(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 354 402**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **89113566.7**

(51) Int. Cl.[4]: **B63H 5/14 , B63H 25/46**

(22) Date of filing: **24.07.89**

The title of the invention has been amended (Guidelines for Examination in the EPO, A-III, 7.3).

(30) Priority: **25.07.88 US 225027**

(43) Date of publication of application:
14.02.90 Bulletin 90/07

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

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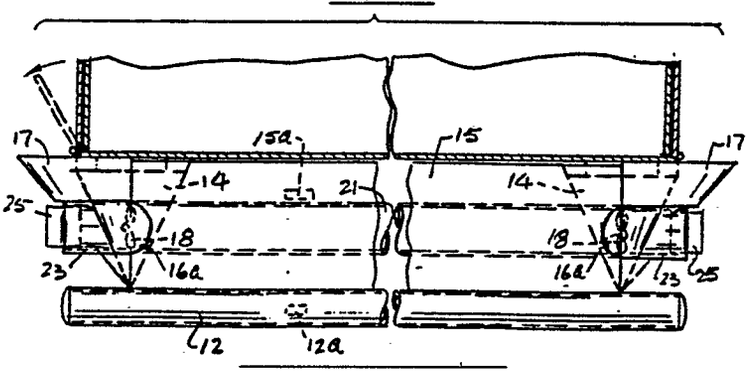
(54) Steering of vessels.

(57) A vessel for the water-borne transportation of people, animals and goods has parallel elongate first chambers (15) each with a pair of rotatable members (14) extending downwardly to opposite ends of the first chambers. Ducts form water passages (16) extending through the rotatable members and propellers (18) are provided in each of them for propelling the vessel. A main water duct (23) extends between the rotatable members and a superstructure is supported on the rotatable members (14). The rotatable members (14) can be rotated between a first position, in which the ducts in the rotatable members communicate with the main duct (23) and a second position in which the ducts discharge at least partially in a direction extending laterally of the main duct, whereby the vessel may be steered, rotated and laterally displaced by varying the positions of rotation of the rotatable members.

Fig. 2.



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The present invention relates to water-borne vessels and, more particularly, to vessels for the transportation of people, animals, goods and cargo of all kinds over water.

Conventional ships are formed with a single, elongate hull provided with propulsion means, usually in the form of one or more propellers, at one end thereof, with one or more rudders aft of the propulsion means. Consequently, such vessels are very difficult to manoeuver and therefore need either large areas of water on which to turn or the assistance of tugs.

It is an object of the present invention to provide a novel and improved water-borne vessel which is substantially more manueverable than a conventional ship.

According to the present invention, there is provided a vessel for water-borne transportation, comprising a pair of propulsion means spaced apart from one another and means for driving the propulsiqon means to propel the vessel through the water, characterized by a pair of rotatable members extending downwardly at the underside of the vessel, duct means defining a water passage extending through each of the rotatable members, the propulsiqon means being provided in each of said water passages, and means for rotating the rotatable members independently of one another between first positions, in which the duct members discharge in a corresponding first direction, and a plurality of other positions in which the duct members discharge in correspondingly different directions for correspondingly varying the direction of movement of the vessel, the rotatable member being rotatable by the rotating means into positions in which the duct means thereof discharge in opposite directions transverse to the first direction for rotating the vessel about a vertical axis located between the rotatable members.

The rotatable members can thus be adjusted to enable the propulsion means to drive the vessel in the first direction or at an angle thereto. Alternatively, by rotating the rotatable members appropriate positions, the propulsive force of the propulsion means can be caused to act laterally, thus causing the vessel to turn or to be displaced laterally or even to be rotated without being displaced.

The invention will appear more readily from the following description of embodiments thereof when taken in conjunction with the accompanying drawings, in which:

Figure 1 shows a diagrammatic view in vertical cross-section through a cargo and passenger vessel embodying the present invention;

Figure 2 shows a broken-away view in vertical cross-section through parts of the cargo vessel of Figure 1;

Figure 3 shows a view in perspective of parts of the vessel of Figure 1;

Figure 4 shows a view similar to Figure 3 but with some parts omitted and other parts in an exploded view;

Figure 5 shows a view in vertical cross-section through the parts shown in Figure 4;

Figure 6 shows a broken-away view in vertical cross-section through parts of a hold in the vessel of Figure 1; and

Figures 7 and 8 are diagrammatic views of the vessel of Figure 1, showing relative displacement of the hold and other parts of the vessel;

Figures 9 through 11 show diagrammatic views corresponding to Figures 7 and 8 of three different modifications of the vessel of Figure 1.

Figure 12 shows a side-view of a modification of one of the propulsion arrangements of the vessel of Figure 1;

Figures 12A and 12B show diagrammatic arrangements corresponding to Figure 2 but illustrating different propulsion arrangements;

Figure 14 shows a view in perspective of a further embodiment of the invention, for transporting a ground-engagement vehicle over water;

Figure 14 shows a diagrammatic end view of a modification of the arrangement of Figure 13;

Figure 15 shows a side view of a still further embodiment of the invention; and

Figures 16, 17 and 18 shows views taken in vertical cross-section through three different propeller arrangements for use in the present invention.

The vessel illustrated in the drawings and indicated generally by reference numeral 10 in Figure 1 has four elongate, hollow cylindrical casings 12, which are parallel to one another and which form elongate chambers.

At opposite ends of the each of the casings 12, a pair of downwardly convergent conical members 14 are rotatably connected to the casings 12 by bearings 13 (Figures 3, 4 and 5).

Between the two conical members which are connected to each casing 12, there extends a housing 15, one of which is shown in greater detail in Figure 3 and which has a downwardly convergent cross-sectional shape.

The housing 15 is formed at each of its opposite ends with a semi-conical recess 19, the surface of which conforms to the shape of, and snugly receives, a respective one of the conical members 14. The housing 15 is also formed with an opening 16 in the wall of each recess 19, and these two openings 16 are connected by a longitudinal duct 21 so that water can flow through the entire length of the housing 15, which forms a watertight enclosure or chamber around the duct 21.

Each conical member 14 has a cylindrical duct forming an opening or water passage 20 extending transversely therethrough and containing a propulsion device 18, by means of which water can be impelled through the water passage 20.

The opposite ends of the housing 15 are formed as streamlined end portions 17 projecting beyond the rotatable conical members 14 and provided with ducts 23 extending in the longitudinal direction of the casings for the passage of water to and from the water passages 20 of the conical members. The ducts 23 are provided with rudders 25 for the fine steering of the vessel.

The conical shape of the rotatable members 14 corresponds to the cross-sectional shape of the housing 15 so that together they form a substantially streamlined shape.

The casings 12 may be used to accommodate equipment within their hollow interiors or may have their hollow interiors used as storage spaces for liquid, gaseous and solid materials. Alternatively, the casings 12 may be employed as floatation chambers, in which case they may be provided with inlet and outlet devices 12a for effecting the flow of water into or from the interior of the casings 12 for correspondingly varying the buoyancy of the chambers 12.

The interiors of the housings 15 may likewise be used for containing equipment or for storage or may be provided with inlet and outlet devices 15a for the flow of water into and from the interiors of the housings 15.

The propulsion devices 18 by which water is impelled through the duct 21 comprise propellers by which water is drawn in through the duct 23 and the opening 16 at one end of the duct 21 and expelled through the opposite end of the duct 21.

By rotating the conical members 14 about their vertical axis, the directions in which water is drawn into and expelled from the passages 20 can be varied for the purpose of steering or turning the vessel.

More particularly, when the rotatable members 14 are positioned so that the passages 20 extend at right angles to the longitudinal axes of the casings 12, so that the water passages discharge through lateral openings 16a formed in the opposite sides of the housings 15, the vessel 10 can be displaced laterally, in the direction of the passages 20, if the propellers 18 are acting in the same direction, or the vessel 10 may be rotated about a vertical axis if the propellers 18 at opposite ends of each casing are facing in opposite directions.

On the other hand, if the rotatable members 14 are rotated through only 45^0 from their straight-ahead positions, in which they are shown in Figure 3, then a portion of the water driven through the passage 20 of each rotatable member 14 by its propeller 18 is driven along the duct 21 and another portion of this water is expelled laterally through one of the openings 16a, so that the vessel is propelled in a direction which is correspondingly at an angle to the longitudinal direction of the casings 12.

By rotating the rotatable members 14 through 180^0 from their straight-ahead positions, the direction of propulsion of the vessel can be reversed.

The rotation of the conical members 14, independently of one another, is effected by drive mechanisms similar to that shown in Figure 5.

The drive mechanism shown in Figure 5 comprises a flanged ball race 26 secured to the top 24 of the housing 15 and another ball race 27 secured to the top 25 of a respective one of the conical members 14. An externally toothed annulus 28 is secured to the ball race 27 and driven by a motor 29, which may be an electric motor, and a pinion 30 on the vertical output shaft of the motor 29.

The conical members 14 project downwardly between stabilizer walls 32 depending from overlying holds 34. Alternatively, the stabilizer walls may be connected to the housings 15.

The holds or compartments 34 are releasably secured in a frame 36, with one of the holds 34 being provided above each of the housings 15. Each hold 34 has vertical rectangular water-tight lower closure members or doors 37 and upper closure members or doors 38, 39 for closing access openings formed in the walls of the respective hold 34, the lower doors 37 being secured by hinges 40 at the bottom edges of the doors 37.

As shown in Figure 6, the upper doors 39 are each formed of three portions 39a, 39b and 39c secured by hinges 44, so that the first portion 39a is hinged to the top of the hold 34, the second portion 39b is hinged to the first and third portions and the third portion 39c can be pivoted upwardly, into a position shown in broken lines, to form a closure for an access opening in a superstructure 46. These three door portions may also be extended horizontally or at an inclination to form a gangway, as also shown in broken lines.

The doors 38 are each formed of two portions 38a, 38b, which are hinged to one another and to the floor 50 of the hold 34 by hinges 48.

These doors 37, 38 and 39 can be opened to allow auxiliary vessels, one of which is shown in broken lines and indicated by reference numeral 52 (Figure 1), to float into and from the interiors of the holds 34 for the purpose of loading and unloading the vessel.

Figure 6 also shows one of a plurality lifting devices 54 connecting the top 53 of the hold 34 and to the underside of an intermediate deck 56. This lifting device 54 comprises a jack 58, e.g. a

piston and cylinder device or a screw jack, connected at opposite ends thereof by connecting brackets 60 and 62 to the deck 56 and to the top 53 of the hold 34.

The lifting devices 54 can be operated to cause the relative displacements shown in Figures 7 and 8. More particularly, with the lifting devices 54 contracted, the housings 15 with their rotatable members 14, the holds 34 and the lower deck 56 of the superstructure are in the relative positions in which they are shown in Figure 7. If the upper lifting devices 54 are now extended as shown in Figure 8, the hold 34 and the deck 56 are displaced away from one another.

One the other hand, when the lower lifting devices 66 associated with any of the holds 34 are extended as shown in Figure 9, then a portion 50a of the floor 50 of the respective hold 34 is raised relative to the bottom of the hold.

In this way, each of the holds 34 can be vertically lowered relative to the frame 36 by actuation of the lifting devices 54 to enable the opening in the hold 34, which is normally closed in a water-tight manner by the doors 38 and 39 to be lowered below the level of the surrounding water to thereby enable the auxiliary vessel or lighter 52 to be floated into or from the hold 34. By contracting the lifting devices 54, the holds 34 can be raised to displace the access openings of the holds above the water level.

Alternatively, instead of the lifting devices 54, other lifting devices, one of which is shown in Figure 9 and indicated by reference numeral 66, are recessed in the housings 15 and the overlying holds 34 for raising the holds 34. The lifting devices 66 also comprise a piston and cylinder device or a screw jack.

By raising the hold 34 above the water level, the auxiliary vessel can be raised with the hold, while water can drain through the hold floor 50, which may be perforated for that purpose.

The water level L1 in Figure 1 diagrammatically illustrates the level of the water relative to the hold when the latter is in its raised position, while the level L2 illustrates the corresponding level when the hold is lowered.

Instead of raising the lowering the entire hold 34 by means of the lifting devices 54 or 66, a portion 50a only of the hold floor 50 may be raised and lowered relative to the remainder of the hold 34, as illustrated in Figures 10 and 11.

More particularly, in Figure 10 there is illustrated a modified arrangement for effecting the raising and lowering of the hold floor portion 50a, in the form of a cable and pulley mechanism which is indicated generally by reference numeral 70 and which suspends the floor portion 50a.

The alternative diagrammatically illustrated in Figure 11 has a lifting device 72 within the hold 34 and acting between the floor 50 and the risible floor portion 50a.

The superstructure 46 comprises a plurality of hollow chambers 70, e.g. cabins or other rooms, which as can be seen from Figure 1, overlap one another horizontally in a stacked arrangement which is a terraced, pyramidal, upwardly convergent arrangement.

The space within this pyramidal arrangement of the hollow chambers 70 is divided by a plurality of intermediate decks 72.

In operation of the above-described vessel, the vessel may be employed for the transportation of people, animals, materials, goods and cargo of all kinds, and may be provided with means and devices for generating and/or converting energy and with greenhouse systems enabling the vessel to be used twnety-four hours a day and three hundred sixty-five days per year for growing vegetation and keeping animals.

The vessel may also be provided with living quarters and recreation areas, heating and air conditioning, ventilation, exhaust purification, provisioning and waste disposal for people, animals and vegetation, utility water supplies and drinking water supplies, as well as waste water purification, dust removal and cargo loading devices.

Each housing 15 with its two conical rotatable members 14 is releasable from the remainder of the vessel 10 for use as an independent auxiliary vessel, e.g. as a submarine, and/or for reducing the total propulsive power of the vessel. Also, each hold 34 may be detached, together with its respective housing 15, for independent use separate from the remainder of the vessel 10 as a surface vessel or as a submarine.

Figure 12 shows a view corresponding to Figure 2 of a modified vessel and, for convenience of illustration, parts shown in Figure 12 which correspond to those of Figure 2 have been indicated by corresponding reference numerals, increased by 100.

Thus, Figure 12 shows a pair of conical members 114 connected to opposite ends of an elongate, hollow cylindrical casing 112. Each of the conical members 114 is provided with a propeller 118 for propelling water through the conical members 114 and along a longitudinal duct, indicated generally by reference numeral 121. Interconnecting water passages 120 extend transversely through the conical members 114.

In this embodiment of the invention, however, the longitudinal duct 121 is not straight, like the duct 21 of Figures 2 to 4, but has horizontal end portions 121A adjacent the conical members 114, an intermediate horizontal portion 121B, which is located at a substantially higher level than the end

portions 121A, and inclined connecting portions 121C, by which the end portions 121A are connected to the intermediate portion 121B.

The intermediate portion 121B is located above the level L3 of the water in which the vessel is floating, and is interrupted by a tank 124, the interior of which communicates with the interior of the intermediate duct portion 121B at opposite sides of the tank 124, so that water can flow from one end of the duct 121 to the other through the tank 124.

A weir in the form of a vertically adjustable plate 127 is provided within the tank 124 and controls the level to which the water in the tank 124 at one side of the plate 127 must rise in order to be able to flow over plate 127 to the opposite side thereof.

In operation of this embodiment of the invention, of the the propellers 118, for example the left-hand propeller 118 as viewed in Figure 12, is driven to propel water through the longitudinal duct 121. In this case the water flow will be in the direction indicated by arrows in Figure 12.

The top of the tank 124 is closed by a cover plate 101, and a pump 102 may optionally be connected to the interior of the tank 124 for creating a partial vacuum within the tank 124.

Water is thrust into the tank 124 by the propeller 118 as described above, and the flow of the water flows from the tank 124 towards the right-hand end of the duct 121 is then controlled by the position of vertical adjustment of the plate 127.

Figures 12A and 12B diagrammatically illustrate further possible modifications of the arrangement of the propulsion devices and the duct interconnecting these devices.

More particularly, as shown in Figure 12A, a pair of propulsion devices in the form of the conical members 14 of Figure 1 are shown in broken lines and are interconnected by a straight, horizontal dash-dot line representing the straight, horizontal centerline of the duct 21.

Alternatively, as shown in broken lines in Figure 12A, the pairs of conical members could be located at different levels, and interconnected by a straight but inclined water duct.

In the modification shown in Figure 12B, the two conical members, indicated generally by reference numerals 14A, are shown at different levels, but are interconnected by a duct (not shown) having a centreline which extends horizontally from the left-hand conical member 14A as shown in Figure 12B, and is then upwardly inclined to a peak, from which the duct is downwardly inclined to a horizontal section thereof extending to the right-hand conical member 14A. As will be readily apparent, the arrangement of Figure 12B corresponds to that of Figure 12 except that in Figure 12 the two conical members are at the same level, whereas in Figure 12B the right-hand conical member 14A is at a higher level that the left-hand conical member 14A.

Figure 13 shows an auxiliary device for conveying cargo and/or passengers over water, e.g. to and from the vessel of Figure 1.

The auxiliary device illustrated in Figure 13 is intended to transport over water a vehicle 200, which is provided with ground engagement wheels 202 for travelling on ground. This vehicle 200 may, for example, comprise a trailer, a camper or a passenger bus or may be a conventional cargo container provided with wheels.

The vehicle 200 is receivable within a framework indicated generally be reference numeral 204, which is provided along its length with a plurality of pairs of propulsion units 206.

The propulsion units 206 are rotatable frusto-conical members similar to the rotatable conical members 14 of the Figure 1, connected by ducts 221, and contain propellers (not shown) for propelling water through passages 208 in the propulsion members 206, when in use.

The propulsion units 206 are mounted on pivotable arms 210, which can be pivoted to and fro about pivots 212 to displace the propulsion units 206 from the positions in which they are shown in broken lines in Figure 13, at the top of the device, to positions in which they are shown in full lines at the bottom of Figure 13.

The propulsion units 206 are provided with wheels 214 so that, in the latter position, they can be used to support the entire device, including the vehicle 200, for travel along the ground. The wheels 214 are pivotably connected to the propulsion units 206.

The device comprises laterally extendible portions, indicated generally by reference numeral 216 formed in sections connected by hinges 217 so that the sections, when not in use, can be folded so as to underlie the propulsion units 206 in the uppermost, raised, inoperative positions of the latter. The laterally extendible portions 216 can also be extended laterally of the device, as shown in full lines. The portions 216 include frameworks 218 pivotably connected to opposite sides of the framework 204 by hinges 212, and the frameworks 204 and 218 provide visibility for the occupants of the vehicle 200 to the exterior.

In use, the device is located on the ground with the propulsion units 206 in their raised positions. The vehicle 200 is then moved into the interior of the device, and secured therein by suitable connecting means.

The frameworks 218 are then pivoted about the hinges 212, with the wheels 214 pivotably adjusted into a position, indicated by reference numeral 214A in Figure 13, such as to dispose the axes of

rotation of the wheels 214 parallel to the longitudinal axis of the device and the vehicle 200. This enables the wheels 214 to run along the ground, during the latter part of the downward pivotation of the frameworks 218 and the propulsion units 206, so as to raise the entire device, including the vehicle 200.

When the propulsion units 206 have reached their lowermost positions, the wheels 214 are pivoted about vertical axis relative to the propulsion units 206 to bring the wheels 214 into suitable positions to enable the device to travel in the longitudinal direction of the vehicle 200.

The entire device can then be driven along the ground and along a ramp into the water, across which the device, including the vehicle 200, can then be propelled by the propulsion units 206.

Figure 14 diagrammatically illustrates a modification of the device of Figure 19, in which the propulsion units, indicated by reference numeral 306, which are similar to the propulsion units 206 of Figure 13, are carried on the ends of arms 308 connected by pivots 309 to the sides of the framework for containing the vehicle, to which they are pivotably connected. approximately halfway up the portion of the side of the vehicle which is located above the water level. The proportion units 306 serve not only for propelling the device through the water but also for stabilizing the device.

The propulsion units 306 of Figure 14 are arranged in pairs connected by longitudinal ducts, as described above with reference to the embodiment of Figure 1.

In Figure 15 of the drawings, there is illustrated another embodiment of the invention which, in this case, is provided on a camper, indicated generally by reference numeral 404, intended to be mounted on a pick-up truck indicated generally by reference numeral 405.

In this case, a pair of propulsion units 406, corresponding to the propulsion units 206 of the Figure 13 and connected by a longitudinal duct 421, corresponding to the duct 21 of Figure 2, are mounted on the top of the pick up 404. The assembly of the duct 421 and the propulsion units 406, each provided with a pivotal wheel 414 corresponding to the wheels 214 of Figure 13, is one of the pair of such assemblies provided at opposite sides of the camper 404 and pivotal from inoperative positions on top of the camper 404, to operative positions, located below the truck 405 in a manner corresponding to that described above with reference to Figure 13. These assemblies are connected to the camper 404 so as to enable the camper 404 to be suspended thereby, when the assemblies are in the operative positions, at a height sufficient to enable the truck 405 to be driven into position beneath the camper 404 or from such position.

Figure 16 shows a view in vertical cross-section through a propeller arrangement which may be employed in the propulsion devices of the above-described embodiments of the invention.

More particularly as shown in Figure 16 a propeller indicated generally by reference numeral 518 has blades 520 extending between a hub 522 and a cylindrical member 524. The cylindrical members 524 carries on its exterior a plurality of turbine blades 526 and an externally-toothed ring gear 528, which meshes with a spur gear 530. The turbine blades 526 are located between the ring 528 and a support plate 532, and are employed to drive the propeller 518.

More particularly, water pressurized by a pump or simply by the hydrostatic pressure beneath the vessel at the exterior of the propulsion devices is discharged from one or more turbine nozzles (not shown) against the blades 526 to rotate the cylindrical members 524, and therewith the propeller 518, and also the gears 528 and 530. The water may be allowed to enter the respective conical member 14 through an inlet valve arrangement 11 (Figure) so as to flow to the nozzle. The propeller 518 forces water through the propulsion devices for propelling the vessel as described above, and the gear 530 can be employed as a power take-off for driving auxiliary devices within the vessel.

Figure 17 shows a modification in which the propeller hub is replaced by a central, cylindrical pipe 602, which is stationary and which supports a rotatable cylinder 604. An outer cylinder 606 is rigidly connected to the cylinder 604 by radial arms 608 and, also, by propeller blades 618.

Turbine blades 626 and a ring gear 628, corresponding to the blades 526 and the gear 528 of Figure 16, are secured relative to the exterior of the outer cylinder 606, which is mounted in a support plate 632.

Figure 18 shows a further modification of the propeller arrangement.

In the arrangement shown Figure 18, a central rotatable shaft 702 is connected by propeller blades 704 to a first cylinder 706 which, in turn, is connected by propeller blades 708 to a second cylinder 710.

Additional propeller blades 712, or alternatively turbine blades 714, are mounted on the exterior of the cylinder 710.

Cylinder 710 is rotatable in a ring member 716, which is connected by radial support arms 718, to a support plate 720. The ring member 716 and the connecting arm 718 are provided in a circular opening 722 in the support plate 720.

Claims

1. A vessel for water-borne transportation, comprising a pair of propulsiqon means spaced apart from one another and means fro driving said propulsiqon means to propel the vessel through the water, characterized by;
a pair of rotatable members (14) extending downwardly at the underside of said vessel;
duct means defining a water passage (16) extending through each of said rotatable members (14);
the propulsion means (18) being provided in each of said water passages, and
means (28 - 30) for rotating said rotatable members independently of one another between first positions, in which said duct members discharge in a corresponding first direction, and a plurality of other positions in which said duct members discharge in correspondingly different directions for correspondingly varying the direction of movement of said vessel,
said rotatable member being rotatable by said rotating means into positions in which said duct means thereof discharge in opposite directions transverse to said first direction for rotating said vessel about a vertical axis located between said rotatable members.

2. A vessel as claimed in claim 1, characterized by a water duct (21) extending between said rotatable members and aligned with said duct means, when said rotatable members are in said first positions, so as to interconnect said water passages thereof.

3. A vessel as claimed in claim 2, in characterized in that said water duct (21) is one of a plurality of water ducts (21) arranged parallel to and spaced from one another, each of said water ducts (21) extending between a respective pair of said rotatable members (140).

4. A vessel as claimed in claim 2, further comprising means defining a watertight, downwardly converging enclosure (15) extending around said water duct (21) into the vicinity of each of said rotatable members (14), said rotatable members each having a downwardly convergent, conical shape corresponding to the cross-sectional shape of said enclosure.

5. A vessel as claimed in claim 5, wherein said enclosure (15) has at each end thereof a curved surface (19) conforming to the conical shape of a respective one of said rotatable members (14) and juxtaposed thereto.

6. A vessel as claimed in claim 6, wherein said enclosure (15) includes end portions (17) which extend around and beyond said rotatable members (14) and which have a longitudinally convergent, substantially streamlined shape.

7. A vessel as claimed in claim 7, further comprising means (23) defining water passages extending through said end portions (17) in the longitudinal direction of said enclosure (15) to said rotatable members (14) and communicating with said water duct (21) when said rotatable members (14) are in said first positions.

8. A vessel as claimed in claim 8, wherein rudder means (25) are provided at outer ends of said water passages for fine steering of said vessel (10).

9. A vessel as claimed in claim 2, characterized in that said water duct (121) is at least partly included.

10. A vessel as claimed in claim 9, wherein said water duct (121) extends upwardly from one of said rotatable members (114) to a water tank (124), and downwardly from said tank (124) to another of said rotatable members (114).

11. A vessel as claimed in claim 2, characterized in that said rotatable members (14, 14A, Figs. 12A and 12B) and located at different levels.

13. A vessel as claimed in anyone of claims 1 to 12 with a hold for containing an auxiliary vessel, characterized by:
means (36) supporting said hold (34) for vertical displacement relative to said superstructure (46);
an access opening in said hold (34) for the passage of said auxiliary vessel (52) into and from the interior of said hold;
closure means (37, 38, 39) movable into a closed position for closing said opening in a water-tight manner; and
lifting means (54) for effecting the vertical displacement of said hold (34) in order to thereby displace said access opening relative to the level of the surrounding water and to enable said auxiliary vessel (52) to float through said opening.

14. A vessel as claimed in any one of claims 1 to 13, characterized by walls (32) extending downwardly past said rotatable members and serving as stabilizers for said vessel.

15. A vessel as claimed in claim 1, characterized in that said rotatable members (206, 406) are mounted for pivotation between a raised, inoperative position, and a lowered, operative position.

16. A vessel as claimed in claim 15, characterized in that said rotatable members (206) are provided with ground engagement wheels (214).

17. A vessel as claimed in claim 16, characterized by means (204) for accommodating therein containers (200, 404) which can be raised and supported by movement of said rotatable members (206, 406) into the lowered portion.

18. A vessel as claimed in claim 15 or 16, further comprising laterally extendible portions (216) which are foldable beneath said rotatable members (206) in the raised portion.

19. A vessel as claimed in claim 1, characterized in that said propulsion means comprise a

combined propeller and turbine blades (Figs 16-18).

20. A vessel is claimed in claim 19, characterized in that said propeller comprises two coaxial sets of propeller blades (704, 708).

Fig. 1.

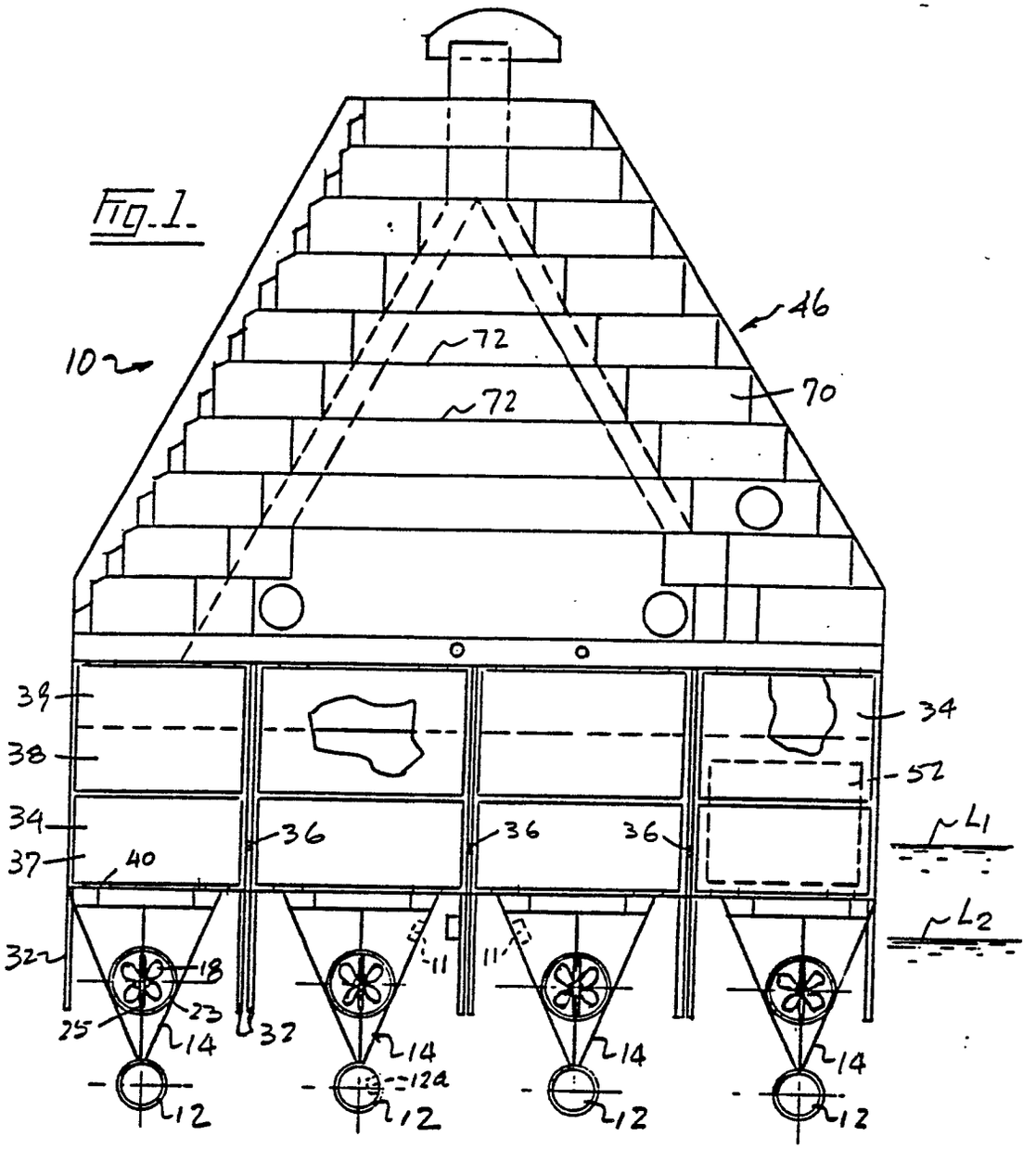
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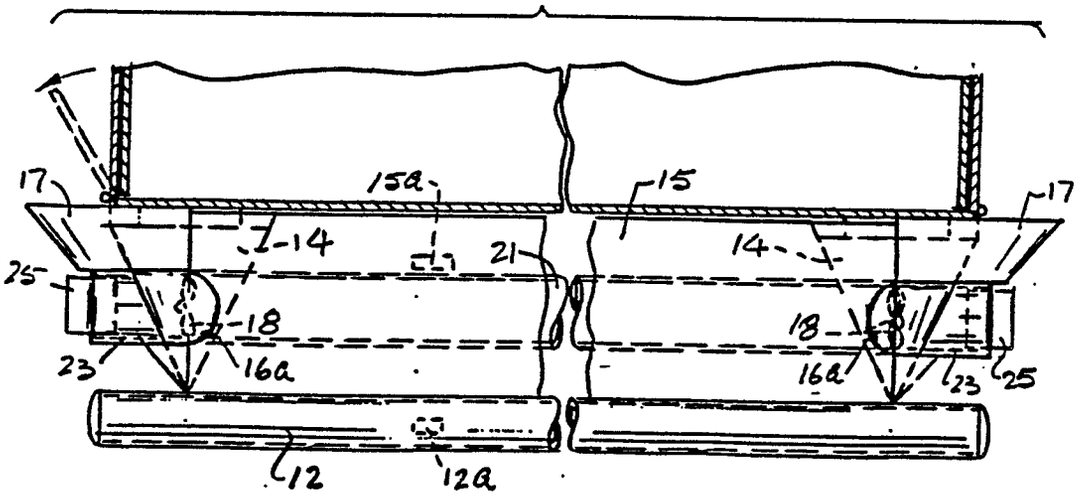
Fig. 2.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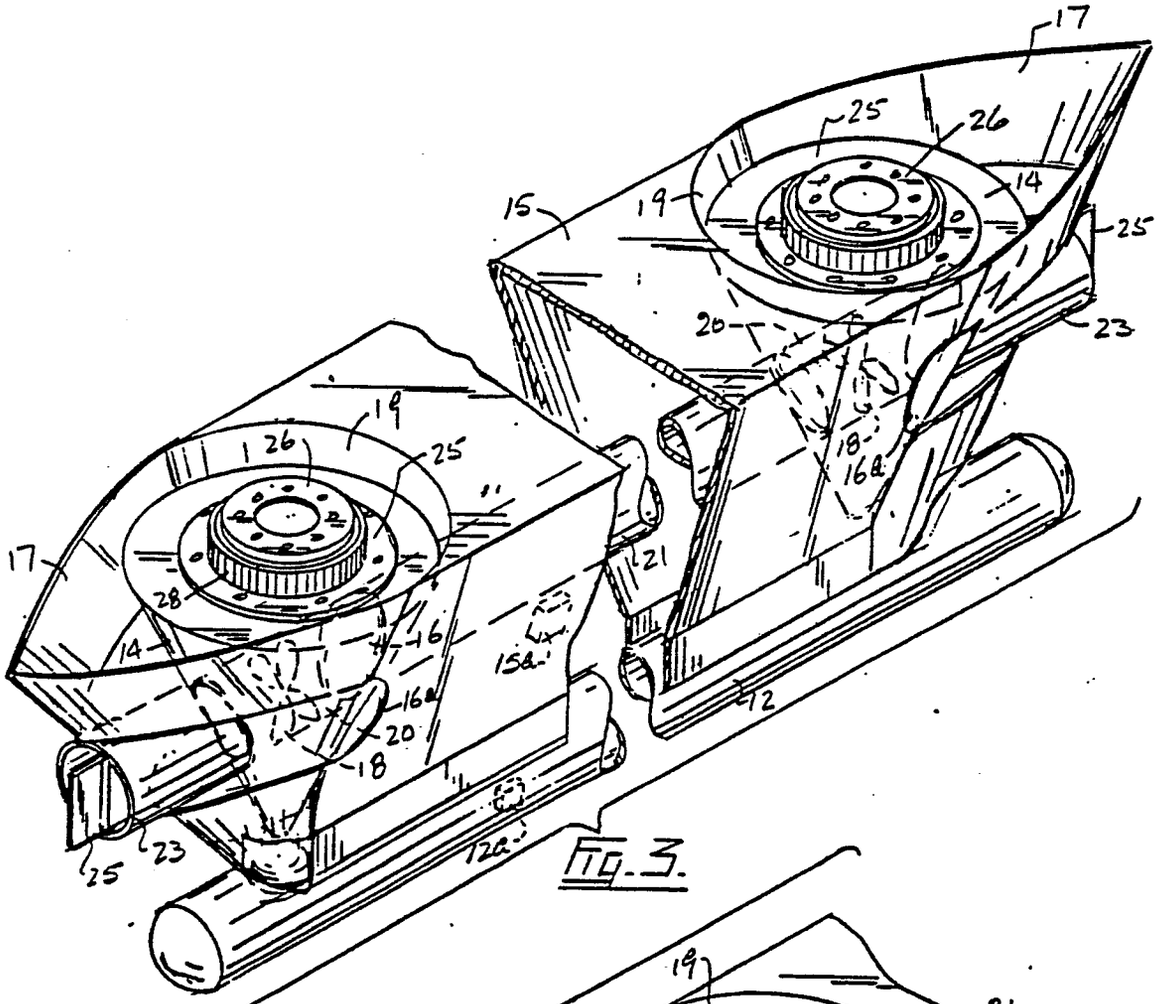
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Fig. 3.

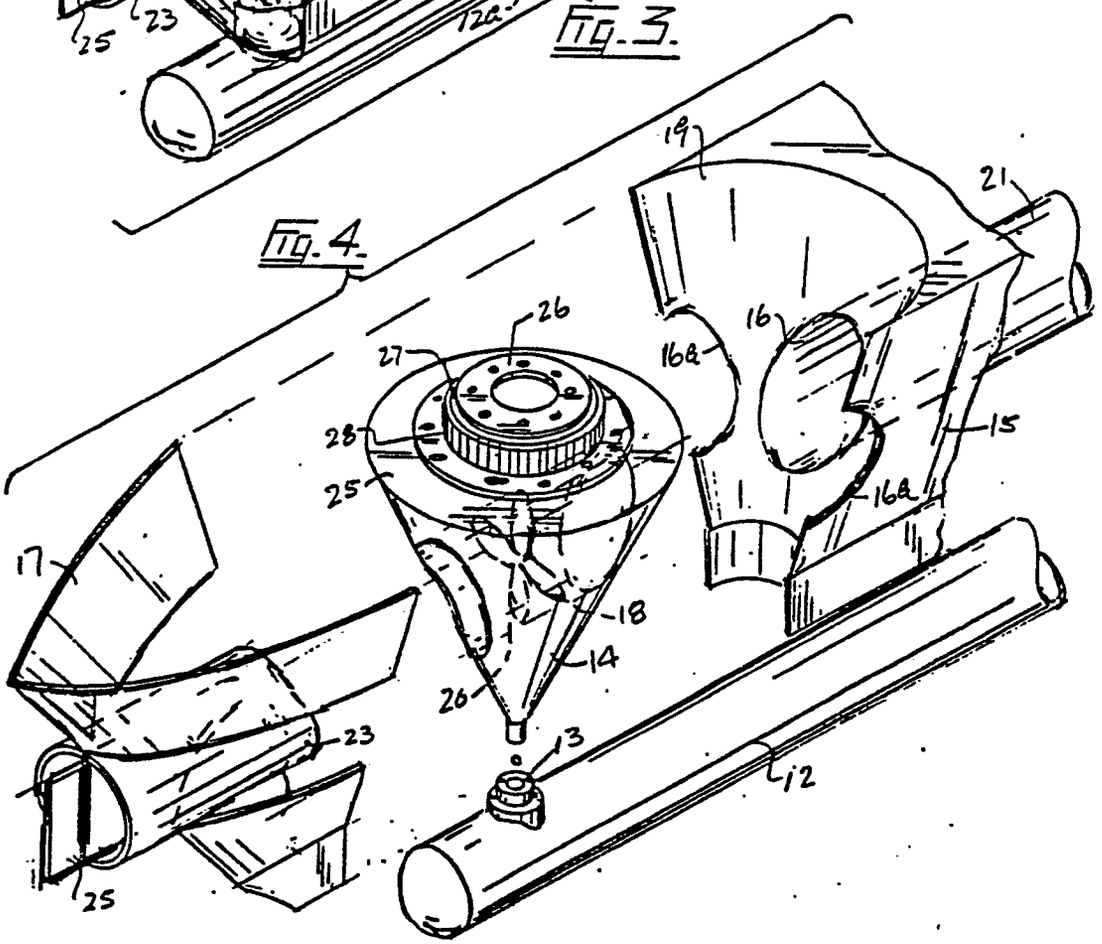
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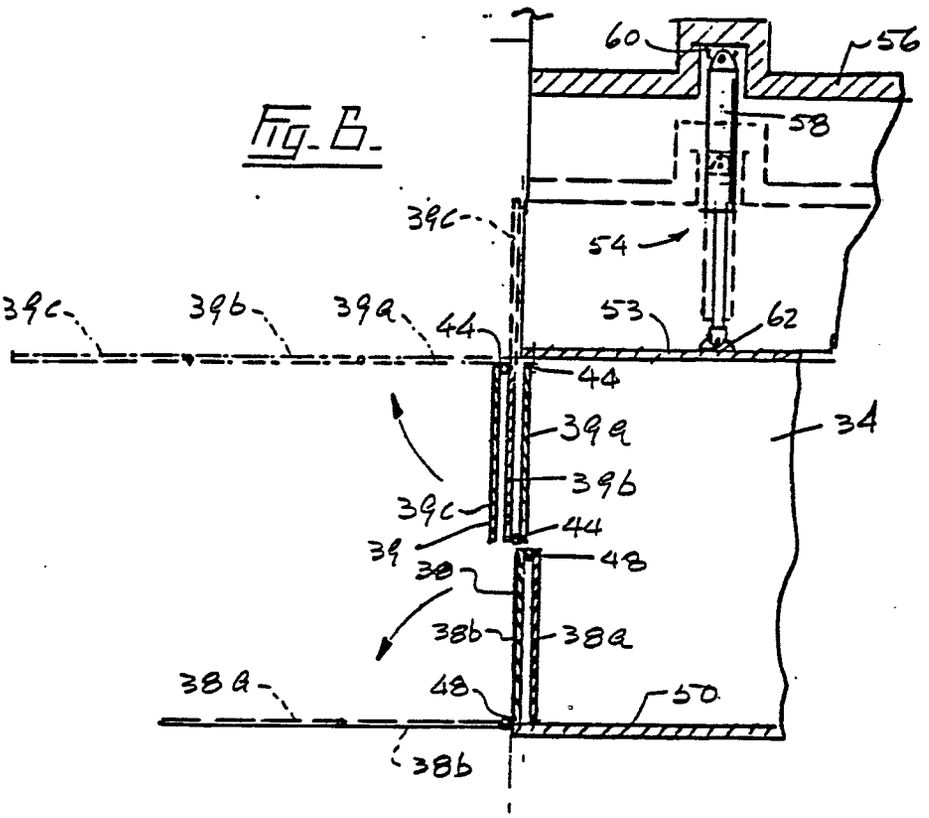
Fig. 4.

Fig. 6.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39c
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39c
39b
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44
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39b
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48
38
38b
38a
38a
48
50
38b

Fig. 5.

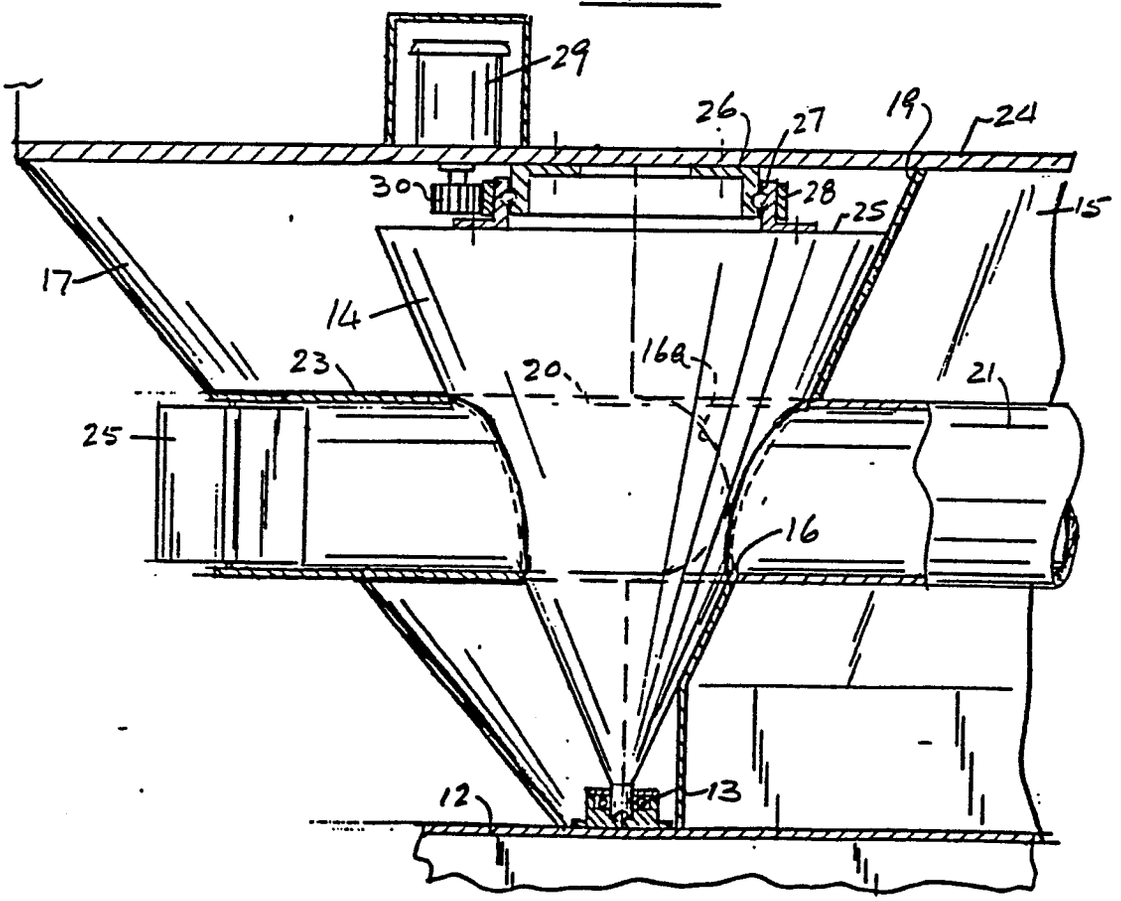
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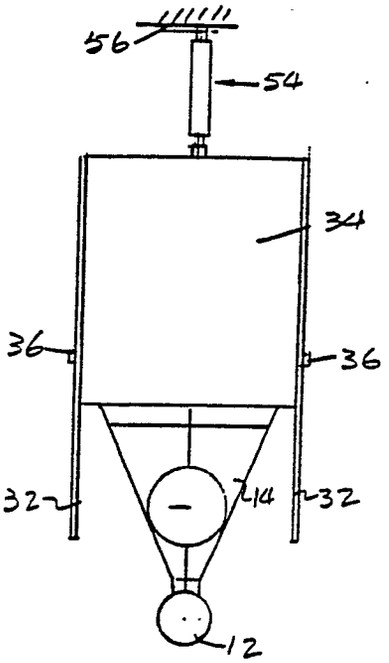
Fig. 7.



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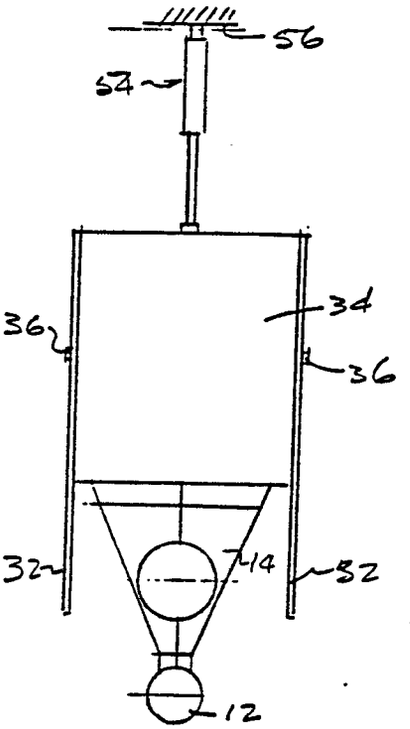


Fig. 9.

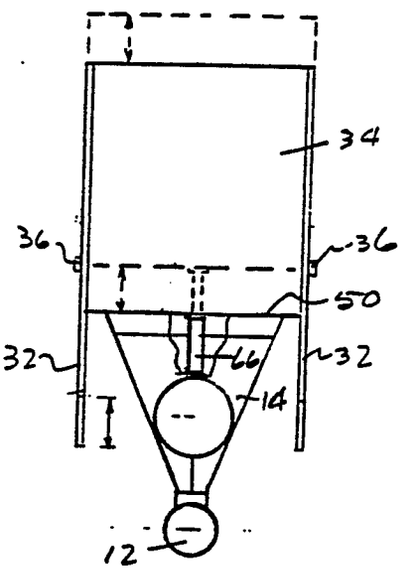
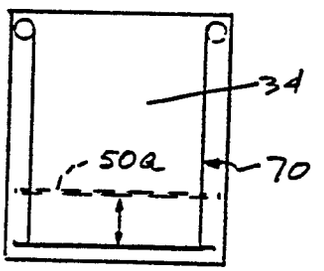


Fig. 10.



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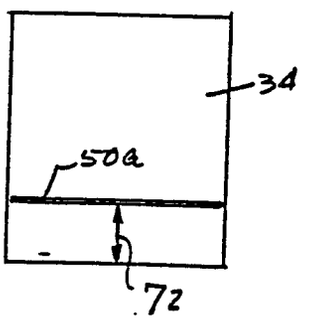


Fig.12A

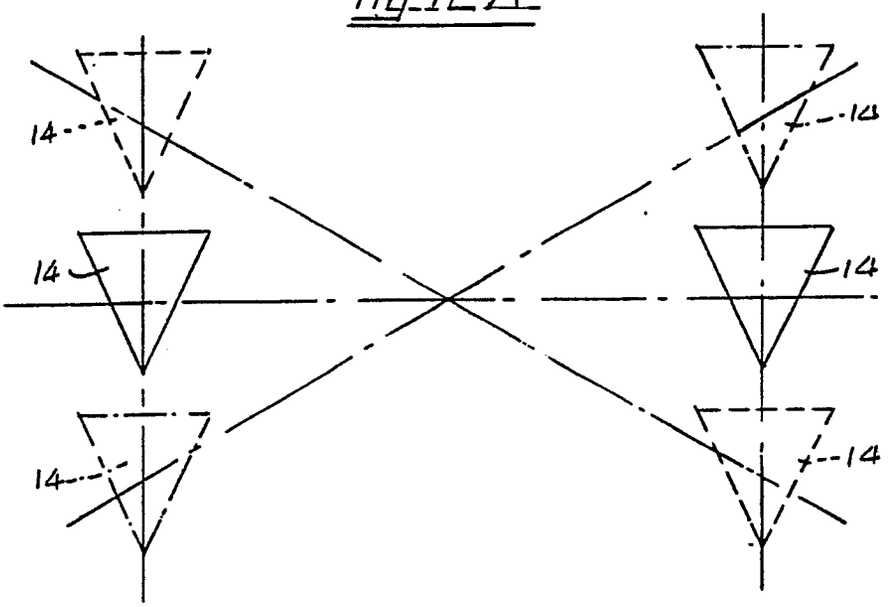


Fig.12B

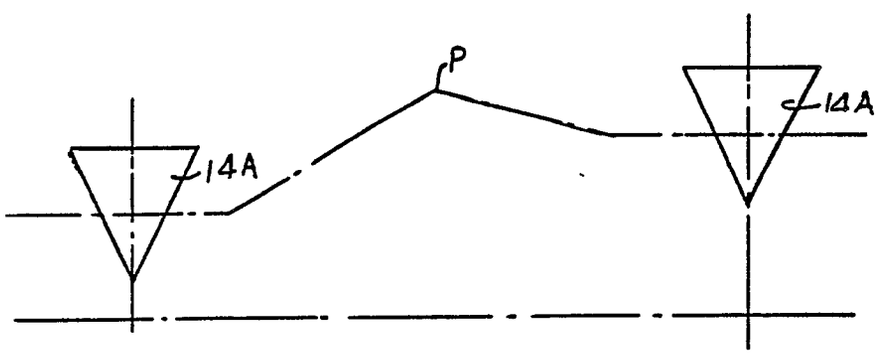


Fig.12

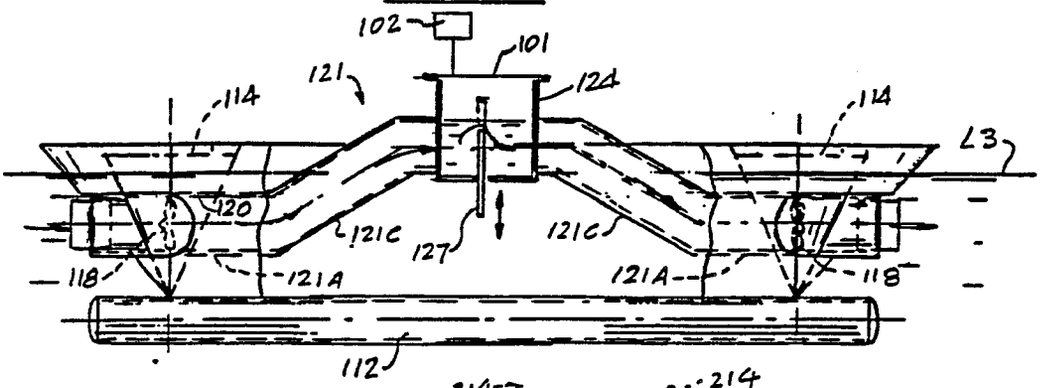


Fig.13

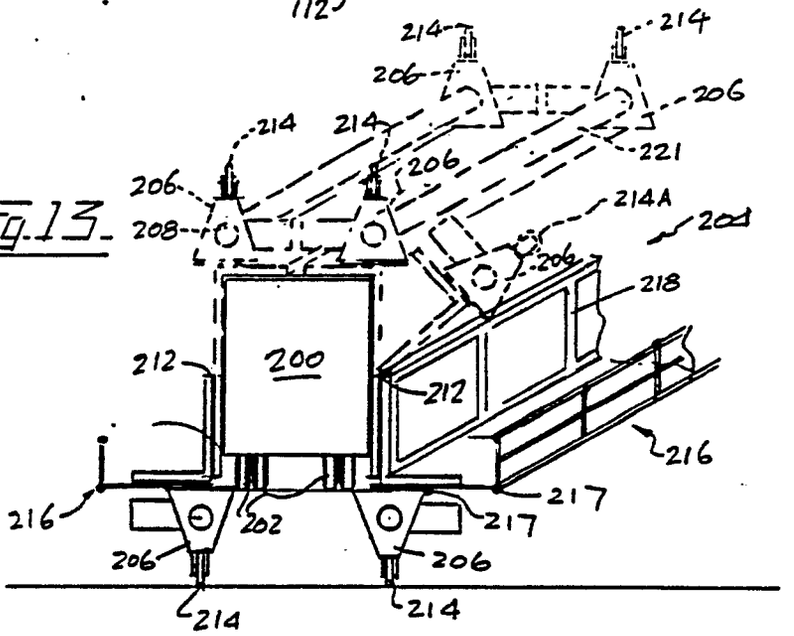


Fig.14

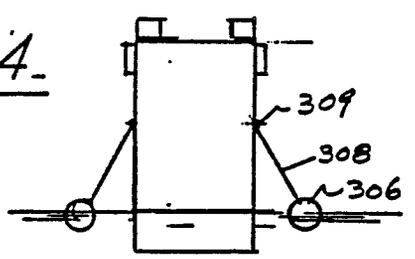


Fig.15.

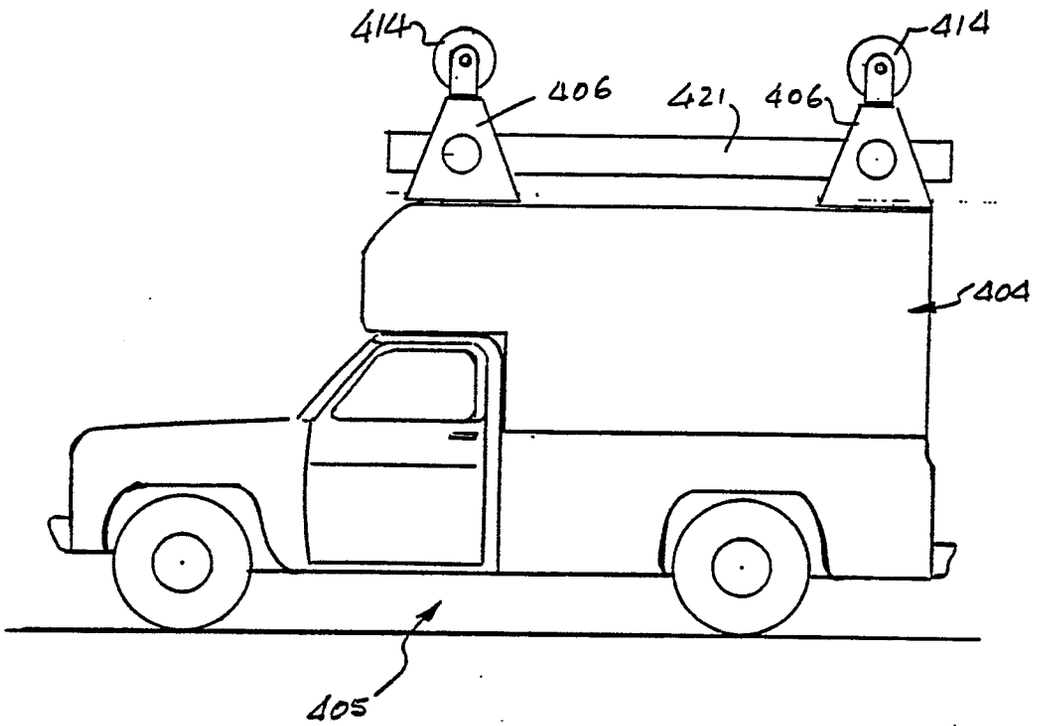


Fig.16.

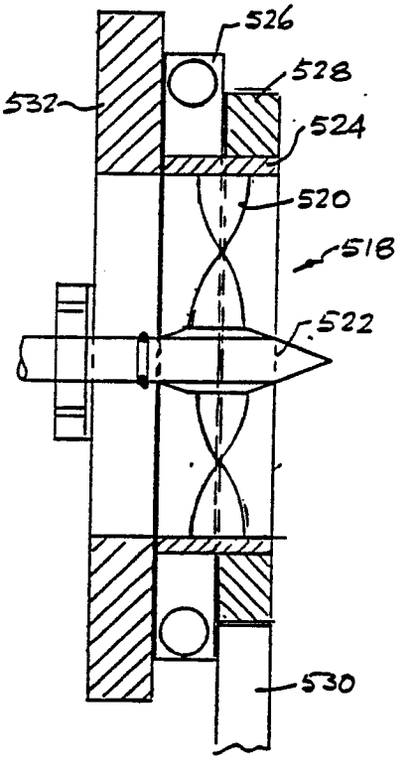


Fig.17.

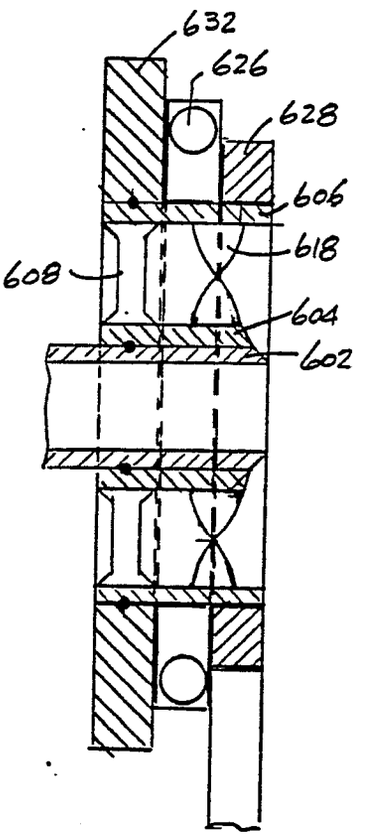
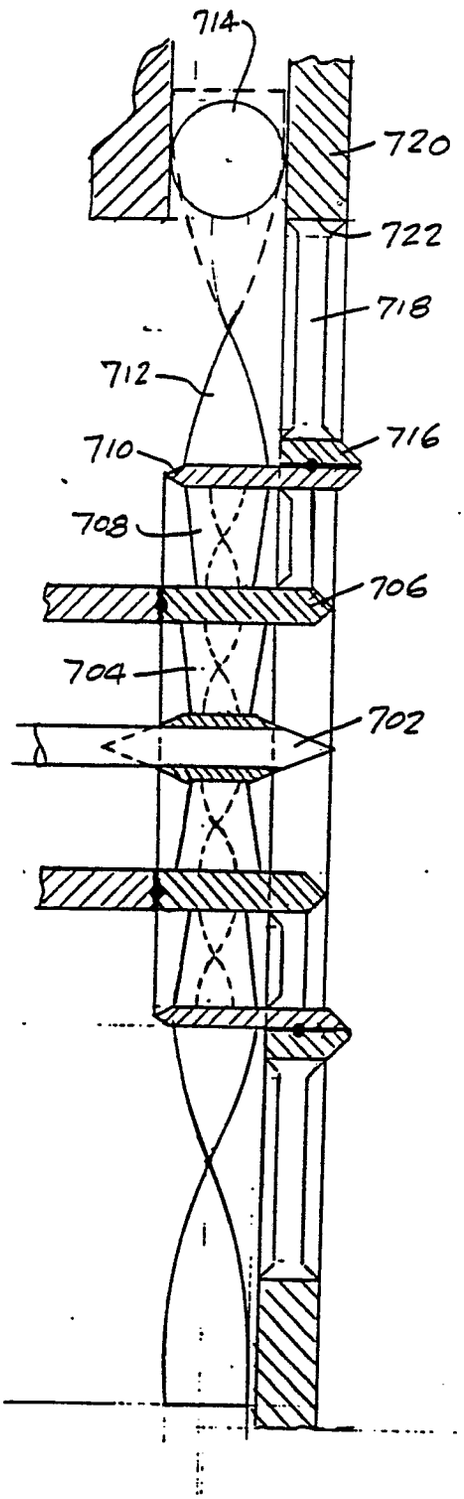


Fig.18.



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 11 3566

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-3 412 705 (NESSON) * Whole document *	1-3	B 63 H 5/14 B 63 H 25/46
Y		13-15, 19,20	
A		4-9	
Y	GB-A- 527 599 (BADOVICI) * Whole document *	13	
A		16,17	
Y	DE-A-1 756 779 (WEISS) * Page 1, paragraph 2 - page 2, last paragraph; figures I-V *	14	
A		1-9	
Y	GB-A-1 130 378 (TAMCO LTD) * Whole document *	15	
A		1-11	
Y	US-A-1 197 850 (SATTERTHWAITE) * Page 7, line 61 - page 8, line 51; figures 11,12 *	19,10	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A		1-9	B 63 H B 63 B
A	DE-A-3 029 632 (GULAIF) * Whole document *	1-11	
A	US-A-3 198 158 (WINTER)		
A	FR-A- 529 147 (GILL PROPELLER CO.)		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	07-11-1989	DE SENA Y HERNANDORENA A

CATEGORY OF CITED DOCUMENTS

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