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(71) Applicant *(for all designated States except US)*: **A.P. Møller-Mærsk A/S** [DK/DK]; Esplanaden 50, DK-1263 Copenhagen K (DK).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **GOVERT VERMEIDEN, Jacob** [NL/NL]; Ridderstraat 42, NL-8061 GK Hasselt (NL).

(74) Agent: **ZACCO DENMARK A/S**; Hans Bekkevolds Allé 7, DK-2900 Hellerup (DK).

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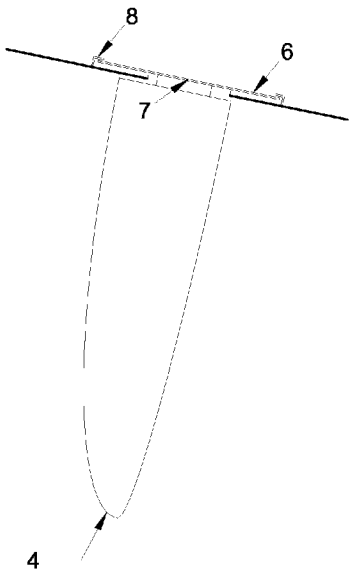

Figure 3

(57) Abstract: The invention relates to a propulsive system for a maritime vessel (1), the system comprising an oscillating or transversely translating sealing member (5) provided in the hull of a maritime vessel. The sealing member (5) is possibly connected to an oscillating power source and possibly connected to propulsive elements (4). The sealing member (5) is slide ably connected to the hull (2) allowing the sealing member to travel in multiple directions. The sealing member (5) covers the opening in the hull (3) and the opening in the hull will at any time lie within the area covered by oscillating sealing member (5). Sealing means (10) are provided for sealing the periphery of the opening in the hull.

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Sealing for fin propulsion

Field of invention

The present invention relates to a propulsion system for a maritime vessel wherein the employed means for propulsion includes flapping, transversely translating or oscillating foils or fins.

According to one aspect, the invention relates to a maritime vessel comprising a hull having an opening through which a propulsive system least partially extends. The propulsive system comprises at least one transversely translating or oscillating sealing member provided in the hull of the vessel.

The sealing member has one portion facing the interior of the vessel and another portion facing away from the interior of the vessel.

Propulsive means extends from the oscillating or transversely translating sealing member, from a portion facing away from said interior of the vessel.

Mountings allows the oscillating or transversely translating sealing member to move inside or outside the hull.

The sealing member is slide ably connected to the hull by fixing means allowing the member to travel in two or more directions.

It must be understood that the hull of the ship accommodates the oscillating or transversely translating system incl. all necessary technical means.

Background

It is recognised that fish and sea mammals move and manoeuvre in water by oscillating fins with higher propulsive efficiency than today's maritime vessels.

No technological equivalent to fin propulsion has until now not been implemented in maritime vessels.

The present invention is an important practical element of realizing efficient and operative flapping propulsion based on the combination of one periodical translating movement and possibly one periodical rotational movement of one or several fins under the ship.

The oscillating motion of a fishtail can be simulated and generated either by rotation of a fin, or, as is the case with sea-mammals and tuna-related fish, by a combination of at least one periodical translation and one periodical rotation of the caudal fin.

Today, almost every waterborne vessel, regardless of size, service speed and application, are propelled by one or more rotating propulsive elements.

The propulsive elements, e.g. propellers, jets, ducted propellers or pump jets etc., are rotating about their own axis. On larger vessel, the propellers are rotating at about 50-500 rpm.

The propellers are carefully designed for their particular application.

One important objective for the designers is to limit the vessels overall fuel consumption. This is achieved through careful design of several parameters such as hull form, propulsion plant and propulsive elements.

The efficiency of today's most effective propellers rarely exceeds 80 %, in fact efficiencies of 30-70 % are generally accepted, leading to unnecessarily large power plants and increased fuel consumption.

Therefore, considering the above mentioned inexpediencies, usefulness of a fully operational and improved low-tech but high-efficiency marine propulsion system is apparent.

Background art

Propulsion by means of oscillating or transversely translating fins possesses attractive features such as higher efficiency than a rotating propeller and inherent steering, which eliminates the need for a separate rudder with the associated costs and the associated reliability issues; in addition it frees volume inside the hull for increased cargo accommodation. The higher efficiency is achieved through lower impulse losses, lower hydrodynamic friction losses, lower induced drag losses and a lower drag on the hull itself, and results in either lower fuel consumption and lower installed power for the prime movers, or a higher service speed with the same installed propulsion power and fuel consumption.

Important challenges for oscillating or transversely translating fins consist in avoiding large mechanical friction losses, and consist in providing reliability and safety comparable to the rotating propellers.

US patent no 5,401,196, published March 28, 1995 (TRIANTAFYLLOU et al.) discloses a propulsion system employing flapping foils. The patent, which teaches a system utilizing at least one foil, discloses a propulsive system wherein a foil is oscillated in a direction transverse to the vessel's sailing direction and is rotationally oscillated about a vertical axis. Preferably, according to the US patent, the propulsive system is built up from a plurality

of foils which are oscillated out of phase resulting in the propulsive elements thrust in a direction transverse to the sailing direction is insignificant.

The main features of a mechanical embodiment of the propulsion system as disclosed in the US patent will be explained below.

Figures 4A, 4B, 5A, 5B & 5C illustrate an embodiment for a foil propulsion system in accordance with the US patent. The propulsive system is build up from two foils (10), each connected via a shaft (34), through a slit (36) in the aft section of the hull (30) to a table (40). The extent of the slits (36), as can be seen in figure 4A and as illustrated by the arrows (38), being greater than the total maximum heave amplitude for the foils. As may best be seen in figure 4B, each table (40) has two or more wheels or rollers (42) mounted to the forward underside and to the rear underside, in which the wheels or rollers ride in corresponding tracks (44) mounted to hull (32). The tables (40) and the foils (10) attached thereto are thus free to move both directions along one axis (38), and are fixed from movement in any other direction. Conclusively, the mechanism according to the US patent is working through a number of slits (36) established in the hull (32), each transverse to the vessels forward sailing direction, and the extension of the slits (36) exceeding the transverse motion of the foils. The fins are also rotating under power around axes placed such that rotation substantially affects the angle of the foil with the direction of motion of the ship.

The patent has so far only seen limited practical application in propulsion of maritime vessels.

US patent no 6,877,692 B2, published April 12, 2005 (Liu) disclose a propulsion system for a submarine. The patent teaches propulsion based on “thuni-form” movement of foil members. The foil members are mounted to the hull for reciprocating oscillating movement towards and away from each other

creating the forward movement due to compression of water between the foil members. The patent does not teach employment of fin propulsion for surface vessels.

US 6,022,249 A, published February 08, 2000 (Ketterman) teaches a water craft comprising a hull having propulsion means extending below the water line. The propulsion means comprises a pair of flappers each adapted to oscillate through an arcuate path in a generally transverse direction with respect to the central longitudinal dimension of the watercraft. Means are operatively associated with the propulsion means for applying input force to the propulsion means. The flappers twist to form an angle of attack for providing forward thrust with respect to the longitudinal dimension of the watercraft while moving in both directions along the arcuate path.

DE 4,212,920 A1, published October 21, 1993 (Erich) teaches a muscle-powered drive system for a catamaran, where the system uses flexible fins positioned between the hulls. The fins have pivots at their forward ends allowing limited movement. The fins are arranged one forward of the other and mounted on downward extensions of a rocker beam suspended from flexible rubber bands.

WO 03/026954 A1, published April 3, 2003 (Inocean) suggests a system utilizing a sinusoidal pattern of movement for propulsion or energy recovery. The system comprises a plurality of rigid hull elements arranged in a row and rotatable attached to one another for rotation about parallel axes of rotation across the longitudinal dimension of the row of hull elements. The system further comprises movement devices for rotating the hull elements relative to one another or movement devices for recovery of energy as a result of rotating the hull elements relative to one another.

WO 2006/038808 A1, published April 13, 2006 (Clavis Biopropulsion) suggests a device comprising at least one transversely translating fin. The device encompasses actuating and drive means allowing substantially free oscillating motion of the fin. The device operates by means of an impulse, established by drive means, every so many cycles and spring are used to store the pulsating energy provided by the drive means.

Brief description of the invention

It is an objective of the present invention to set forth a propulsive system which, in an operational manner, generally will increase the overall efficiency of a maritime vessels propulsive system. This is achieved by allowing a maritime vessel to be propelled by means of transversely translating propulsive means extending through an opening which is covered by the oscillating or transversely translating sealing member.

A further object of the present invention is to set forth a propulsive mechanism utilizing the known flapping foils as disclosed above, however, according to the invention, an operable system introducing distinct contributions and advantages over prior art is presented, wherein a part of the hull of a maritime vessel is provided with an opening which is permanently covered by a part of a sealing member leading to effective separation between the environment outside the ship and the interior of the ship. This separation reduces the part of the mechanism that needs to operate in water and thereby reduce the viscous losses and provides increased operational safety.

Sealing of the system without causing substantial mechanical friction losses and without causing substantial hydrodynamic drag and without compromising reliability and safety represents significant challenges which so far remained unsolved.

Sealing of the system is problematical given a ships significant structural flexibility, and by the fact that the dimensions of opening in the hull are large considering the size of the ship.

Forces generated on the surface covered by the sealing member are large, and together with the high translation speed of the oscillating or transversely translating sealing member, which is easily reaching 10 m/s, a need for a unique sealing system is clear.

According to one embodiment, the oscillating or transversely translating sealing member transmits a majority of the propulsive power to the propulsive means.

According to one embodiment, the oscillating or transversely translating sealing member does not transmit the majority of propulsive power to the propulsive means, and a distinct structure moves within the hull with substantially the same movement as the sealing member in order to drive the propulsive means. The sealing member may be connected to the propulsive means, or to a part thereof, by a connection allowing at least one rotation in both directions.

According to one embodiment, the oscillating or transversely translating sealing member acts as support and guide element for the propulsive means.

According to one embodiment, the propulsive means constitutes at least one foil.

According to one embodiment, the propulsive means is pivot able about an axis being substantially vertical or substantially normal to the surface of the hull at the location of the opening in the hull.

According to one embodiment, a screen or a guard is provided on the outside or the inside of hull.

According to one embodiment, the means for sealing is established at the periphery of the opening in the hull.

According to one embodiment, the means for sealing is, at least partially, established on the oscillating or transversely translating sealing member.

According to one embodiment, the means for sealing constitutes a two part sealing, wherein the first part of the sealing seals the portion of sealing member facing the interior of the vessel, and the second part of the sealing seals the portion of the sealing member facing away from the interior of the vessel.

According to one embodiment, the means for sealing comprise conduits allowing a pressurized medium to access to the sealing surfaces.

According to one embodiment, the first portion of the sealing is provided with slits allowing the sealing to flex around its own axis.

According to one embodiment, the second portion of the sealing is provided with a flexible mounting on a plate allowing the sealing to flex around its own axis.

According to another aspect, the invention relates to a method of sealing a propulsive system by covering an opening in a hull, from where means for propulsion extends, by means of an oscillating or transversely translating sealing member as described throughout the teachings of this document.

Brief description of the drawings

Figure 1 shows a principal and sectional side view of a maritime vessel incorporating a propulsion mechanism according to the present invention.

Figure 2 shows a principal top view of a maritime vessel incorporating a propulsion mechanism incl. sealing members according to the present invention.

Figure 3 shows a principal and sectional side view of the propulsive system incl. sealing member.

Figure 4 shows an example of a sealing for the inventive sealing member.

Detailed description of the invention with reference to the figures

According to the present invention, at least one oscillating or transversely translating sealing member (5) is provided in the hull (2) of a maritime vessel (1).

The oscillating heave motion of the sealing member (5) originates from the oscillating means according to at least one of the below embodiments:

I) The sealing member (5) is oscillated and/or translated by the propulsive means (4), or parts thereof. In this embodiment, the sealing member (5) follows the propulsive means (4), and no propulsive power is transferred from the sealing member (5) to the propulsive means (4).

II) The sealing member (5) is connected to the oscillating and/or translating means and transfers the propulsive power to the

propulsive means (4), or parts thereof. In this embodiment, the sealing member (5) drives the propulsive means (4).

The sealing member (5) may or may not, and in any embodiment, act as support and guide for the propulsive means (4).

In embodiments where the oscillating or transversely translating sealing member (5) does not transmit the majority of propulsive power to the propulsive means (4), a distinct structure (16) moves within the hull (2) with substantially the same movement as the sealing member (5) in order to drive the propulsive means (4).

The sealing member (5) is connected to the propulsive means, or parts thereof, by a connection allowing at least one rotation in both directions; however the connection may also include a larger degree of liberty.

The sealing member (5) is slide ably installed inside or outside the hull (2) allowing the member (5) to travel in multiple directions. The figures indicate that movement of the two sealing members are straight and parallel to each other, however, the system will proof equally beneficial in embodiments where the movement of the members are non parallel or the motion of the members is arched.

Preferably, the sealing member (5) is manufactured, either as an integrated part or as interconnected parts, and in the form of a steel slab produced in mild steel, high tensile steel, stainless steel or any other suitable material such as fibre reinforced plastic or fibre reinforced metal.

Further, the sealing member may be manufactured in any suitable profile, e.g. open web or even a honeycomb structure manufactured in a non-steel material.

The hull (2) is supplied with at least one opening (3). The sealing member (5) has to ensure that the opening in the hull (2) will not be exposed during the heave/oscillating motion of the member, that is; the member shall be larger (transversally) than the transverse length of opening in the hull (2) plus the transversal motion of the sealing member (5), in other words; the opening in the hull (2) remains covered by the sealing member (5) under all normal working conditions. The transversal outer edge of the swept area is indicated by (9) on figure 2.

In a preferred embodiment, the oscillating or transversely translating sealing member (5) is substantially flush with the outside of the hull's shell plating in order to maintain optimal hydrodynamic performance.

In some embodiments, it will be beneficial to provide a screen or a guard on the inside or the outside of the hull. The screen or guard will optimize water flow past the system consequently reducing drag and disturbance to the water flowing past the system. Further, the screen or guard may also act as a sealing member.

The embodiment according to the figures indicates the port & starboard propulsive systems incl. sealing members being offset in a longitudinal direction. It will be possible to construct a vessel with the systems being juxtaposed or being placed longitudinally one in front of the other, either totally or partially. The propulsion mechanism incl. sealing member according to the present invention is not in any way limited to one configuration above another configuration.

In order to imitate the motion of a fishtail, there may be a need for provision of means being able to pivot or influence pivoting of the propulsive means (4) at least partially around an axis of the propulsive means. The propulsive

means can be pivot able about an axis being substantially vertical or substantially normal to the surface of the hull at the location of the opening in the hull. The pivoting can be achieved via several different arrangements, e.g. electric or hydraulic motors, ram's, pure mechanical links and springs etc. The sealing member may in some embodiments accommodate the means for the pivoting of the propulsive means.

Sealing of the sealing member

A sealing system (10) applicable for the propulsion system according to the present invention is proposed below, although the inventive system is not in any way limited to the proposed sealing system.

The sealing system may include sleeves for sealing the area of penetration of the sealing member around the sockets of the propulsive means.

The sealing system can also act as the bearing and force absorbing means for the sealing member (5).

The sealing system will meet the challenges set up by members sliding and rotating in multiple directions and in a broad range of speeds.

The sealing is performed via a two-part sealing, which also is able to serve as bearing means allowing the sealing member (5) to bend and tilt slightly.

A first portion of the sealing (11) seals a first side (6) of the sealing member (5), and a second portion (12) of the sealing seals a second side (7) of the sealing member (5).

The first portion of the sealing (11) seals against the portion of the sealing member facing the interior of the vessel (6). The sealing receives the inwards

oriented forces exerted on the sealing member e.g. from the second portion of the sealing (12), propulsive forces and forces originating from the environment. The first portion of the sealing (11) is provided with slits (14) allowing the sealing to flex around its own axis, by which motion and deflection of the hull and the sealing member (5) is anticipated.

The second portion of the sealing (12) serves as the outer bearing and seal. It can be mounted in a way that it can tilt and remain parallel to the sealing member (5); in this case through the flexibility of the plate on which it is mounted, which itself acts as a flexible wall of a pressure chamber.

The means for sealing can at least partially be established on the oscillating or transversely translating sealing member.

The sealing is able to statically close off the system when the system is immobile. The static sealing may be realised by a separate elastic chamber that can be brought under pressure.

The seals are built up from material with flexible properties, such as stainless steel, bronze, steel, FRP, elastomer etc. allowing limited deflection of the seals.

The seals can be mounted on flexible mountings on plates (15) allowing the seals to flex around their own axis.

The seals can be configured as pressurized and/or hydrostatic seals with conduits (13) allowing a pressurized medium access to the sealing surfaces.

Portions of the sealing can be provided with slits (14) allowing the sealing to flex around its own axis. This will provide further flexibility allowing the seal

and bearing system to take up deflections in the hull and in the sealing member (5) respectively.

In the above, it has been assumed that the propulsive system is being used as part of a marine propulsion system, and this is to be considered the preferred application of the invention, it is also possible to utilize the present invention to propel vessels in other fluids that water, i.e. liquids or gases. Further, while a motor or engine-driven vessel has been assumed for the preferred embodiment, the invention may also be advantageously utilized in muscle powered systems. Such devices can provide faster motion with less exertion than currently available systems for propelling a swimmer or diver without a drive motor.

It should be emphasized that the term "comprises/comprising/comprised of" when used in this specification is taken to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof.

Claims

1. A maritime vessel (1) comprising at least one hull (2) having at least one opening (3) and a propulsive system extending at least partially through said at least one opening (3), said propulsive system comprising:

- at least one oscillating or transversely translating sealing member (5) provided in said hull (2) of said maritime vessel (1), said sealing member (5) having one portion (6) facing the interior of said vessel and another portion (7) facing away from said interior of said vessel (1),
- propulsive means (4) extending from said oscillating or transversely translating sealing member (5) from a portion facing away from said interior of said vessel (7),
- mountings (8) allowing said oscillating or transversely translating sealing member (5) to move inside or outside said hull (2),

characterized in that said at least one opening (3) is covered by said oscillating or transversely translating sealing member (5).

2. A propulsive system according to claim 1, wherein said oscillating or transversely translating sealing member (5) transmits a majority of the propulsive power to said propulsive means (4).

3. A propulsive system according to claim 1, wherein said oscillating or transversely translating sealing member (5) does not transmit the majority of propulsive power to said propulsive means (4), and where a distinct structure (16) moves within said hull (2) with substantially the same movement as said sealing member (5) in order to drive said propulsive means (4), said sealing member (5) being connected to said propulsive means (4), or to a part thereof, by a connection allowing at least one rotation in both directions.

4. A propulsive system according to claim 1, wherein said oscillating or transversely translating sealing member (5) act as a support and guide element for said propulsive means (4).

5. A propulsive system according to claim 1, wherein said propulsive means (4) constitute at least one foil (4).

6. A propulsive system according to claim 1, wherein said propulsive means are pivot able about an axis being substantially vertical or substantially normal to the surface of said hull (2) at the location of said opening (3) in said hull (2).

7. A propulsive system according to claim 1, wherein a screen or a guard is provided on the outside or the inside of said hull (2).

8. A propulsive system according to claim 1, wherein means for sealing (10) are established at the periphery of the opening (3) in said hull (2).

9. A propulsive system according to claim 1, wherein means for sealing at least partially are established on said oscillating or transversely translating sealing member (5).

10. A propulsive system according to claim 8 or 9, wherein said means for sealing constitute a two part sealing, wherein the first part of the sealing (11) seals the portion of said sealing member (5) facing said interior of the vessel (6), and the second part of the sealing (12) seals the portion of said sealing member (5) facing away from said interior of said hull (2).

11. A propulsive system according to claim 10, wherein said sealing means comprise conduits (13) allowing a pressurized medium access to the sealing surfaces.

12. A propulsive system according to claim 10, wherein the first portion of the sealing (11) is provided with slits (14) allowing the sealing to flex around its own axis.

13. A propulsive system according to claim 10, wherein the second portion of the sealing (13) is provided with flexible mounting on a plate (15) allowing the sealing to flex around its own axis.

14. A method of sealing a propulsive system according to any of the preceding claims wherein said at least one opening (3) is covered by said oscillating or transversely translating sealing member (5).

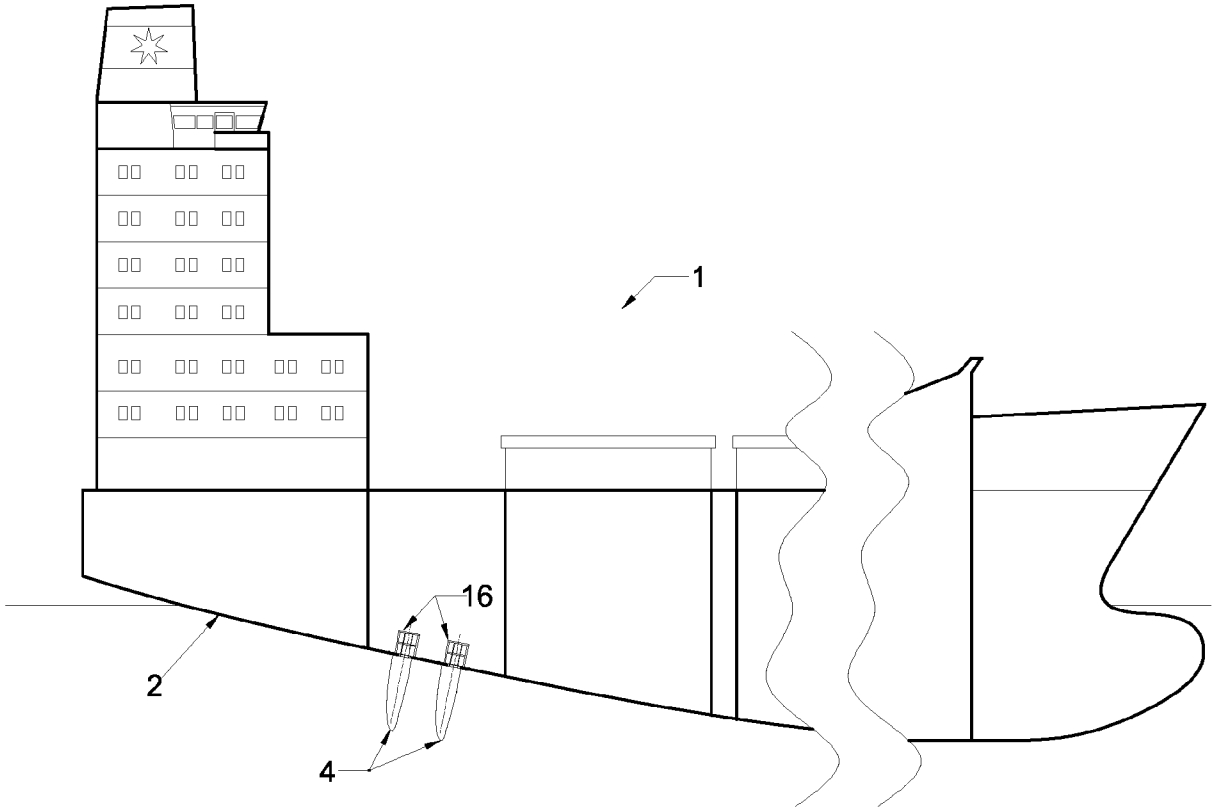

Figure 1

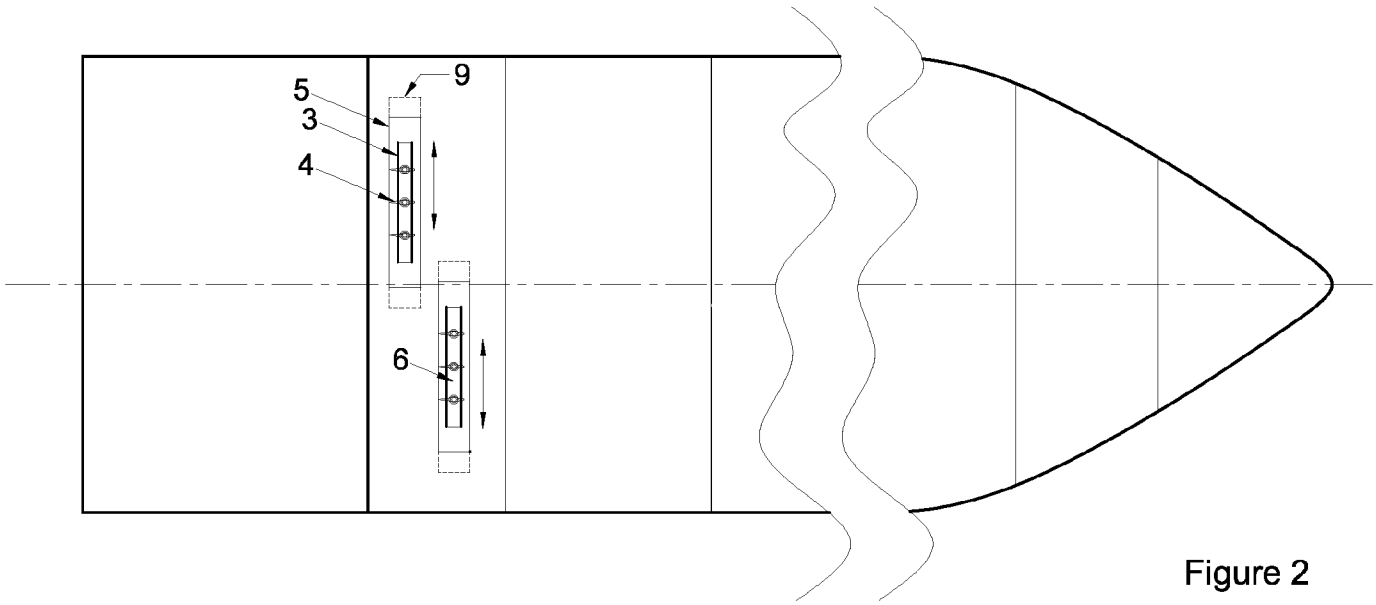

Figure 2

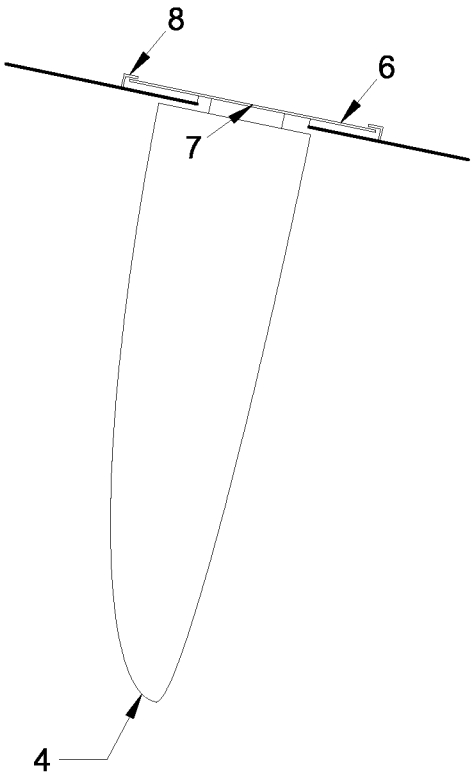

Figure 3

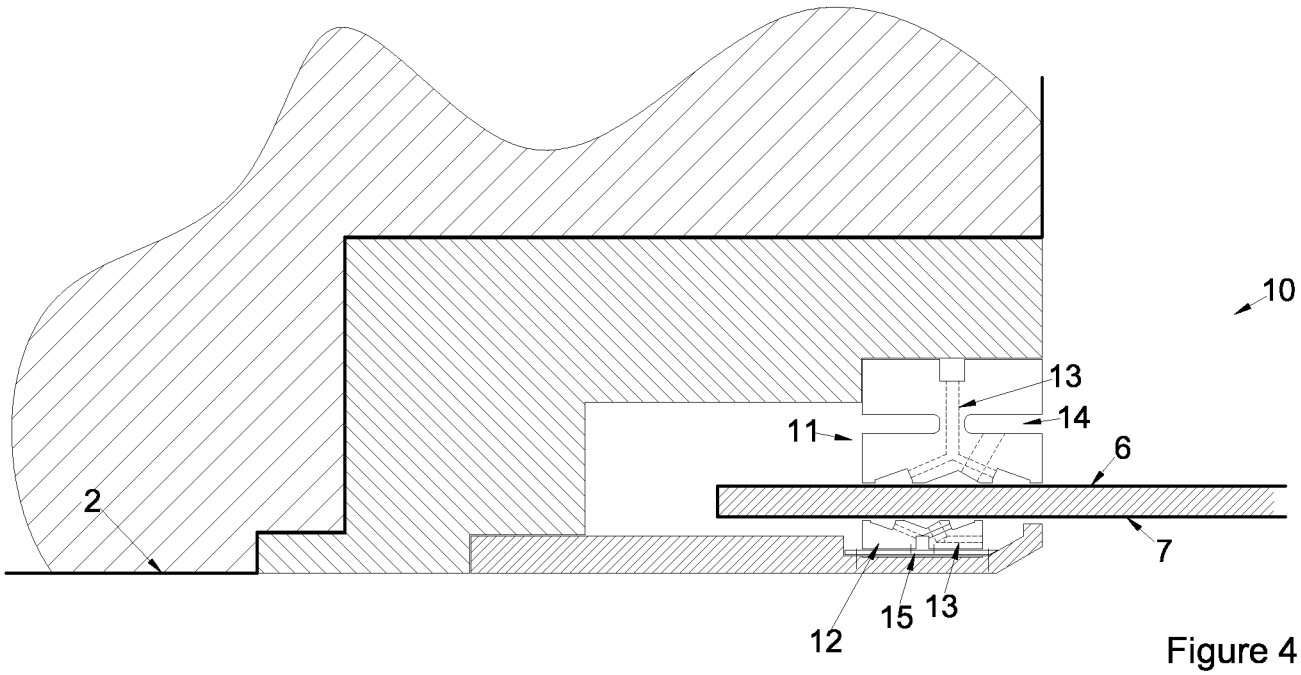

Figure 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/067130

A. CLASSIFICATION OF SUBJECT MATTER
INV. B63H1/36 B63H1/32

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B63H

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 401 196 A (TRIANTAFYLLOU MICHAEL S [US] ET AL) 28 March 1995 (1995-03-28) cited in the application figures	1,14
A	US 6 877 692 B2 (LIU PENGFEI [CA]) 12 April 2005 (2005-04-12) cited in the application figures & US 2004/195440 A1 (LIU PENGFEI [CA]) 7 October 2004 (2004-10-07)	1,14
A	WO 92/02409 A (ONOUE YOSHIAKI [JP]) 20 February 1992 (1992-02-20) figures	1,14

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

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 April 2009	07/05/2009

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	van Rooij, Michael

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/067130

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 99/06272 A (R R SAIL INC DBA HOBIE CAT COM [US]) 11 February 1999 (1999-02-11) figures	1,14
A	DE 42 12 920 A1 (HENKER ERICH DR ING [DE]) 21 October 1993 (1993-10-21) figures	1,14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2008/067130

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5401196 A	28-03-1995	AT 170477 T	15-09-1998
		DE 69413056 D1	08-10-1998
		DE 69413056 T2	18-03-1999
		EP 0728099 A1	28-08-1996
		WO 9513959 A1	26-05-1995
US 6877692 B2	12-04-2005	US 2004195440 A1	07-10-2004
US 2004195440 A1	07-10-2004	NONE	
WO 9202409 A	20-02-1992	NONE	
WO 9906272 A	11-02-1999	AT 257794 T	15-01-2004
		AU 728773 B2	18-01-2001
		AU 8764598 A	22-02-1999
		BR 9811571 A	19-09-2000
		CA 2297214 A1	11-02-1999
		CN 1265627 A	06-09-2000
		DE 69821113 D1	19-02-2004
		DE 69821113 T2	18-11-2004
		EP 0999975 A1	17-05-2000
		ES 2210796 T3	01-07-2004
		JP 4034934 B2	16-01-2008
		JP 2001512077 T	21-08-2001
		NZ 502346 A	24-11-2000
		US 6022249 A	08-02-2000
DE 4212920 A1	21-10-1993	NONE	