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(54) Hydraulic propeller thrust enhancement method

(57) The present invention relates to a hydraulic propeller enhancement method for enhancing the propelling force of a hydraulic propeller (30). The present invention uses a gas release outlet (40) in the propeller (32) at the area where the high-speed axial flow of water F passes for guiding in a gas by means of a negative pressure subject to Bernoulli's principle. Thus, subject to Bernoulli's principle, gas compressible characteristic and Boyle's law and the arrangement of the contracted end piece (341) of the nozzle (34) to work as an air compressor for compressing air bubbles (60), the invention uses one single gas guide device (50) and a negative pressure suction force to guide in air bubbles (60) to enhance the propelling force of the hydraulic propeller (30).

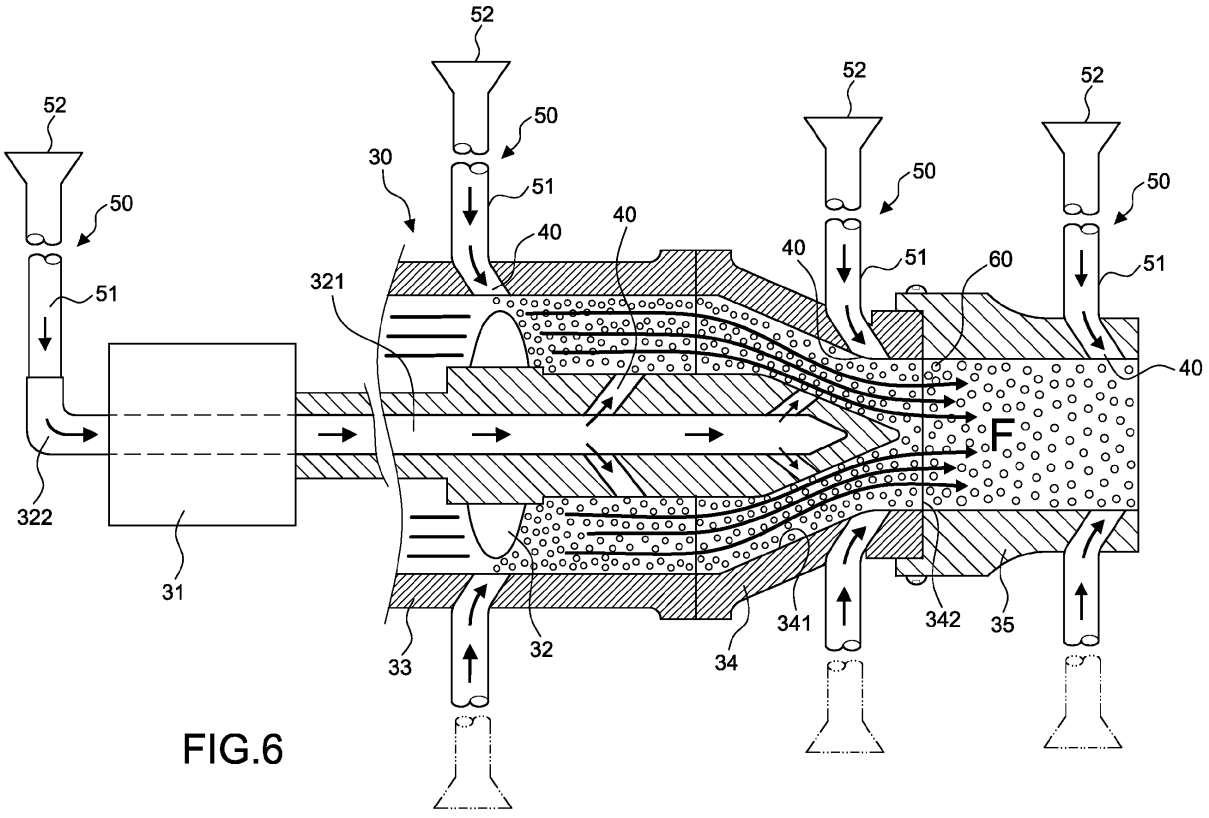

FIG.6

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention:

[0001] The present invention relates to hydraulic propeller technology and more particularly, to a hydraulic propeller enhancement method for enhancing the propelling force of a hydraulic propeller by means of the application of a gas.

2. Description of the Related Art:

[0002] A conventional for enhancing the propelling force of a hydraulic propeller is known by: increasing the horsepower of the propeller, using a different design of propeller or transmission system, or changing the angle of attach of the propeller.

[0003] FIG. 1 illustrates a conventional hydraulic propeller **10** of a boat **20;** the hydraulic propeller **10** comprises a power engine **11,** a water passage **12,** a propeller **13,** a nozzle **14** and a directional nozzle **15.** FIG. 2 illustrates a flow of water passing through the nozzle **14** of the hydraulic propeller **10.** Because only a flow of pure water **141** is driven out of the nozzle **14,** the reactive force thus produced is less strong, there is room for improvement.

[0004] To improve the performance of the aforesaid hydraulic propeller, a complicated design or a change of the structural details of the propeller may be necessary. However, it costs a lot to improve the performance of the hydraulic propeller in this manner.

[0005] Therefore, it is desirable to provide a method for enhancing the propelling force of a hydraulic propeller and improving its performance and reducing its fuel consumption.

SUMMARY OF THE INVENTION

[0006] The present invention has been accomplished under the circumstances in view. It is the main object of the present invention to provide a method for enhancing the propelling force of a hydraulic propeller, which provides a gas release outlet in the propeller at the area where the high-speed axial flow of water passes for guiding in a gas by means of a negative pressure subject to Bernoulli's principle.

[0007] To achieve the main object, a hydraulic propeller enhancement method comprises the step of:

a) providing a boat and then installing a hydraulic propeller in the boat, wherein the hydraulic propeller comprises a power engine, a water passage, a propeller rotatably accommodated in the water passage and rotatable by the power engine to cause a high-speed axial flow of water, a nozzle located on an outlet of the water passage and terminating in a contracted end piece;

b) installing at least one gas release outlet in the hydraulic propeller at a selected area the high-speed axial flow of water passes;

c) providing a gas guide device comprising at least one guide pipe arranged at a selection location in the boat and connecting a bottom end of the at least one guide pipe to the at least one gas release outlet;

d) employing said hydraulic propeller within said high-speed axial flow of water passing through said at least one gas release outlet, due to Bernoulli's principle, said high-speed axial flow of water enables pressure around said at least one gas release outlet rapidly decreased to form a negative pressure for sucking outside air into a gas inlet located on the top end of said at least one guide pipe during rotation of said propeller ;

e) employing said negative pressure to suck in outside air which is to be guided by said at least one guide pipe into said at least one gas release outlet to mix with water and to produce air bubbles; and

f) subject to compressible gas characteristic, the air bubbles thus produced pass through the contracted end piece of the nozzle are compressed to reduce the size, and the compressed air bubbles expand suddenly subject to a pressure difference between the inside of said contracted end piece and the outside of the nozzle when going out of the nozzle, thereby enhancing the propelling force of the hydraulic propeller.

[0008] The at least one gas release outlet is located on the peripheral wall of the water passage for the connection of the at least one guide pipe of the gas guide device; the at least one gas release outlet is located on the peripheral wall of the nozzle for the connection of the at least one guide pipe of the gas guide device.

[0009] The hydraulic propeller further comprises a directional nozzle connected to a distal end of the nozzle; the at least one gas release outlet is located on the peripheral wall of said directional nozzle for the connection of the at least one guide pipe of the gas guide device.

[0010] Moreover, the propeller comprises an axial tube having an inner end connected to the at least one guide pipe of the gas guide device and an outer end extended to the at least one gas release outlet located on the outer surface of the propeller.

[0011] Besides, the gas guide device uses a supplementary measure to guide engine waste gas or low pressure gas from the steam turbine into the at least one guide pipe of the gas guide device from for generating air bubbles.

[0012] The gas guide device further compresses a

pressure device for pumping a gas into the at least one guide pipe toward the at least one gas release outlet, the pressure device being selected from an air compressor, an air blower, an engine, a steam turbine and a turbo of the boat.

[0013] Thus, subject to Bernoulli's principle, gas compressible characteristic and Boyle's law and the arrangement of the contracted end piece of the nozzle to work as an air compressor for compressing air bubbles, the invention uses one single gas guide device and a negative pressure suction force to guide in air bubbles to enhance the propelling force of the hydraulic propeller, saving power consumption and cost.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

FIG. 1 is a schematic drawing of a hydraulic propeller according to the prior art.

FIG. 2 is a schematic drawing illustrating flows of water driven out of the nozzle of the hydraulic propeller according to the prior art.

FIG. 3 is a schematic drawing illustrating air bubbles generated in a nozzle of a hydraulic propeller in accordance with the present invention.

FIG. 4 is a schematic drawing illustrating a gas guided into the hydraulic propeller in accordance with the present invention.

FIG. 5 is a sectional view taken in an enlarged scale line 5-5 of FIG. 4.

FIG. 6 corresponds to FIG. 5, illustrating air bubbles generated in the negative pressure zone.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0015] Further features and benefits of the present invention will be apparent from the following detailed description of the preferred embodiment taken in conjunction with the annexed drawings. However, it is to be understood that the invention is applicable to any of a variety of boats. The present preferred embodiment is simply an example but not a limitation.

[0016] Referring to FIG. 3, when compared to the prior art design shown in FIG. 2 in which only a flow of pure water is driven out of the nozzle, multiple air bubbles **60** are generated in the flow of water **141** that is driven out of the nozzle of the hydraulic propeller.

[0017] Referring to FIGS. 3 to 5, a hydraulic propeller enhancement method in accordance with the present invention comprises the steps of:

a) providing a boat **20** in any type or shape, and then installing a hydraulic propeller **30** in the boat **20,** wherein the hydraulic propeller **30** comprises a power engine **31,** a water passage **33,** a propeller **32** rotatably accommodated in the water passage **33** and rotatable by the power engine **31** to cause a high-speed axial flow of water **F,** as shown in FIGS. 5 and 6, a nozzle **34** located on the-outlet of the water passage **33** and terminating in a contracted end piece **341** and then an outlet **342,** and a directional nozzle **35** connected to the outlet **342** of the nozzle **34** (the propeller **30** of the known art, no further detailed description in this regard is necessary);

b) installing at least one gas release outlet **40** in the hydraulic propeller **30** at the water passage **33,** the nozzle **34,** the directional nozzle **35** or any location where the high-speed axial flow of water **F** passes, and attaching an axial tube **321** to the propeller **32** to connect an inner end **322** of the axial tube **321** to at least one gas pipe **51** and to have the at least one gas release outlet **40** be formed in each of the aforesaid four components, as shown in FIGS. 5 and 6, or in the outer end **342** of the axial tube **321** where the velocity of the flow of water **141** is high, wherein each gas release outlet **40** can made in, but not limited to, circular shape, and backwardly inclined or perpendicular to the tube wall for causing a suction force of negative pressure upon passing of a high-speed of water;

c) providing a gas guide device **50,** which, as shown in FIG. 4, comprises the at least one guide pipe **51** arranged at a selection location in the boat **20** above the water line **WL** and connected with the bottom end thereof to the at least one gas release outlet **40** at the water passage **33** and/or the nozzle **34** and/or the directional nozzle **35** or the axial tube **321** of the propeller **32** subject to type of the board or actual requirements;

d) employing the hydraulic propeller **30** within the high-speed axial flow of water **F** passing through the at least one gas release outlet **40,** due to Bernoulli's principle, the high-speed axial flow of water **F** enables pressure around the at least one gas release outlet **40** rapidly decreased to form a negative pressure for sucking outside air into a gas inlet **52** located on the top end of the at least one guide pipe **51** during rotation of the propeller **32** without power consumption to save energy consumption;

e) employing said negative pressure to suck in outside air which is to be guided by said at least one guide pipe **51** into said at least one gas release outlet **40** to mix with water and to produce air bubbles **60;** and

f) subject to compressible gas characteristic, the air bubbles **60** are compressed to reduce the size when passing through the contracted end piece **341** of the nozzle **34,** and the compressed air bubbles **60** expand suddenly subject to a pressure difference between the inside of the contracted end piece **341** and the outside of the nozzle **34** when they go out of the nozzle **34,** enhancing the propelling force of the hydraulic propeller **30.**

[0018] In other words, when the high-speed axial flow of water F propelled by the propeller **32** passes through the contracted end piece **341** of the nozzle **34,** it flowing speed is accelerated, and the pressure at the orifice of the nozzle **34** is relatively increased. The air bubbles **60** that are sucked into the at least one gas release outlet **40** are small-sized due to compression. When the compressed air bubbles **60** move with the flow of water to the outer end **342** of the axial tube **321,** the surrounding water pressure is reduced, and therefore, the compressed air bubbles **60** expand suddenly, as shown in FIG. 3, enhancing the reactive force of the axial flow of water **F,** and therefore, the invention greatly increases the propelling force of the hydraulic propeller, i.e., the technical measure of the present invention utilizes:

1. Bernoulli's principle: a high-speed flow causes generation of a negative pressure therearound.

2. Gas compressible characteristic and Boyle's law: the volume of gas is indirectly proportional to the applied pressure, i.e., $P_1V_1=P_2V_2$; when increasing the pressure, the volume is reduced, or when reducing the pressure, the volume is increased. For example, $2P_11V_1=1P_22V_2$.

3. Air compressor: water is not compressible, however it becomes compressible when contains air bubbles **60;** the contracted end piece **341** of the nozzle **34** works as an air compressor for compressing the air bubbles **60** passing therethrough.

[0019] The aforesaid technical measure for enabling the hydraulic propeller to guide in outside air for generating air bubbles **60** can be achieved simply by providing the at least one gas release outlet **40** in the hydraulic propeller **30** in the area where the high-speed flow of water passes without using any power, and therefore this method saves energy and cost. When a pressure is necessary drive air into the hydraulic propeller **30** for generating air bubbles **60,** a small power consumption can achieve a high effect.

[0020] Referring to FIG. 4, a supplementary measure may be employed to guide air or gas into the at least one guide pipe **51** of the gas guide device **50,** for example, engine waste gas or low pressure gas from the steam turbine may be guided into the at least one guide pipe **51** of the gas guide device **50** for generating air bubbles **60.** This waste gas recycling method does not require any extra resource or cost. Further, a pressure device **70** and a control valve **71** may be used in the at least one guide pipe **51** of the gas guide device **50** for pumping a gas into the at least one guide pipe **51** toward the at least one gas release outlet **40.** The pressure device **70** can be the existing air compressor, air blower, engine, steam turbine or turbo of the boat **20.** Thus, using a small power can obtain multiple times of power.

[0021] In conclusion, subject to Bernoulli's principle, gas compressible characteristic and Boyle's law and the arrangement of the contracted end piece of the nozzle to work as an air compressor for compressing air bubbles, the invention uses one single gas guide device and a negative pressure suction force to guide in air bubbles to enhance the propelling force of the hydraulic propeller, saving power consumption and cost.

[0022] Although particular embodiments of the invention have been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.

Claims

1. A hydraulic propeller enhancement method, comprising the step of:

a) providing a boat (20) and then installing a hydraulic propeller (30) in said boat (20), wherein said hydraulic propeller (30) comprises a power engine (31), a water passage (33), a propeller (32) rotatably accommodated in said water passage (33) and rotatable by said power engine (31) to cause a high-speed axial flow of water F, a nozzle (34) located on an outlet (342) of said water passage (33) and terminating in a contracted end piece (341);
b) installing at least one gas release outlet (40) in said hydraulic propeller (30) at a selected area said high-speed axial flow of water F passes;
c) providing a gas guide device (50) comprising at least one guide pipe (51) arranged at a selection location in said boat (20) and connecting a bottom end of said at least one guide pipe (51) to said at least one gas release outlet (40);
d) employing said hydraulic propeller (30) within said high-speed axial flow of water F passing through said at least one gas release outlet (40), due to the Bernoulli's principle, said high-speed axial flow of water F enables pressure around said at least one gas release outlet (40) rapidly decreased to form a negative pressure for sucking outside air into a gas inlet (52) located on the top end of said at least one guide pipe (51) during rotation of said propeller (32);

e) employing said negative pressure to suck in outside air which is to be guided by said at least one guide pipe (51) into said at least one gas release outlet (40) to mix with water and to produce air bubbles (60); and

f) subject to compressible gas characteristic, the air bubbles (60) thus produced pass through said contracted end piece (341) of said nozzle (34) are compressed to reduce the size, and the compressed air bubbles (60) expand suddenly subject to a pressure difference between the inside of said contracted end piece (341) and the outside of said nozzle (34) when going out of said nozzle (34), thereby enhancing the propelling force of said hydraulic propeller (30).

2. The hydraulic propeller enhancement method as claimed in claim 1, wherein said at least one gas release outlet (40) is located on the peripheral wall of said water passage (33) for the connection of said at least one guide pipe (51) of said gas guide device (50).

3. The hydraulic propeller enhancement method as claimed in claim 1, wherein said at least one gas release outlet (40) is located on the peripheral wall of said nozzle (34) for the connection of said at least one guide pipe (51) of said gas guide device (50).

4. The hydraulic propeller enhancement method as claimed in claim 1, wherein said hydraulic propeller (30) further comprises a directional nozzle (35) connected to a distal end of said nozzle (34); said at least one gas release outlet (40) is located on the peripheral wall of said directional nozzle (35) for the connection of said at least one guide pipe (51) of said gas guide device (50).

5. The hydraulic propeller enhancement method as claimed in claim 1, wherein said propeller (32) comprises an axial tube (321) having an inner end (322) connected to said at least one guide pipe (51) of said gas guide device (50) and an outer end extended to said at least one gas release outlet (40) located on the outer surface of said propeller (32).

6. The hydraulic propeller enhancement method as claimed in claim 1, wherein said at least one guide pipe (51) of said gas guide device (50) has a top end thereof terminating in said gas inlet (52) and disposed in said boat (20) above the water line.

7. The hydraulic propeller enhancement method as claimed in claim 6, wherein said gas guide device (50) uses a supplementary measure to guide engine waste gas or low pressure gas from the steam turbine into said at least one guide pipe (51) of said gas guide device (50) for generating air bubbles (60).

8. The hydraulic propeller enhancement method as claimed in claim 7, wherein said gas guide device (50) further compresses a pressure device (70) for pumping a gas into said at least one guide pipe (51) toward said at least one gas release outlet (40), said pressure device (70) being selected from an air compressor, an air blower, an engine, a steam turbine and a turbo of said boat (20).

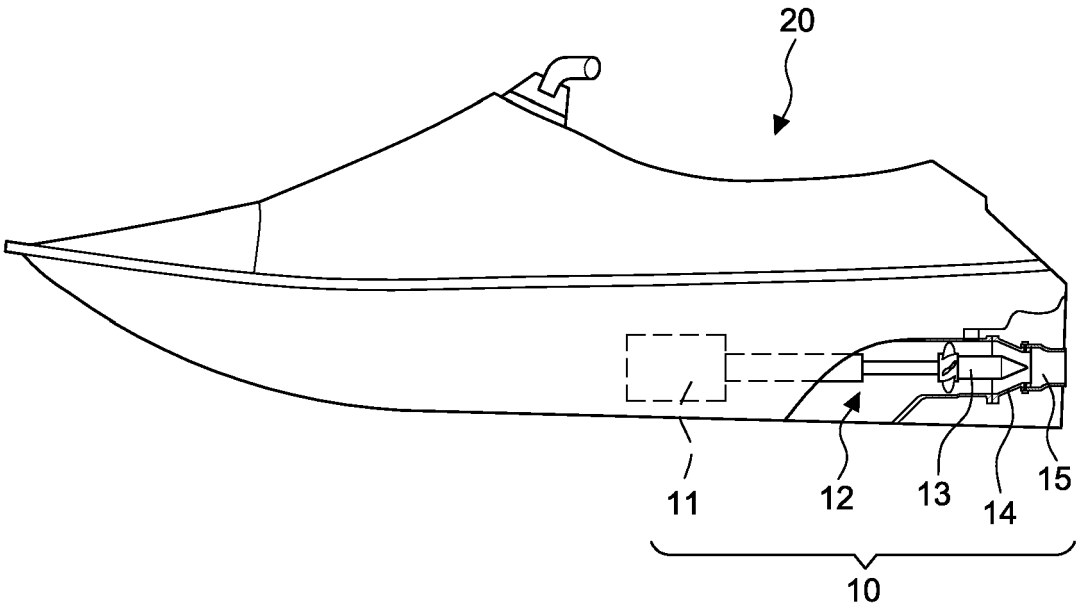

FIG.1
PRIOR ART

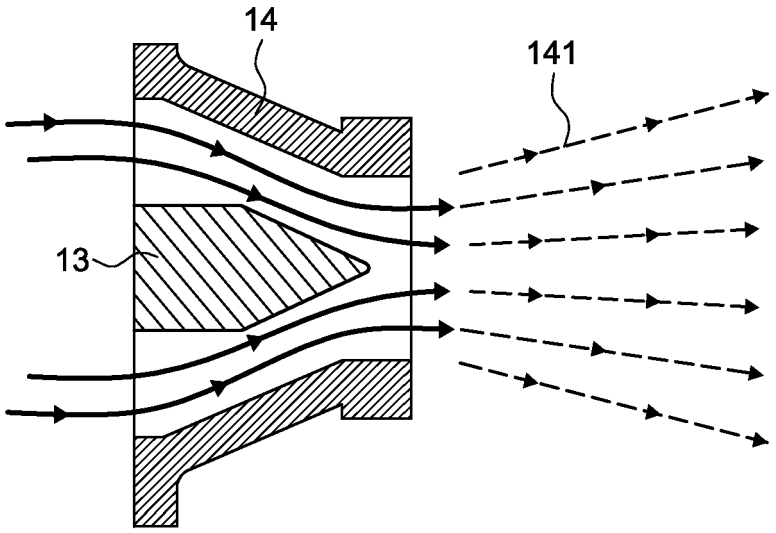

FIG.2
PRIOR ART

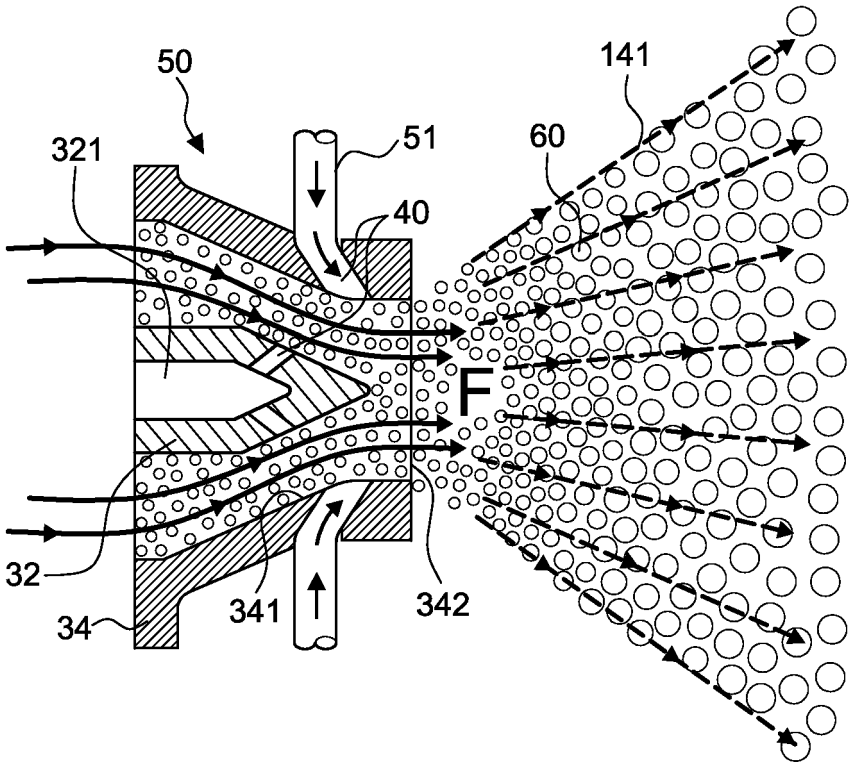

FIG.3

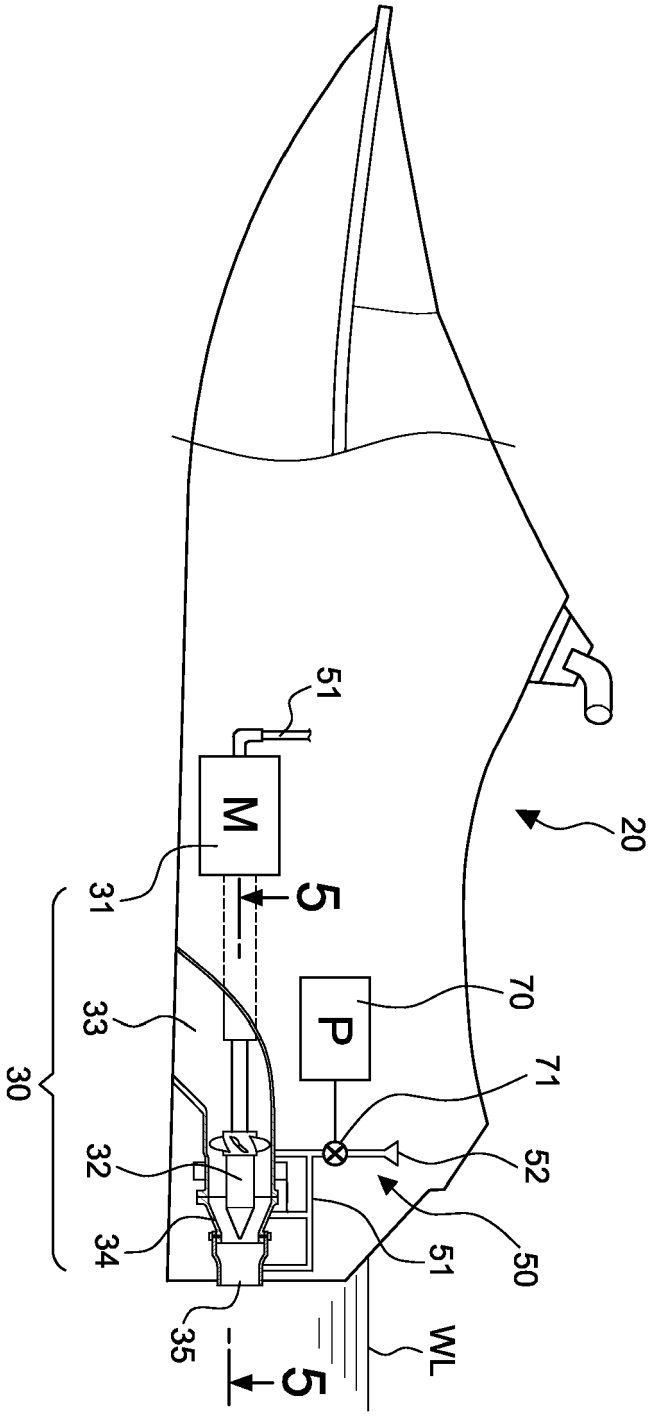

FIG.4

FIG.5

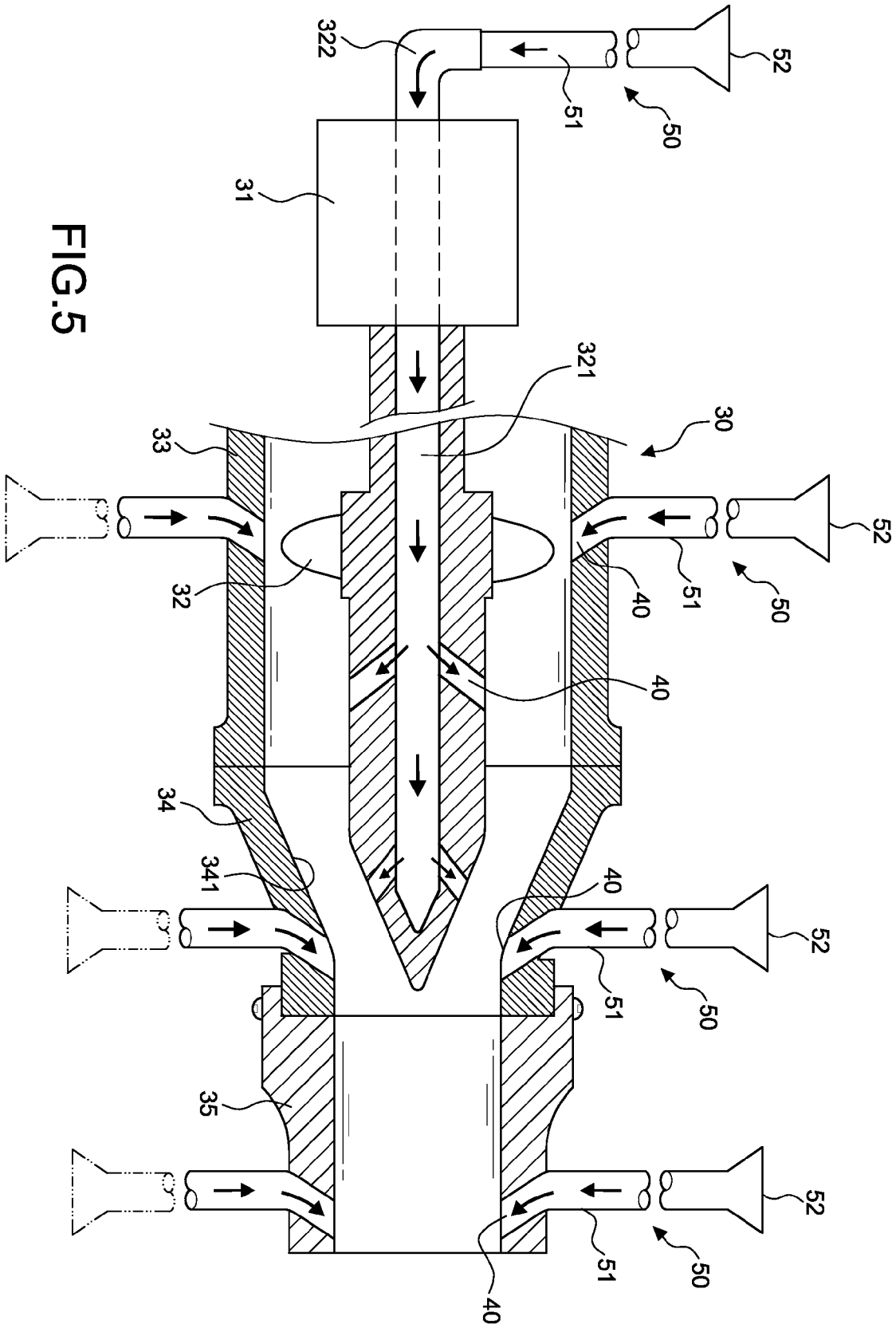
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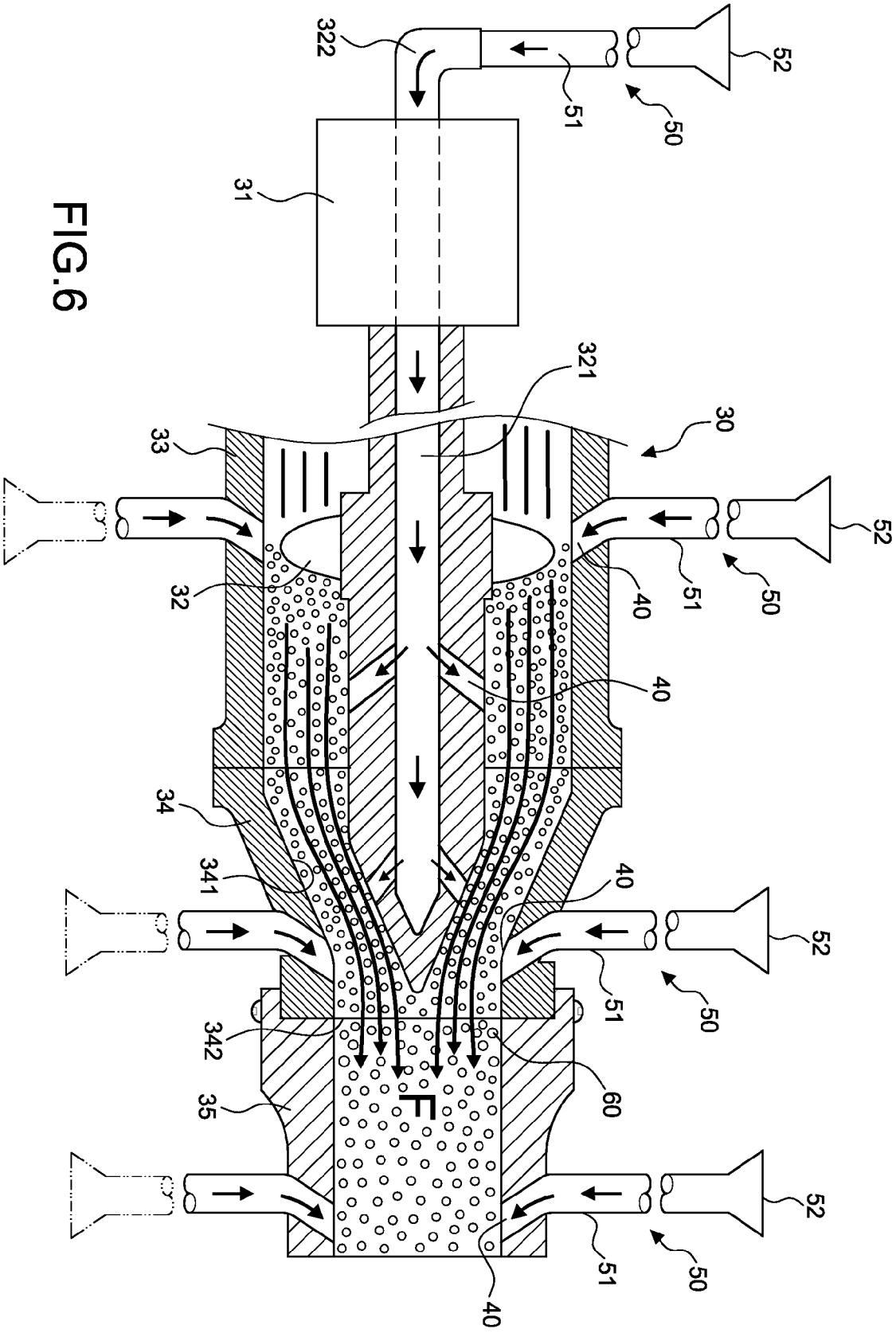
FIG.6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EUROPEAN SEARCH REPORT

Application Number
EP 11 17 8735

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 3 365 891 A (WILLIAMS VIRGIL C) 30 January 1968 (1968-01-30) * column 1, line 14 - column 2, line 63; figure 1 *	1-8	INV. B63H11/12
A	US 6 168 485 B1 (HALL KIMBALL P [US] ET AL) 2 January 2001 (2001-01-02) * columns 5-6; figure 1 *	1-8	
A	DE 197 39 445 A1 (HEINIG JUERGEN DR ING [DE]; NENNINGER PETER [DE]) 11 March 1999 (1999-03-11) * column 3, line 53 - column 4, line 45; figure 3 *	1-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			B63H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 February 2012	Raffaelli, Leonardo

CATEGORY OF CITED DOCUMENTS

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20-02-2012

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