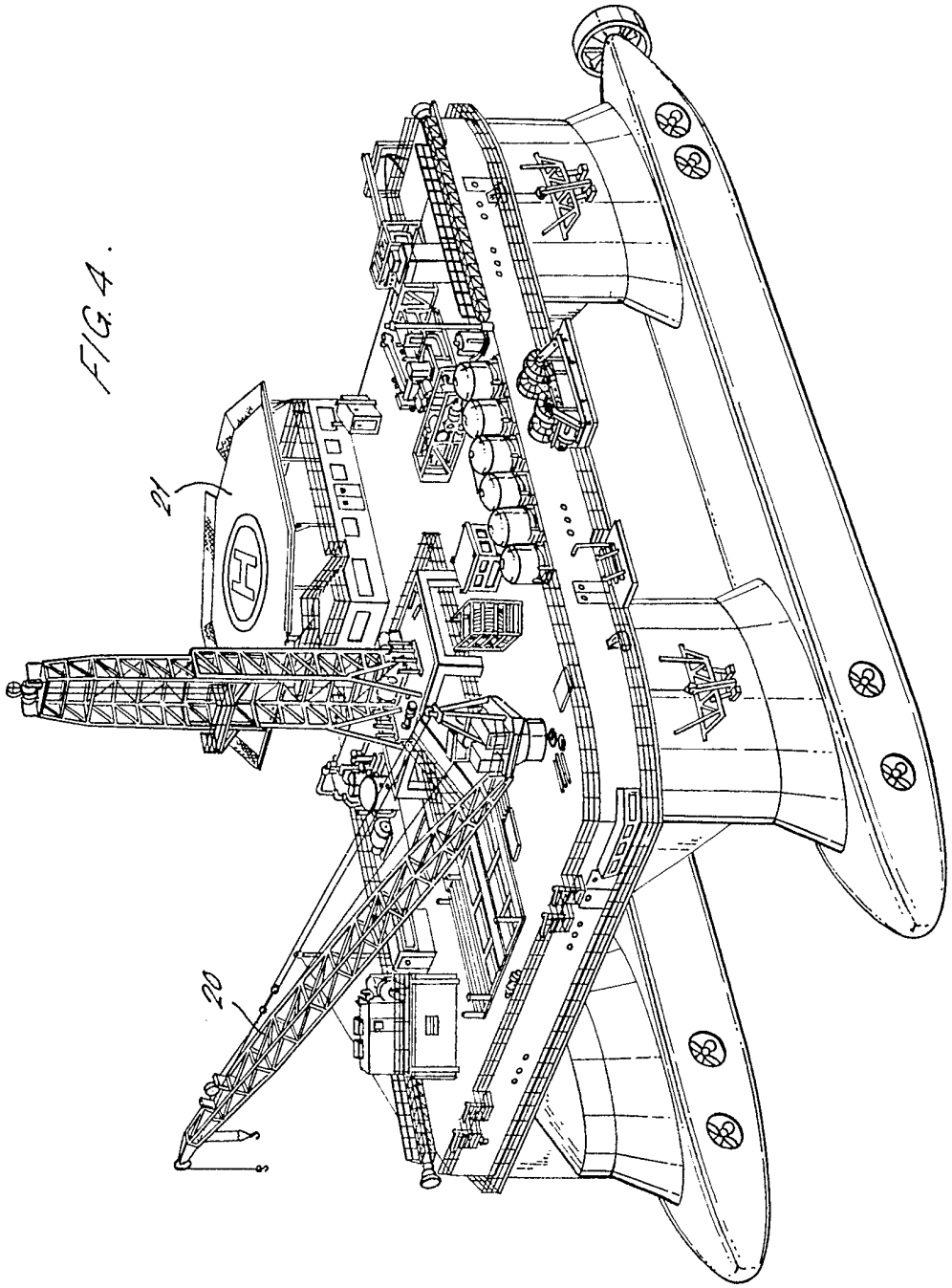


FIG.4.



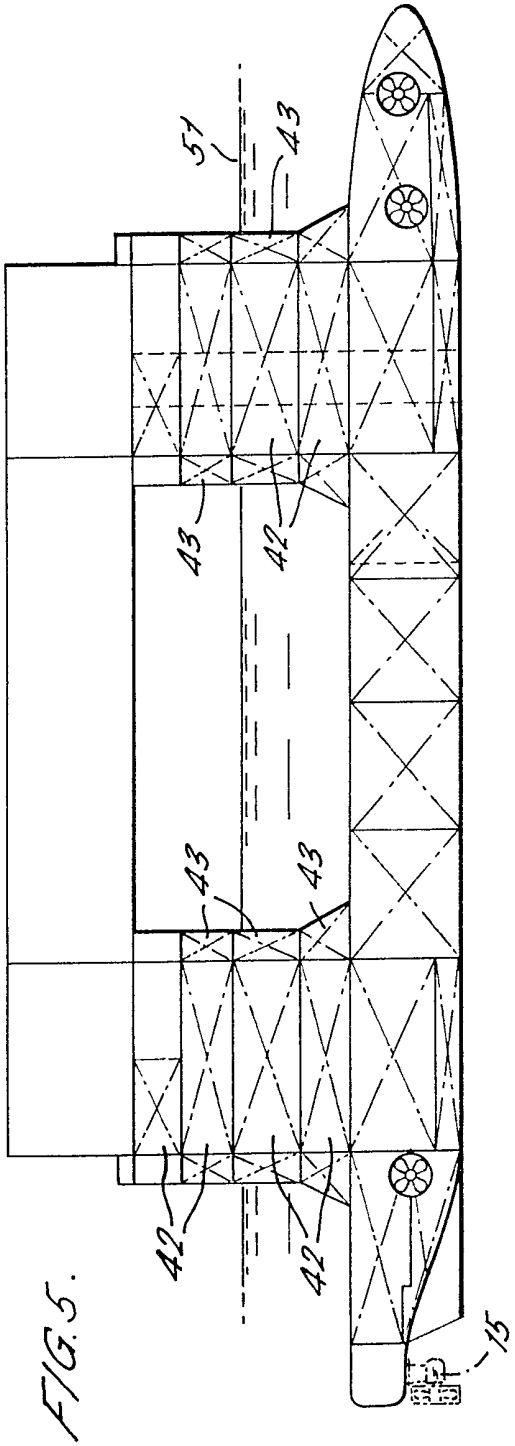

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FIG. 5.

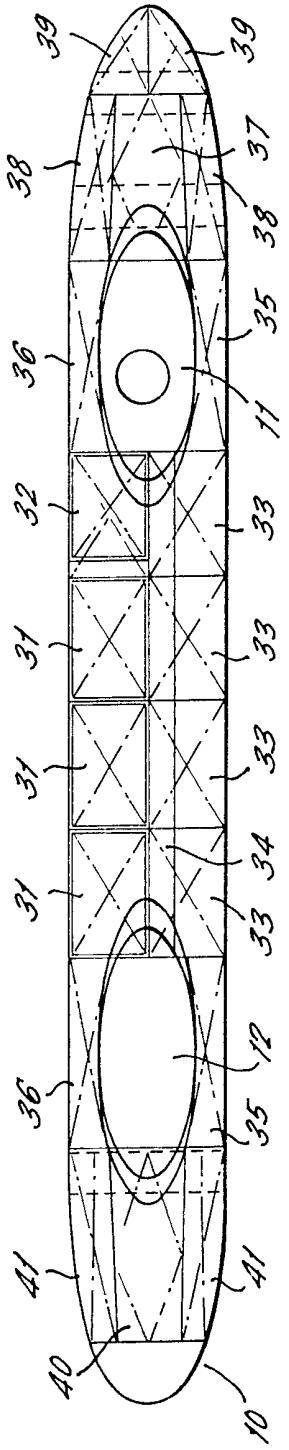
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FIG. 6.

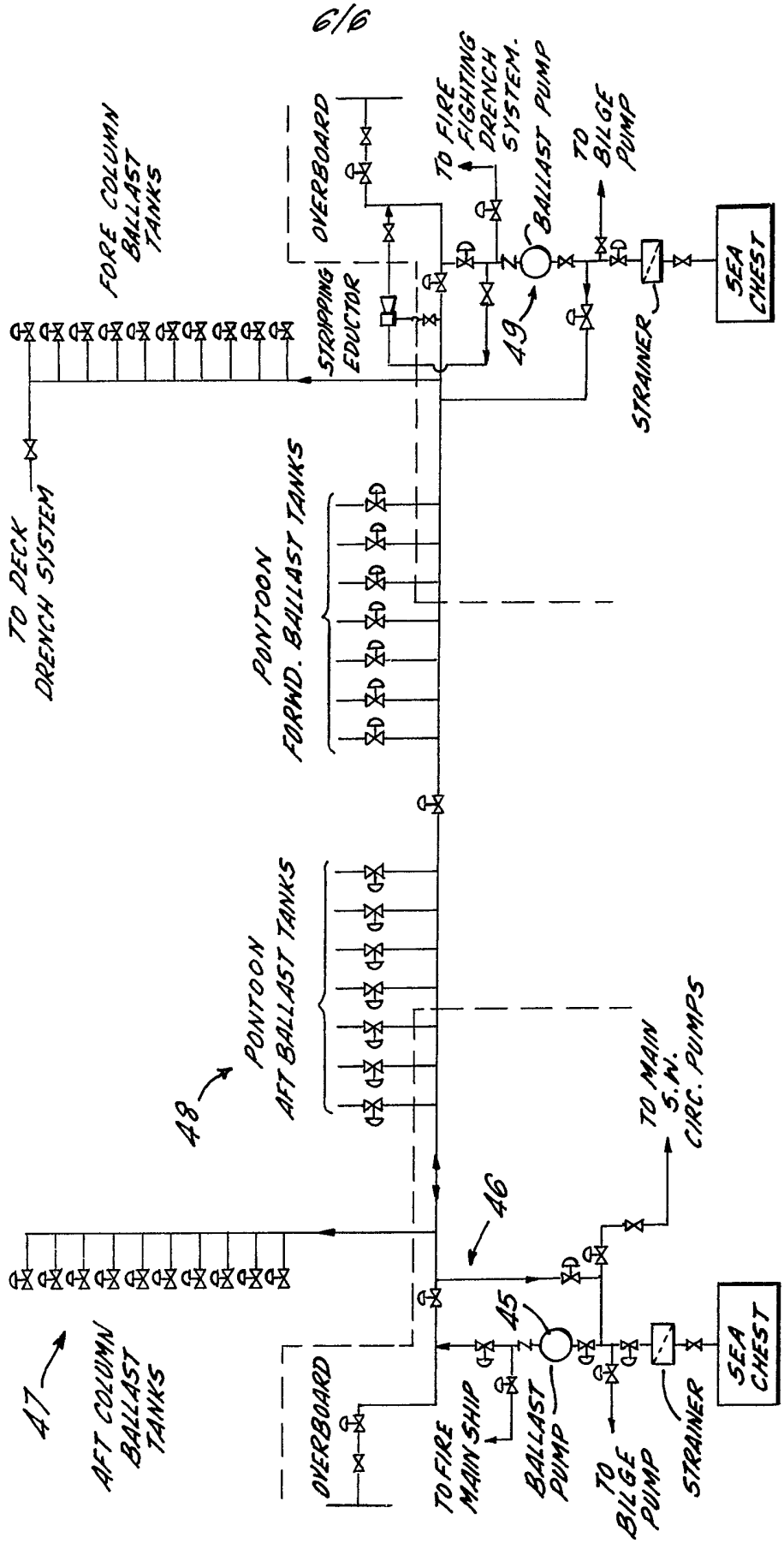
FORE COLUMN BALLAST TANKS
OVERBOARD
TO FIRE FIGHTING DRENCH SYSTEM.
BALLAST PUMP
TO BILGE PUMP
STRIPPING EDUCTOR
49
STRAINER
SEA CHEST
TO DECK DRENCH SYSTEM
PONTOON FORWD. BALLAST TANKS
PONTOON AFT BALLAST TANKS
48
TO MAIN S.W. CIRC. PUMPS
46
47
AFT COLUMN BALLAST TANKS
OVERBOARD
TO FIRE MAIN SHIP
45
BALLAST PUMP
TO BILGE PUMP
STRAINER
SEA CHEST

FIG. 7.

SPECIFICATION

Multi-hulled vessel

This invention relates to multi-hulled vessels and is particularly although not exclusively applicable to vessels known as semi-submersibles in which a deck for carrying a pay-load is mounted on columns extending upwardly from normally submerged pontoons or hulls. Conventionally such vessels do not have self-propulsion means to propel the vessel at any reasonable transit speed and the structure inter-connecting the columns, hulls and deck is such as to cause considerable drag when they are moved from place to place. As a result such vessels can normally only be moved very slowly. Further, it is normal for the pontoons of such vessels to be de-ballasted to ride on the surface during movement from place to place.

U.S.Patent Specification Nos: 370123, 3830178, 3897744 and 4440103, disclose semi-submersibles of the type referred to above but adapted for high-speed operation. The vessels utilise lenticular form columns to minimise forward resistance and require elaborate systems to control the dynamic pitch when at speed. Furthermore the columns have a considerable lateral area which causes such vessels to be easily displaced by a beam on sea making it difficult to keep such vessels on station.

The invention provides a multi-hulled vessel comprising a plurality of ubmerged streamlined pontoons located parallel to one another and each having one or more upwardly extending structural columns, a deck structure rigidly attached to the upper ends of the columns to carry a payload, means to propel the vessel in the fore and aft direction and means embodied within the depth of the pontoons to move the vessel laterally, the vessel waterline in its normal operation position extending through the columns between the pontoons and deck structure and the columns each having a streamlined cross-section which is curved with a varying radius of curvature around at least a greater part of the section including the forwardly disposed part thereof and which section is elongate in the fore and aft direction to minimise both fore and aft and lateral resistances. Preferably the columns have an elliptical cross-section although other compound curvatures are also applicable.

It is further preferred that means are provided for ballasting and de-ballasting at least the pontoons of the vessel to cary the vessel waterline so that the vessel may be trimmed to a normal waterline position extending through the columns between the pontoons and the deck structure and, by de-ballasting the pontoons, the vessel may be raised to bring the pontoons to or adjacent the surface of the water to reduce the draft of the vessel for operation in shallow water such as when entering harbour.

The following is a description of a specific embodiment of the invention reference being made to the accompanying drawings in which:

Figure 1 is a diagrammatic view of a multi-hulled vessel;

Figure 2 is a side view of the vessel;

Figure 3 is a view of the vessel bow;

Figure 4 is a similar view to Figure 1 showing the deck of the vessel fitted out as an oil field workover vessel; and

Figures 5 to *7* are more detailed views of parts of the vessel.

Referring firstly to Figures 1 to 3 of the drawings there is shown a multi-hulled vessel having two streamlined pontoons 10 located parallel and spaced apart from one another. Each pontoon 10 has an upright structural column 11 adjacent the forward end thereof and a similar column 12 adjacent the aft end thereof. A pay-load carrying deck 9 is rigidly mounted at the upper ends of the columns.

Reinforcement 18 is provided between the upper parts of the columns above the vessel waterline to the underside of the deck 9 to strengthen the connection between the deck and columns.

The columns 11, 12 may be flared as indicated at 13, 14 at their lower ends where they join the pontoons 10. Each column 11, 12 is of streamline form tapering to both its forward and rearward ends from a point of maximum width with a streamlined cross-section. The column cross-sections are of a symmetrical elliptical cross-section with the major axes extending lengthwise of the pontoons to create a substantially streamlined overall cross-section. The buoyancy of the pontoons 10 and the lower parts of the columns is such that the vessel floats with a waterline (indicated at 8 on Figures 1 to 3) through the columns 11, 12 between the pontoons and deck. The columns are designed to permit the vessel to move through the water in its normal ballasted state without having to de-ballast the pontoons 10 to lie on the surface of the water. To that end, the columns 11, 12 are so streamlined and the structure is such that minimum disturbance of the water is created as the vessel moves through the water.

For transit of the vessel, in forward or aft directions thrust units 15 incorporating conventional motor driven propellors are mounted at the sterns of the pontoons 10. Additionally side thrusters in the form of motor driven propellors are provided in throughways 16, 17 arranged singularly or in pairs adjacent the forward and rearward ends of the pontoons as necessary. By operating the side thrusters at the front and rear of the pontoons in the same or opposing directions the vessel can be displaced laterally or turned on its own axis as required. As an alternative or in addition to the thrust means 15 and side thrusters, the hulls may be provided with power drives mounted to swivel about vertical axes to propel and direct the vessel.

The propulsion systems for the vessel are intended to enable the vessel to be moved independently from site to site where it is required to be operated from the vessel floating to its normal waterline, that is partway up the columns 11, 12. The forward and lateral thrust means are intended to enable the vessel to be kept on station if required as an alternative to an anchoring system.

The deck of the vessel is intended to be fitted

out to suit its required purpose. For example the deck may be provided with a crane 20, a helicopter launching/landing pad 21, and other equipment and utilities to enable the vessel to perform its required function. The vessel may therefore be built in different sizes and fitted out as a support vessel or a workover vessel for other off-shore operations particularly those involving oil/gas production. Specifically, the vessel may be fitted out for (i) diving support, (ii) well stimulation and workover (iii) multi-functional services, (iv) crew service, (v) standby duties, or (vi) rapid intervention.

Reference is now made to Figures 5 and 6 of the drawings which illustrate typical ballasting arrangements for the vessel. Firstly, referring to Figure 4 of the drawings, each pontoon 10 is subdivided internally to provide ballast tanks, fuel tanks and machinery rooms. Thus along the inner side of each pontoon between the columns 11, 12 three fuel tanks 31 and fresh water tank 32 are provided. On the corresponding outer part of the pontoon ballast tanks 33 are provided with an escape tunnel 34 between the ballast tanks and opposing fuel/water tanks 31,32. Further ballast tanks 35 and 36 are provided on either side of each pontoon below the connection of the structural column 11, 12 to the pontoon. At the forward end of the pontoon beyond the forward column 11 there is an inner machinery room 37 containing the motors for the thrust units 17 and further ballast tanks 38 are provided between the machinery room 37 and the outer sides of the vessel and the bow of the vessel contains ballast tanks 39. The stern of the pontoon contains a further machinery room 40 containing a prime mover for example a motor or motors for the main propulsion unit indicated at 15 and further ballast tanks 41 are provided between the sides of the machinery room and the sides of the pontoon. It will be appreciated therefore that the fuel tanks for the vessel are positioned in which their vulnerability to damage by collision is reduced to a minimum and it will also be appreciated that the positioning of the ballast tanks provides some protection to the machinery rooms in the pontoons in the event of a collision.

Further ballast tanks 42 are provided on the outer sides of the columns 11, 12 and still further ballast tanks 43 are provided before and aft ends of each column 11, 12. Thus the ballast tanks are disposed to provide some protection to the columns on the outer side of the columns which are most vulnerable to damage by collision.

Figure 7 of the drawings illustrates the pumping circuit and valving system for each pontoon and its associated column. The aft part of the pontoon and the rear column 12 have a ballast pump 45 associated circuitry and control valves indicated generally at 46, valve control connections to the ballast tanks of the after column 12 indicated generally at 47 and valve control connections to the ballast tanks in the after part of the pontoon indicated generally at 48. A similar pump 49 is provided for the forward part of the pontoon and the forward column and like parts have been allotted the same reference numeral. The arrangement of pumps and valve controls enables ballast tanks to be emptied or filled with sea water individually or collectively to enable the trim of the vessel to be adjusted. Thus the vessel can be trimmed to its normal water line indicated at 51 on Figure 5 lying at a position between the upper and lower ends of the columns and the contents of the ballast tanks may be adjusted to maintain the vessel in this position, correcting for the consumption of payload, fuel oil and other consumables.

CLAIMS

1. A multi-hulled vessel comprising a plurality of submerged streamlined pontoons located parallel to one another and each having one or more upwardly extending structural columns, a deck structure rigidly attached to the upper ends of the columns to carry a payload, means to propel the vessel in the fore and aft direction and means embodied within the depth of the pontoons to move the vessel laterally the vessel waterline in its normal operation position extending through the columns between the pontoons and deck structure and the columns each having a streamlined cross-section which is curved with a varying radius of curvature around at least a greater part of the section including the forwardly disposed part thereof and which section is elongate in the fore and aft direction to minimise both fore and aft and lateral resistances.

2. A multi-hulled vessel as claimed in claim 1 wherein the columns have elliptical cross-sections which are elongate in the fore and aft directions.

3. A multi-hulled vessel as claimed in claim or claim 2 wherein means are provided to ballast and de-ballast at least the pontoons of the vessel to vary the vessel waterline so that the vessel may be trimmed to a normal waterline extending through the columns between the pontoons and deck structure and may be de-ballasted to bring the pontoons to or adjacent the surface of the water to reduce the vessel draft.

4. A multi-hulled vessel as claimed in claim 3 wherein the pontoons have ballast tanks therein and means are provided for emptying and filling the ballast tanks from the surrounding water.

5. A multi-hulled vessel as claimed in claim 4 wherein each pontoon has ballast tanks on at least the outer side thereof with respect to the vessel.

6. A multi-hulled vessel as claimed in claim 5 wherein machinery compartments are provided adjacent the ends of the pontoons and ballast tanks are provided on the outer sides of the pontoons to either side of each machinery compartment.

7. A multi-hulled vessel as claimed in claim 5 or claim 6 wherein the ballast tanks are provided on both sides of the pontoon below the connection of the or each column to the pontoon.

8. A multi-hulled vessel as claimed in any of the preceding claims wherein further ballast tanks are provided on at least the outer sides of the or each column for each pontoon, said means for filling and emptying the first mentioned ballast tanks also being connected to the further ballast tanks.

9. A multi-hulled vessel as claimed in any of the preceding claims and having two or more submerged streamlined pontoons each having two upwardly extending streamlined columns mounted at spaced locations along the length thereof and a deck structure mounted on the upper ends of the columns.

10. A multi-hulled vessel as claimed in any of the preceding claims wherein the lower ends of the columns are flared outwardly to increase in cross-sectional area adjacent the pontoons.

11. A multi-hulled vessel as claimed in any of the preceding claims wherein each pontoon has a bow and/or stern located propulsion unit within the depth of the pontoon.

12. A multi-hulled vessel as claimed in any of the preceding claims wherein the lateral thrust means comprise laterally extending throughways in the pontoons containing thrust means for directing water flow one way or the other along the throughway to move the pontoons laterally.

13. A multi-hulled vessel as claimed in claim 12 wherein at least one throughway containing lateral thrust means is provided adjacent the stern of each pontoon and at least one throughway containing lateral thrust means is provided adjacent the forward end of each pontoon.

14. A multi-hulled vessel as claimed in any of the preceding claims wherein structural means are provided above the waterline of the vessel between the columns and deck but no reinforcing structure is connected to the pontoons or columns below the waterline for all normal operational drafts.

15. A multi-hulled vessel substantially as described with reference to and as illustrated in Figures 1 to 3 of the accompanying drawings.

16. A multi-hulled vessel substantially as described with reference to and as illustrated in Figures 1 to 4 of the drawings as modified by Figures 5, 6 and 7.

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