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(54) **UNIT FOR PROPULSION IN AN AQUATIC ENVIRONMENT AND AQUATIC VEHICLE  
CONTAINING SAME**

(57) The present invention falls within the area of propulsion mechanisms for aquatic environment, particularly based on turbines, the unit of the present invention finding applications, in a non-limitative way, in the propulsion of self-propelled aquatic vehicles. It is an object of the present invention a unit for propulsion (10) in aquatic environment comprising a turbine (2), a mobile valve (3), and a water floating body having two inlets (4, 4A) and at least one outlet (8), configured in such a way that,

when afloat, one of the inlets (4, 4A) is submerged and the other is emerged. The valve (3) is movable at least between a first locking position and a second locking position, wherein the valve (3) prevents the passage of air and/or water from either of the inlets (4, 4A) to the turbine (2), the mobile valve (3) being lockable in the first position and/or in the second position. It is also an object of the present invention a watercraft (100) comprising the unit for propulsion.

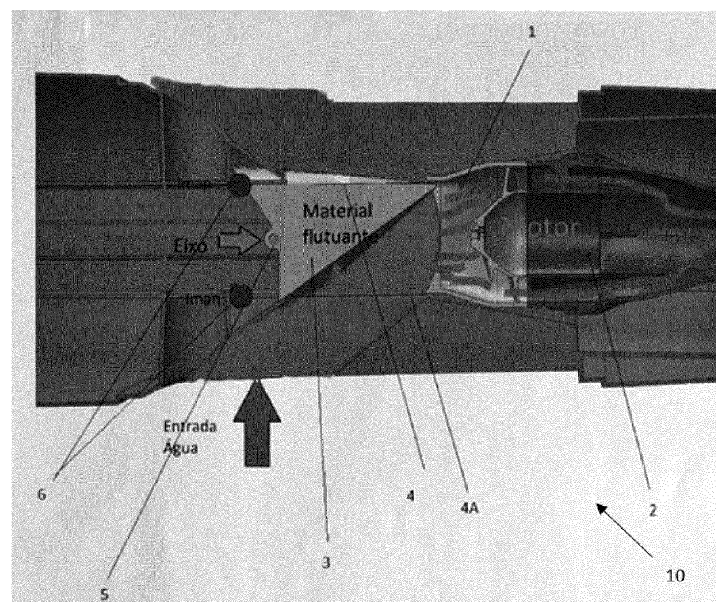


Figure 1

## Description

### FIELD OF THE INVENTION

[0001] The present invention falls within the scope of propulsion mechanisms for aquatic environment, particularly based on turbines.

[0002] More specifically, the unit of the present invention finds applications, in a non-limitative way, in the propulsion of self-propelled watercrafts.

### BACKGROUND OF THE INVENTION

[0003] The present invention is most closely related to patent EP3041733.

[0004] This patent discloses a watercraft comprising two propulsion units, whose turbines can be positioned in two different ways, thus allowing continuous operation of the watercraft even after rollover.

[0005] The solution of the present invention makes it possible to maintain full operating capacity after rollover.

[0006] On the other hand, it is an alternative solution and with characteristics of simplification and reliability of the propulsion mechanism.

[0007] Patent application CN 110 562 416 is also known, which also presents a watercraft with two propulsion units, in which the valves controlling the water input to the respective turbines are mobile.

[0008] However, this is a solution with a rather reduced functionality, since the movement of the vehicle leads to vibration, movement and eventual rollover, all of which have an effect on the valves, which thus allow the unwanted ingress of air into the turbines.

[0009] The solution of the present invention thus overcomes the said issues identified in the prior art.

### SUMMARY OF THE INVENTION

[0010] A propulsion unit in aquatic environment is, therefore, an object of the present invention.

[0011] In one embodiment, the propulsion unit of the present invention comprises:

- a turbine,
- a mobile valve, and
- a water floating body having two inlets and at least one outlet, configured in such a way that, when afloat, one of the inlets is submerged and the other inlet is emersed,

the turbine being fixedly arranged between the two inlets and the outlet such that the water from each inlet enters the turbine and exits the turbine to the outlet, and the valve being movable between at least a first locked position and a second locked position, and being so configured that:

- in the first position the valve prevents the passage

- of air and/or water from one of the turbine inlets, and
- in the second position, the valve prevents the passage of air and/or water from the other turbine inlet, and

where the mobile valve is lockable in the first and/or second position.

[0012] The propulsion unit of the present invention thus makes it possible to attach the turbine, a more complex equipment, and to move a valve that allows water to enter through one of two inlets to the turbine, the said valve preventing or sealing the ingress of water through one of the inlets while keeping the other open, and being able to be locked in one of the said positions.

[0013] Several embodiments of the unit for propulsion in an aquatic environment are described below.

[0014] In one embodiment, the mobile valve is a floating one.

[0015] In one embodiment, the unit for propulsion additionally comprises a shaft to which the mobile valve is coupled, the valve being movable between the first position and the second positions by rotation around the said shaft.

[0016] In another embodiment, the mobile valve is freely movable when not locked.

[0017] In an alternative embodiment to the previous one, the propulsion unit additionally comprises a motor, the valve being movable between the first position and the second position by the action of said motor and/or lockable in the first and in the second position by the action of said motor.

[0018] In one embodiment, the propulsion unit additionally comprises locking means, the locking means being configured to lock the valve in the first position and/or in the second position, thus preventing its movement.

[0019] In one embodiment, the unit for propulsion additionally comprises a computerized controller and the locking means are controllable, the said controller being configured to actuate the locking means for locking and unlocking the mobile valve in the first and/or second position.

[0020] In one embodiment, the locking means comprise two operable elements for locking the mobile valve, each of the operable elements being associated with one of two locking positions, the valve comprising at least one lockable element corresponding to the operable elements of the locking means, the lockable element being arranged such that it is lockable by action of at least one of the operable elements.

[0021] In one embodiment, the mobile valve comprises a lockable element associated with each of the operable elements, wherein:

- a first pair of lockable element and operable element is associated with the first locking position, and
- a second pair of lockable element and operable element is associated with the second locking position.

**[0022]** In one embodiment, each of the operable elements comprises an electromagnet, the corresponding lockable element being susceptible to the magnetic field generated by each of the electromagnets.

**[0023]** In an alternative embodiment to the previous one, each of the operable elements comprises physical means for gripping a lockable element, the corresponding lockable element comprising a projection that is attachable by said gripping means.

**[0024]** In another embodiment, the propulsion unit additionally comprises means for determining the position of the inlets between an emerged position and a submerged position, the computerized controller being configured to, based on the position determined by said means for determining the position of the inlets, actuate the locking means.

**[0025]** In one embodiment, the means for determining the position of the inlets between an emerged position and a submerged position comprise at least one guiding sensor, preferably a gyroscope, an accelerometer and/or a tilt sensor.

**[0026]** A watercraft is also the object of this invention.

**[0027]** In one embodiment, the watercraft comprises at least one unit for propulsion of the present invention, in any one of its embodiments.

**[0028]** In another embodiment, the watercraft comprises a plurality of substantially parallel arms, at least one of the said arms comprising the said unit for propulsion.

**[0029]** In yet another embodiment, the watercraft comprises a plurality of substantially parallel arms, wherein more than one of the said arms comprises one of said units for propulsion.

**[0030]** In another embodiment, all of said arms comprise one of the said units for propulsion.

**[0031]** In still another embodiment, said inlets of each of the said units for propulsion are aligned, the watercraft being configured so that the propulsion operation of each of said different units for propulsion is synchronized.

## DESCRIPTION OF THE FIGURES

**[0032]**

Figure 1-representation of an embodiment of the propulsion unit (10) according to the present invention, featuring a fixed turbine (2), a mobile valve (3) and two inlets (4, 4A). The mobile valve (3) is in one position, preventing the passage of air and/or water from one of the inlets to the turbine (2) (the inlet positioned above in the figure) and allowing the passage of air and/or water to the other inlet (the inlet positioned below in the figure). The mobile valve (3) is coupled to a shaft (5). The water coming from this lower positioned inlet is directed, after passing through the turbine (2), to the outlet (8). Also shown are the locking means (6), or more specifically, the operable elements of the locking means (6). The turbine (2) is also referenced as a motor, and the mobile

valve comprises, in this embodiment, a floating material.

Figure 2 - representation of an embodiment of a watercraft (100) according to the present invention, in a top view.

Figure 5 - representation of an embodiment of a watercraft (100) according to the present invention, in lateral view.

## DETAILED DESCRIPTION OF THE INVENTION

**[0033]** Several embodiments of the unit for propulsion and the watercraft of the present invention are hereinafter disclosed.

**[0034]** The propulsion unit also comprises a water floating body, having two inlets and at least one outlet, configured in such a way that, when in floating mode, one of the inlets is submerged and the other inlet is emerged.

**[0035]** This allows the unit for propulsion to always have an inlet enabling the passage of water to the turbine, regardless of the position in which it is placed in the water or after a rollover occurs.

**[0036]** As mentioned, the unit for propulsion comprises a turbine which is fixedly arranged between the two inlets and the outlet, in such a way that the water originating from each of the inlets enters the turbine and exits the turbine to the outlet.

**[0037]** The body of the unit for propulsion is thus such that water passes from each of the inlets to the turbine. The water passes through the turbine and thence heads for the outlet. Therefore, the layout of the body, inlets, turbine and outlet is such that water passes through the turbine and thus propels the propulsion unit.

**[0038]** In one embodiment, it may be noted that the body contains a turbine chamber formed within it, the turbine chamber being such that the turbine is integrated into it, between the two inlets and the outlet. The turbine chamber is thus connected to the two inlets and to the outlet.

**[0039]** In one embodiment, the body presents a substantially uniform surface, on which the inlets and the outlet are arranged.

**[0040]** In one embodiment, the body may be comprised of various components.

**[0041]** As regards the valve, the latter is movable at least between a first locking position and a second locking position. Specifically, the mobile valve is configured such that:

- in the first position, the valve prevents the passage of air and/or water from one of the inlets for turbine, and
- in the second position, the valve prevents the passage of air and/or water from the other of the inlets for turbine.

**[0042]** Thus, the mobile valve contributes to a correct

operation of the propulsion unit in the aforementioned conditions.

**[0043]** By being movable between a first and a second locking position, the mobile valve prevents the passage of air or water through one of the inlets (in the first position) and through another of the inlets (in the second position).

**[0044]** So, the mobile valve allows the maintenance of conditions suitable for propelling the unit for propulsion, since it is capable of preventing the ingress of air from the inlet that is emerged and, consequently, allows the ingress of water only from the submerged inlet which, in turn, enables the proper propulsion performed by the turbine and, hence, of the propulsion unit.

**[0045]** Furthermore, the mobile valve is also lockable in the first position and/or in the second position.

**[0046]** That is, the mobile valve is configured to be lockable in the first position and/or in the second position.

**[0047]** The fact that the mobile valve is lockable in the first and/or second position allows it to be effectively locked in one of the two positions, ensuring that said conditions suitable for propulsion are maintained, even when vibration or impacts occur due to the movement itself, waves, wind or others.

**[0048]** As an example, where the mobile valve prevents air from entering from the inlet that is emerged and consequently allows water to enter from the inlet that is submerged, the mobile valve is thus lockable and therefore capable of being locked in that same position (whether first or second position), ensuring that said conditions suitable for propulsion are maintained even when vibration occurs or impacts arise from the movement itself, waves or wind, among others.

**[0049]** As previously mentioned, in one embodiment, the mobile valve is floating.

**[0050]** Therefore, when one of the inlets is submerged, water enters and contacts the valve which, being floating and mobile, is naturally propelled and thus causes such inlet to remain open.

**[0051]** In an equally natural and consequent manner, the valve is thus also propelled towards the other inlet, which is emerged.

**[0052]** In this way, the second inlet is also naturally closed, i.e., prevented from air and/or water entering through it, by action of the mobile valve driven by water coming from the inlet which is submerged.

**[0053]** As previously stated, in one embodiment, the unit for propulsion additionally comprises a shaft to which the mobile valve is coupled, the valve being movable between the first position and the second position by rotation around said shaft.

**[0054]** The shaft provides for fixing the mobile valve at a given point, and thus a simultaneously simplified and effective way of moving the valve between the two locking positions, allowing efficient alignment and a consequent effective impediment, by the valve, to the passage of air and/or water through the inlet.

**[0055]** In one embodiment, the mobile valve is freely

movable when not locked.

**[0056]** The mobile valve is thus freely movable, at least between the two locking positions.

**[0057]** When the valve is buoyant and freely movable, it allows a particularly efficient operation, since - being buoyant - it is naturally propelled by the water and, at the same time, it is freely movable, so that the thrust is mostly transmitted for moving the valve to the respective blocking position, corresponding to the inlet that is emerged.

**[0058]** Since the valve is lockable, it can be locked in this position after being naturally propelled.

**[0059]** In an alternative embodiment to the previous one, the propulsion unit additionally comprises a motor, the valve being movable between the first position and the second position by action of said motor and/or lockable in the first and the second position by action of said motor.

**[0060]** The motor promotes movement of the mobile valve between the first and second position.

**[0061]** The motor is thus primarily responsible for the movement of the valve between the first and second position, even when it is a floating valve.

**[0062]** The motor may thus also make it impossible to move the valve in a certain position, in particular in the first or second position, the valve thus being lockable in that position by means of this action of the motor.

**[0063]** In one embodiment, particularly when combined with the embodiment in which the unit comprises the aforementioned shaft, the motor applies a rotational movement to the mobile unit and concordant with the shaft, such that it thereby moves the valve between the said two positions.

**[0064]** In one embodiment, the propulsion unit additionally comprises locking means, the locking means being configured to lock the valve in the first position and/or in the second position, preventing its movement.

**[0065]** The locking means may thus consist of means external to the valve which ensure that the valve is locked in the first and/or second position.

**[0066]** In one embodiment, the unit for propulsion additionally comprises a computerized controller and the locking means are controllable, the said controller being configured to actuate the locking means for locking and unlocking the mobile valve in the first and/or second position.

**[0067]** Thus, the locking and unlocking of the mobile valve is electronically controllable.

**[0068]** In one embodiment, the unit additionally comprises wired or wireless communication means.

**[0069]** The wireless communication means are preferably configured such that they operate according to a personal, local or worldwide network protocol such as, but not limited to, those listed below.

**[0070]** The communication means are thus likely to operate with one or more of the following protocols, by way of example: 2.5G GPRS, 2.75G EDGE, 3G, 4G or 5G, or IEEE 802.11, Bluetooth, Wi-Fi or Bluetooth Low Energy, or IEEE 802.15.4 or Zigbee, WirelessHART,

6LowPAN or RF4CE.

**[0071]** In one embodiment, the communication means comprise communication means compatible with one or more of the said protocols.

**[0072]** Said communication means are thus capable of receiving remote commands.

**[0073]** Such remote commands may, in one embodiment, be sent by at least one control equipment, said equipment being part of a system which also comprises the unit for propulsion of the present invention, in any of its embodiments.

**[0074]** The system is thus also an object of the present invention.

**[0075]** The said communication means are thus capable of sending information remotely.

**[0076]** Such remote information may, in one embodiment, be sent to at least one control equipment, which is part of said system.

**[0077]** In one embodiment of the locking means, the latter comprise two operable elements for locking the mobile valve, each of the operable elements being associated with one of the two locking positions, the valve comprising at least one lockable element corresponding to the operable elements of the locking means, the lockable element being arranged such that it is lockable by action of at least one of the operable elements.

**[0078]** Therefore, the locking means may comprise operable elements, each of which allows the mobile valve to be locked in a respective position, of the two locking positions.

**[0079]** The operable elements may be electronically operable.

**[0080]** Thus, the computational controller may be configured to electronically actuate each of the operable elements such that it correspondingly locks the mobile valve in a respective position.

**[0081]** In one particular embodiment, the mobile valve comprises a lockable element associated with each of the operable elements, wherein:

- a first pair of lockable element and operable element is associated with the first locking position, and
- a second pair of lockable element and operable element is associated with the second locking position.

**[0082]** In one embodiment, each of the operable elements comprises an electromagnet, the corresponding lockable element being susceptible to the magnetic field generated by each of the electromagnets.

**[0083]** In one embodiment, the blocking means are based on electromagnets which, being controllable, allow control to be performed by means of a computational element.

**[0084]** On its turn, the mobile valve comprises a lockable element that is susceptible to the magnetic field generated by each of the electromagnets.

**[0085]** The lockable element may thus consist of a metallic element susceptible to the magnetic field generated

by each of the electromagnets, arranged at a position on the mobile valve.

**[0086]** Figure 1 shows one such embodiment.

**[0087]** In one embodiment, the mobile valve presents a substantially triangular or arrow-shaped conformation, with respect to a cross-section view shown in Figure 1.

**[0088]** At two extreme vertices of this triangle, elements susceptible to the magnetic field of electromagnets are arranged.

**[0089]** The electromagnets, in turn, are arranged collinearly.

**[0090]** In one embodiment, when the mobile valve rotates around the shaft, one of said lockable elements - susceptible to the magnetic field - is arranged in the action field of the electromagnet.

**[0091]** Upon activation of the electromagnet, the valve will remain in that position as long as the electromagnet remains connected.

**[0092]** By having a substantially triangular or arrow-shaped conformation, the blocked mobile valve entirely seals the corresponding inlet.

**[0093]** When the electromagnet is deactivated, the valve will be free to move, whereby, if rollover occurs, the same applies for the other inlet and corresponding operable element (electromagnet) and lockable element (susceptible element, for example a metal, as previously mentioned).

**[0094]** In an alternative embodiment to the previous one, each of the operable elements comprises physical means for gripping a lockable element, the corresponding lockable element comprising a projection that is attachable by said gripping means.

**[0095]** The physical gripping means, which may, for example, have a gripper shape, can thus fix a projection provided on the mobile valve, preventing its movement and thereby ensuring that it remains fixed or locked in the desired position.

**[0096]** The operation of the embodiment wherein i) the operable elements comprise physical means for gripping a lockable element, and ii) the corresponding lockable element comprises a projection that is attachable by said gripping means, is identical to the operation of the above-described embodiment comprising electromagnets, except in that the operation is performed by operable gripping means and not magnetic means such as electromagnets.

**[0097]** The gripping means can thus open and close by means of commands from the computerized controller and, consequently, fix or release the lockable element and thereby the mobile valve.

**[0098]** In another embodiment, the unit for propulsion additionally comprises means for determining the position of the inlets between an emerged position and a submerged position, the computerized controller being configured to, based upon the position determined by said means for determining the position of the inlets, actuate the locking means.

**[0099]** The means for determining the position of the

inlets between an emerged position and a submerged position allows for finer control of the operation of the propulsion unit.

**[0100]** Specifically, they allow a better determination of the position of the unit for propulsion, making it possible to better determine which of the inlets is submerged and which of the inlets is emerged.

**[0101]** Determining that one of the inlets is emerged and that the other inlet is submerged thus allows the position of the unit for propulsion to be determined.

**[0102]** As previously defined, the mobile valve allows water to pass into the turbine through the inlet which is submerged and prevents the passage of air and/or water through the inlet which is emerged.

**[0103]** Consequently, the movement and/or blocking of the mobile valve in a certain position can be implemented based on said improved knowledge of the position of the inlets.

**[0104]** And also consequently, in one embodiment, the valve may be moved by a motor to prevent the passage of air and/or water through the emerged inlet, releasing the submerged inlet.

**[0105]** Also consequently, in an alternative embodiment, the free and floating valve is driven by the water entering through the submerged inlet.

**[0106]** This may also allow the position of the inlets to be known and, as result, to determine the locking of the mobile valve in the corresponding position, i.e. the position that locks the emerged inlet.

**[0107]** Such determination may be performed by a guiding sensor.

**[0108]** Alternatively or cumulatively, the determination may be performed by a sensor that determines the movement of the valve, for example by determining that the valve is being propelled and thus rotating towards one of the inlets, which is thus determined to be emerged.

**[0109]** Alternatively or cumulatively, the determination may also be performed by a sensor that determines the flow of water passing through at least one of the inlets.

**[0110]** When there is a flow of water through one of the inlets, this will indicate that this inlet is submerged.

**[0111]** In various alternative or cumulative embodiments, the means for determining the position of the inlets between an emerged position and a submerged position comprise at least one guiding sensor, preferably a gyroscope, an accelerometer and/or a tilt sensor and/or at least one sensor determining the flow of water passing through at least one of the inlets.

**[0112]** Several embodiments of the watercraft of the present invention are hereunder described.

**[0113]** In one embodiment, the watercraft comprises at least one unit for propulsion of the present invention, in any of its embodiments.

**[0114]** Said water vehicle, comprising the unit for propulsion of the present invention, is thus a floating watercraft, thus movable in the water surface, and allowing continuous operation even after rollover.

**[0115]** In another embodiment, the watercraft comprises

a plurality of substantially parallel arms, at least one of said arms comprising the said unit for propulsion.

**[0116]** In another embodiment, the watercraft comprises a plurality of substantially parallel arms, wherein more than one of said arms comprises one of said units for propulsion.

**[0117]** In another embodiment, all of said arms comprise one of said units for propulsion and thus ensure a homogeneous operation of the watercraft even after rollover.

**[0118]** In one embodiment, the watercraft comprises two arms as shown in Figure 2, wherein both arms comprise one of said units for propulsion.

**[0119]** In one embodiment, said inlets of each of said units for propulsion are aligned, the watercraft being configured so that the propulsion operation of each of said different units for propulsion is synchronized.

**[0120]** Since the inlets are aligned, the determination of which inlets are submerged and which inlets are emerged is made easier, since one of the inlets of each unit for propulsion will also be emerged when another corresponding inlet of each of the other units for propulsion is also emerged.

**[0121]** The same applies, of course, to the determination of which inlets are submerged.

**[0122]** The propulsion operation of each of the different units for propulsion may thus be synchronized.

**[0123]** This implies that the various propulsion units will be performing their propulsion action simultaneously.

**[0124]** And also, accordingly, that the various emerged inlets will be impeded and the various submerged inlets will be open, allowing the passage of water and the continued operation of the turbine.

**[0125]** The watercraft may consist of any type of water vehicle, such as a buoy.

## EMBODIMENTS

**[0126]** An embodiment of the unit for propulsion of the present invention is described below, according to Figure 1.

**[0127]** The unit for propulsion is positioned in the water a first time, being in a position in which a first inlet is emerged and a second inlet is submerged.

**[0128]** The mobile valve is freely movable and buoyant, whereby the thrust force of the water entering through the second inlet (submerged) propels the valve towards the opposite inlet, the first inlet (emerged).

**[0129]** The mobile valve is thus positioned adjacent to the first inlet, preventing air (or water) from passing through it.

**[0130]** The water that enters through the second inlet (submerged) is directed to the turbine, which promotes the propulsion of the unit and of any body that is fixed to it (such as the entire body of a watercraft), by acting and directing the water towards the outlet, as shown in Figure 1.

**[0131]** The unit for propulsion thus provides the initial

tion of movement, both its own and that of any associated body.

[0132] The inlets may thus be positioned in a plane perpendicular to that of the outlet.

[0133] The inlets may thus be positioned collinearly according to a direction and under the surface of the body such that they present opposite directions, as shown in Figure 3.

[0134] The turbine and outlet may thus be arranged perpendicular to said direction formed by the two inlets, such that water entering through either of the inlets flows through channels arranged substantially transverse to said direction of the inlets and arrangement of the turbine and outlet.

[0135] The turbine arrangement may thus be substantially parallel to a longitudinal arrangement of the unit body for propulsion, as shown in Figures 2 and 3.

[0136] The longitudinal arrangement of the body of the unit for propulsion is thus also substantially parallel to a longitudinal arrangement of a watercraft comprising it, as presented in Figures 2 and 3.

[0137] The outlet may thus be arranged in a so-called rear area of the unit for propulsion, at the turbine outlet, as presented in Figures 2 and 3.

[0138] Again as regards the operation of the unit for propulsion, when the mobile valve is positioned adjacent to the first inlet, preventing air (or water) from passing through it, and in one embodiment, the locking means may be actuated to lock it in that position.

[0139] Determining the implementation of such blocking may be achieved by means for determining the position of the inlets between an emerged position and a submerged position.

[0140] These means may allow, for example, determining which is the arrangement of the unit for propulsion and, consequently, of each of the inlets, in relation to the gravity vector.

[0141] The determination of the gravity vector thus makes it possible to determine which inlet is submerged and, thus determining that the valve may be blocked for the other position.

[0142] Means for determining the position of the valve, or any other means known in the state of the art, may also be used for the aforementioned purpose of determining the position of the inlets.

[0143] An embodiment in case of a rollover situation is described below.

[0144] As previously mentioned, the second inlet was submerged and the first inlet was emerged.

[0145] When a rollover occurs, the second inlet will be emerged and the first inlet submerged.

[0146] The locking means will then unlock the valve from its position, releasing it to move freely by floating, under the action of water entering through the first inlet, now submerged, which propels the valve.

[0147] The situation previously described will thus be repeated for this new arrangement.

[0148] Although the present disclosure is primarily de-

scribed in terms of methods, units, vehicles, and systems, the person skilled in the art understands it as being also directed to various devices or apparatus, such as various types of watercraft, wireless communication means, automatic, manual, or semi-automatic remote controls, a server and/or computing equipment, such as a computer or a set of computers, that implement or incorporate the said methods and systems. Such devices or apparatus may be connected via communication networks, which may be wireless or wired.

[0149] The unit for propulsion, the watercraft, and/or the system may include components for performing at least some of the examples of features of the described methods, either by means of hardware components (such as memory and/or processor), software, or any combination thereof.

[0150] An article for use with the unit for propulsion, the water vehicle and/or the system, such as a pre-recorded storage device or other similar computer-readable medium including program instructions recorded thereon, or a computer data signal carrying computer-readable program instructions may carry a device for facilitating implementation of the methods described herein. It is understood that such devices, articles of manufacture, and computer data signals are also within the scope of the present disclosure.

[0151] A "computer-readable medium" shall be understood as any medium that can store instructions for use or execution by a computer or other computing device, including read-only memory (ROM), erasable programmable read-only memory (EPROM), or flash memory, random access memory (RAM), a portable floppy disk, a hard disk drive (HDD), a solid state storage device (e.g., NAND flash or synchronous dynamic RAM (SDRAM)) and/or an optical disc such as a Compact Disc (CD), digital versatile disc (DVD) or Blu-Ray™ disc.

[0152] As will be evident to a person skilled in the art, the present invention should not be limited to the embodiments described herein, with a number of changes being possible, which remain within the scope of this invention. Of course, the preferred embodiments above described are combinable in the different possible forms, the repetition of all such combinations being herein avoided.

## Claims

1. A unit for propulsion in aquatic environment, **characterized in that** it comprises:

- a turbine,
- a mobile valve, and
- a water floating body having two inlets and at least one outlet, configured in such a way that, when afloat, one of the inlets is submerged and the other is emerged,

the turbine being fixedly arranged between the two

inlets and the outlet such that the water from each inlet enters the turbine and exits the turbine to the outlet, and the valve being movable between at least a first locked position and a second locked position, and being so configured that:

- in the first position the valve prevents the passage of air and/or water from one of the turbine inlets, and
- in the second position, the valve prevents the passage of air and/or water from the other turbine inlet, and

where the mobile valve is lockable in the first and/or second position.

2. A unit according to the previous claim, wherein the mobile valve is a floating valve.
3. A unit according to any of the previous claims, further comprising a shaft to which the mobile valve is coupled, the valve being movable between the first position and the second positions by rotation around the said shaft.
4. A unit according to any of the previous claims, wherein the mobile valve is freely movable when not locked.
5. A unit according to any of the claims 1-3, additionally comprising a motor, the valve being movable between the first position and the second position by the action of said motor and/or lockable in the first and in the second position by the action of said motor.
6. A unit according to any of the previous claims, additionally comprising locking means, the locking means being configured to lock the valve in the first and/or second position, preventing it from moving.
7. A unit according to any of the previous claims, additionally comprising a computerized controller and wherein the locking means are controllable, the said controller being configured to actuate the locking means for locking and unlocking the mobile valve in the first and/or second position.
8. A unit according to the previous claim, wherein the locking means comprise two operable elements for locking the mobile valve, each of the operable elements being associated with one of two locking positions, the valve comprising at least one lockable element corresponding to the operable elements of the locking means, the lockable element being arranged such that it is lockable by action of at least one of the operable elements, the mobile valve preferably comprising a lockable associated with each of the operable elements, wherein:

- a first pair of lockable element and operable element is associated with the first locking position, and
- a second pair of lockable element and operable element is associated with the second locking position.

9. A unit according to the previous claim, wherein:

- each of the operable elements comprises an electromagnet, the corresponding lockable element being susceptible to the magnetic field generated by each of the electromagnets, or
- each of the operable elements comprises physical means for gripping a lockable element, the corresponding lockable element comprising a projection that is attachable by said gripping means.

10. A unit according to any of the claims 7-9, additionally comprising means for determining the position of the inlets between an emerged position and a submerged position, the computerized controller being configured to, based on the position determined by said means for determining the position of the inlets, actuate the locking means.

11. A unit according to the previous claim, wherein the means for determining the position of the inlets between an emerged position and a submerged position comprise at least one guiding sensor, preferably a gyroscope, an accelerometer and/or a tilt sensor.

12. A watercraft **characterized in that** it comprises at least one unit for propulsion according to any of the above claims, preferably comprising a plurality of substantially parallel arms, at least one of the said arms comprising the said unit for propulsion.

13. A watercraft according to the previous claim, comprising a plurality of substantially parallel arms, wherein more than one of the said arms, preferably all of them, comprises one of said units for propulsion.

14. A watercraft according to the previous claim, comprising two arms, each of the arms comprising one of the said propulsion units, the two arms being linked together to form a body of the watercraft, the set of the watercraft body with the arms optionally having a U-shape, optionally forming a single body.

15. A watercraft according to any of the claims 13-14, wherein the inlets of each of the said units for propulsion are aligned, the watercraft being configured so that the propulsion operation of each of said different units for propulsion is synchronized.



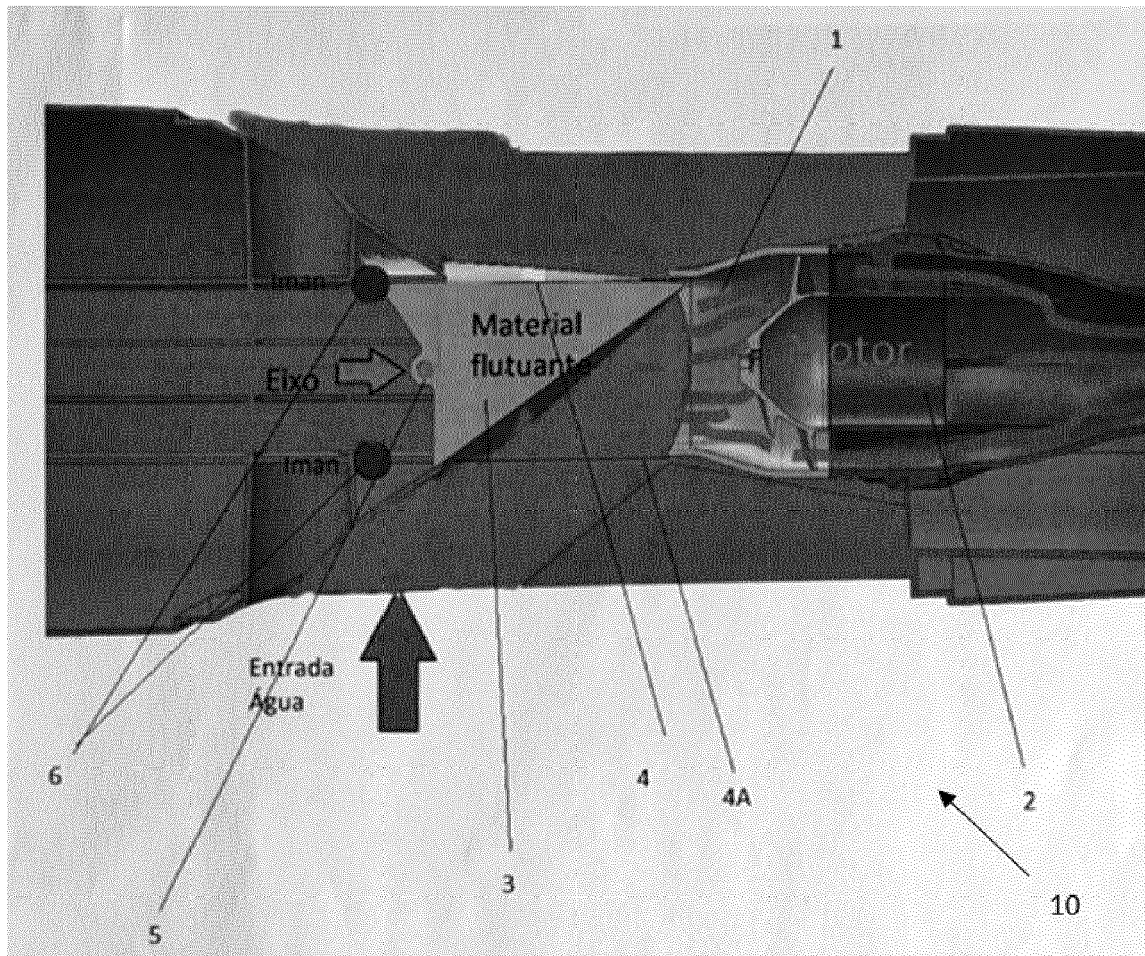


Figure 1

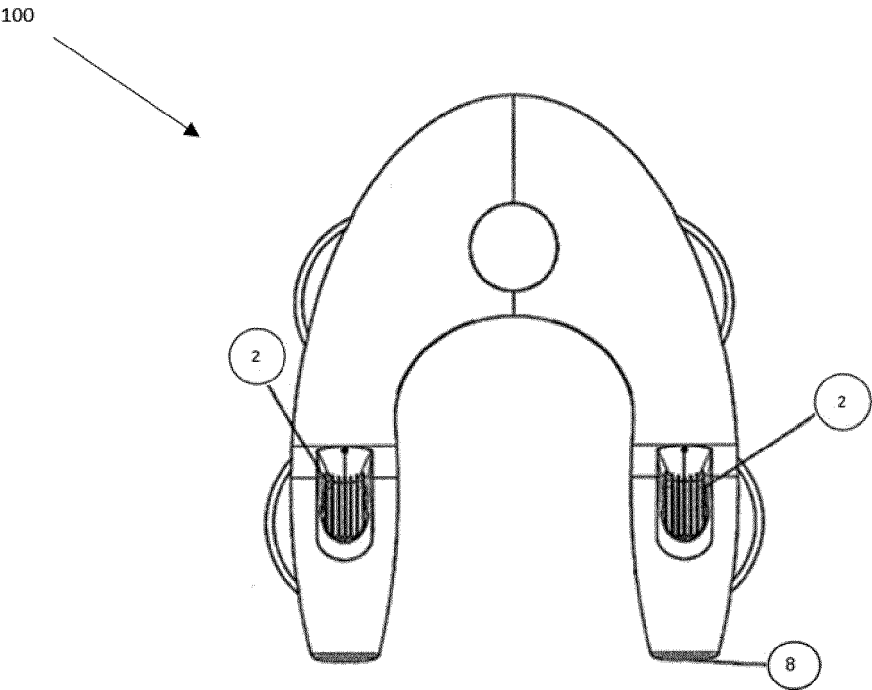


Figure 2

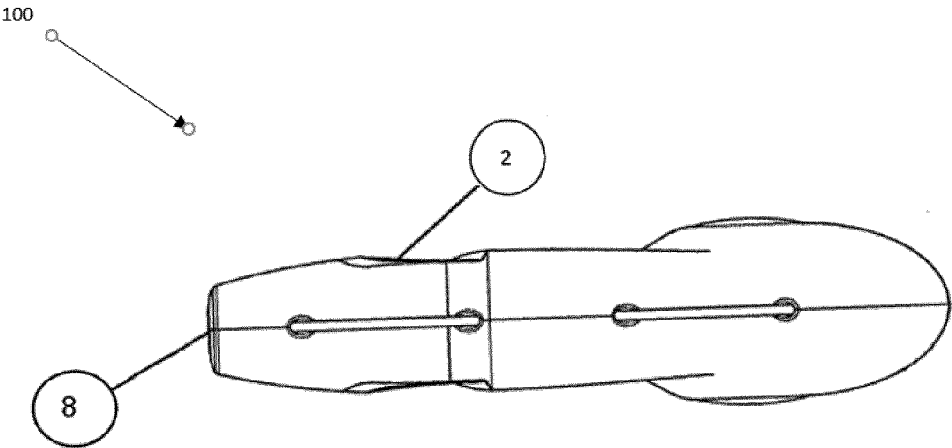


Figure 3



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			B63H B63C B63B
The present search report has been drawn up for all claims			
Place of search <b>The Hague</b>		Date of completion of the search <b>21 January 2022</b>	Examiner <b>Gardel, Antony</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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