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(54) MARINE PROPULSION SYSTEM

(57) The disclosure relates to a marine propulsion system for a marine vessel, comprising a drive unit comprising an upper part and a lower part, the upper part being pivotable in relation to the marine vessel and the lower part is rotatably connected with the upper part, the lower part comprises one or more propellers, an input unit configured to receive an activation message indicative of an operation mode for the drive unit, a control unit being operatively connected with the drive unit and the input unit, the control unit is configured to control the drive unit on basis of the activation message received from the input unit, wherein the control unit, in response to receiving a beach mode activation message from the input unit, is configured to rotate the lower part to a position with the one or more propellers facing aft in relation to the marine vessel, and/or wherein the control unit, in response to receiving a swim mode activation message from the input unit, is configured to rotate the lower part to a position with the one or more propellers at least facing forward in a position of minimum 90 degrees compared to an aft facing position of the one or more propellers

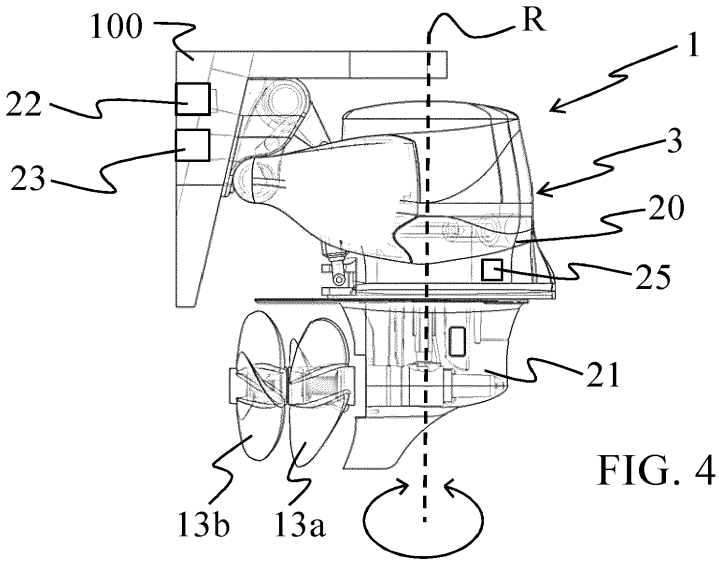

FIG. 4

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Description

TECHNICAL FIELD

[0001] The disclosure relates generally to a propulsion system. In particular aspects, the disclosure relates to a marine propulsion system for a marine vessel. The disclosure can be applied to marine vessels, such as water crafts, motorboats, work boats, sport vessels, boats, ships, among other vessel types. Although the disclosure may be described with respect to a particular marine vessel, the disclosure is not restricted to any particular marine vessel.

BACKGROUND

[0002] Propulsion systems for marine vessels are known. These propulsions systems having a drive unit which may be operated in different positions so as to improve the marine vessel's performance and energy consumption to power the drive unit. These known systems do not take into account where the marine vessel is operating both in normal draught and in reduced draught situations.

[0003] The drive unit having one or more propellers propelling the marine vessel in normal manner. However, sometimes persons and/or equipment are in the water around the marine vessel for bathing and swimming which may have the severe consequence that the person and/or equipment may come in contact with the one or more propellers.

[0004] Hence, there is a need for an improved marine propulsion system with enhanced security during different modes of operations.

SUMMARY

[0005] According to a first aspect of the disclosure, a marine propulsion system for a marine vessel, comprising

- a marine drive unit comprising an upper part and a lower part, the upper part being pivotable in relation to the marine vessel and the lower part is rotatably connected with the upper part, the lower part comprises one or more propellers,
- an input unit configured to receive an activation message indicative of an operation mode for the drive unit,
- a control unit being operatively connected with the drive unit and the input unit, the control unit is configured to control the drive unit on basis of the activation message received from the input unit,

  wherein the control unit, in response to receiving a beach mode activation message from the input unit, is configured to rotate the lower part to a position with the one or more propellers facing aft in relation to the marine vessel, and/or

  wherein the control unit, in response to receiving a swim mode activation message from the input unit, is configured to rotate the lower part to a position with the one or more propellers at least facing forward in a position of minimum 90 degrees compared to an aft facing position of the one or more propellers. The first aspect of the disclosure may seek to solve the disadvantages with the known marine propulsion systems while operating in shallow waters and/or when people are swimming and bathing near the marine vessel. A technical benefit may include providing a propulsion system having a drive unit with a lower part which is rotatably connected with an upper part, whereby the control unit ensures that the one or more propellers are rotated to a position with the one or more propellers at least facing forward in a position of minimum 90 degrees compared to an aft facing position of the one or more propellers when the control unit has received a swim mode activation message. Hereby the risk for damaging persons bathing and swimming around the marine vessel is minimized. In addition, the control unit ensures that the lower part is rotated to a position with the one or more propellers facing aft in relation to the marine vessel when receiving a beach mode activation message. Hereby the risk for damaging the one or more propellers when operating in shallow waters is minimized.

[0006] Optionally in some examples, including in at least one preferred example, the control unit, in response to receiving a beach mode activation message from the input unit, is configured to bring the drive unit to a reduced draught mode of operation, and/or wherein the control unit, in response to receiving a swim mode activation message from the input unit, is configured to bring the drive unit to a maximum draught position. A technical benefit may include minimizing the risk for hitting obstacles when raising the drive unit in the beach mode, and minimizing the risk for persons coming into contact with the one or more propellers by lowering the drive unit in the swim mode.

[0007] Optionally in some examples, including in at least one preferred example, the activation message is activated by an operator or captain and/or is an automatically generated activation message. A technical benefit may include providing different possibilities for activating the activation message.

[0008] Optionally in some examples, including in at least one preferred example, the automatically generated activation message is sensor data obtained from one or more sensor(s). A technical benefit may include that the sensors may detect different objects in the surrounding of the marine vessel or other parameters and based on these detections an automatically generated activation message may be provided to the control unit. Hereby is the risk for human failure or unintended opera-

tion of the propulsion system minimized.

[0009] Optionally in some examples, including in at least one preferred example, the operator or captain activates the beach mode activating message at the input unit, and/or the operator or captain activates the swim mode activating message at the input unit. A technical benefit may include that the operator may ensure that propulsion system is in the intended mode of operation.

[0010] Optionally in some examples, including in at least one preferred example, the one or more sensor(s) is/are configured to detect a draught around the marine vessel and based on the detected draught activates the beach mode activating message. A technical benefit may include that the propulsion system ensures that the risk for the drive unit and one or more propellers are being damaged during operating in shallow waters are minimized, even in circumstances where the captain or operator of the marine vessel is less experienced.

[0011] Optionally in some examples, including in at least one preferred example, the one or more sensor(s) is/are configured to detect an obstacle and/or humans or animals around the marine vessel and based on the detection activates the swim mode activating message. A technical benefit may include that the propulsion system ensures that the risk for damaging humans or animals during bathing and swimming around the marine vessel is minimized.

[0012] Optionally in some examples, including in at least one preferred example, the drive unit is locked in the swim mode until swim mode activation message is deactivated by the operator or captain. A technical benefit may include that it is ensured that the drive unit not intendedly is activated when humans are bathing and swimming around the marine vessel.

[0013] Optionally in some examples, including in at least one preferred example, the drive unit is configured to be started with a special acknowledgement operation when in swim mode, such as unlocking by a physical or digital key. A technical benefit may include that the captain or operator shall perform a dedicated and special action before the drive unit can be started which minimizes the risk for damaging the person bathing and swimming around the marine vessel as well as minimizes the risk for unintended starting of the drive unit.

[0014] Optionally in some examples, including in at least one preferred example, the one or more propellers is/are locked when in the swim mode so that they are unable to rotate. A technical benefit may include that it is ensured that the one or more propellers not intendedly is/are rotated.

[0015] Optionally in some examples, including in at least one preferred example, when the swim mode activation message is deactivated, the lower part is rotated to its intended position before it the one or more propellers is/are allowed to rotate. A technical benefit may include that the risk for unintended activation of the one or more propellers is minimized.

[0016] Optionally in some examples, including in at least one preferred example, the control unit is configured to issue a notification that it is safe to swim around the drive unit when the lower part of the drive unit has been rotated the position with the one or more propellers at least facing forward in the position of minimum 90 degrees compared to the aft facing position of the one or more propellers, and the one or more propellers are locked. A technical benefit may include that the persons onboard the marine vessel and/or around the marine vessel are notified that it is safe to bath and swim around the marine vessel.

[0017] Optionally in some examples, including in at least one preferred example, the drive unit comprises one or more unit sensors configured to detect a position of the lower part of the drive unit and/or the position of the one or more propellers. A technical benefit may include that the propulsion system may provide information about the position of the one or more propellers to the captain or operator of the marine vessel.

[0018] Optionally in some examples, including in at least one preferred example, wherein the drive unit is connected with a transom of the marine vessel via a transom bracket. A technical benefit may include facilitating that the drive unit is connected with and positioned correctly in relation to the marine vessel.

[0019] Optionally in some examples, including in at least one preferred example, wherein the drive unit is arranged to be moved in relation to the transom bracket for moving the drive unit in the water and out of the water, the drive unit is connected with the transom bracket via a connecting arm having a first pivot joint connected with the transom bracket and a second pivot joint connected with the drive unit, wherein the drive unit is configured to be moved in the water and out of the water by the connecting arm pivots around the first pivot joint or the drive unit pivots around the second pivot joint or the connecting arm and the drive unit pivot around both pivot joints. A technical benefit may include that the drive unit may be trimmed in different trim positions of the drive unit independently water depth. Additionally, the drive unit may be moved up and down as well as translated rearwards compared to the transom bracket while maintaining an improved angle of thrust. In addition, when maneuvering in shallow waters close to a beach, the reduced draught may be provided in combination with turning the one or more propellers to a position where they are facing aft.

[0020] According to a second aspect of the disclosure, a method of operating a marine propulsion system of any of the preceding claims, comprising

- providing a propulsion system of any of the preceding claims, on a marine vessel,
- receiving an activation message indicative of an operation mode for the drive unit,
- controlling the drive unit on basis of the activation message,
- receiving a beach mode activation message,

- rotating, in response to receiving the beach mode activation message, the lower part to a position with the one or more propellers facing aft in relation to the marine vessel, and/or
- receiving a swim mode activation message,
- rotating, in response to receiving the swim mode activation message, the lower part to a position with the one or more propellers at least facing forward in a position of minimum 90 degrees compared to an aft facing position of the one or more propellers. The second aspect of the disclosure may seek to solve the disadvantages with the known marine propulsion systems while operating in shallow waters and/or when people are swimming and bathing near the marine vessel. A technical benefit may include providing a propulsion system having a drive unit with a lower part which is rotatably connected with an upper part, whereby the control unit ensures that the one or more propellers are rotated to a position with the one or more propellers at least facing forward in a position of minimum 90 degrees compared to an aft facing position of the one or more propellers when the control unit has received a swim mode activation message. Hereby the risk for damaging persons bathing and swimming around the marine vessel is minimized. In addition, the control unit ensures that the lower part is rotated to a position with the one or more propellers facing aft in relation to the marine vessel when receiving a beach mode activation message. Hereby the risk for damaging the one or more propellers when operating in shallow waters is minimized.

[0021] The disclosed aspects, examples (including any preferred examples), and/or accompanying claims may be suitably combined with each other as would be apparent to anyone of ordinary skill in the art. Additional features and advantages are disclosed in the following description, claims, and drawings, and in part will be readily apparent therefrom to those skilled in the art or recognized by practicing the disclosure as described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Examples are described in more detail below with reference to the appended drawings.

FIGS. 1-3 is an exemplary a marine propulsion system according to an example.
FIG. 4 shows in a side view a marine propulsion system where the one or more propellers have been rotated to facing forward.
FIG. 5 shows in a top view a drive unit
FIGS. 6a-6g show in a top view a sequence of rotating a lower part of the drive unit according to an example.
FIGS. 7-9 shows a marine propulsion system according to an example.
FIGS 10-11 show in a side view the drive unit being translated rearwards according to an example.
FIGS. 12-15 show different view of an example of a connecting arm according to an example.
FIGS. 16-17 show different view of another example of a connecting arm according to an example.
FIGS. 18-19 show different view of another example of a connecting arm according to an example.
FIG. 20 shows a view of another example of a connecting arm according to an example.
FIG. 21 is another view of an example.

DETAILED DESCRIPTION

[0023] The detailed description set forth below provides information and examples of the disclosed technology with sufficient detail to enable those skilled in the art to practice the disclosure.

[0024] **FIGS. 1-3** is an exemplary view of a marine propulsion system **1** for a marine vessel **100** according to an example. In **FIG. 1,** the marine propulsion system **1** comprises a drive unit **3** comprising an upper part **20** and a lower part **21,** the upper part **20** being pivotable in relation to the marine vessel **100** and the lower part **21** is rotatably connected with the upper part **20,** the lower part **21** comprises in the present example a first propeller **13a,** and a second propeller **13b.** The upper part **20** of the drive unit **3** may be moved in relation to the transom **101** of the marine vessel **100** so that the drive unit may be tilted in and out of the water and/or trimmed to an intended trim angle in the water. Hence, the upper part **20** may be moved in relation to the marine vessel **100.** The lower part **21** is rotatably connected with the upper part **20** whereby the lower part may be rotated in relation to the upper part **20** around an axis R. The lower part **21** is configured to follow the movements of the upper part **20** in relation to the marine vessel **100.**

[0025] The marine propulsion system **1** also comprises an input unit **22** configured to receive an activation message indicative of an operation mode for the drive unit **3,** and a control unit **23** being operatively connected with the drive unit **3** and the input unit **22,** the control unit **23** is configured to control the drive unit **3** on basis of the activation message received from the input unit **22.** The input unit **22** may be arranged at the marine vessel **100** or at the drive unit **3,** in the example in **FIG. 1** the input unit **22** is arranged at the marine vessel **100.** The control unit may also be arranged at the marine vessel **100** or at the drive unit **3,** in the example in **FIG. 1** the input unit **22** is arranged at the marine vessel **100.**

[0026] According to the disclosure, the control unit **23,** in response to receiving a beach mode activation message from the input unit **22,** is configured to rotate the lower part 21 to a position with the one or more propellers facing aft in relation to the marine vessel, as shown in **FIG. 1** and/or wherein the control unit **23,** in response to receiving a swim mode activation message from the input

unit, is configured to rotate the lower part **21** to a position with the one or more propellers **13a, 13b** at least facing forward in a position of minimum 90 degrees compared to an aft facing position of the one or more propellers. The beach mode activation message may be activated when the marine vessel **100** is approaching shallow water or the harbor for instance. The swim mode activation message may be activated when persons onboard the marine vessel **100** would like to swim around the marine vessel **100,** for instance by using the bathing platform **103** arranged at the transom **101** of the marine vessel **100.**

[0027] Moreover, the control unit **23,** in response to receiving a beach mode activation message from the input unit **22,** is configured to bring the drive unit to a reduced draught mode of operation, and/or wherein the control unit **23,** in response to receiving a swim mode activation message from the input unit **22,** is configured to bring the drive unit to a maximum draught position.

[0028] Hence, the drive unit **3** may be moved upwards to the reduced draught position when the control unit **23** receives the beach mode activation message. Furthermore, the drive unit **3** may be moved downwards to the maximum draught position when the control unit **23** receives the swim mode activation message.

[0029] In **FIGS. 1-3,** the propellers **13a, 13b** are configured to be a pushing drive, hence in normal operation they are pushing the marine vessel **100.** In the example, the first and second propellers **13a, 13b** are arranged after the lower part **21** so that when rotated they will push the lower part **21.**

[0030] The drive unit **3** may be trimmed in different angles for optimizing the angle of thrust for the propellers **13a, 13b** during different operating conditions. In **FIG. 1,** the drive unit **3** is positioned in neutral trim where the angle of thrust of the first propeller **13a** and the second propeller **13b** are zero.

[0031] In **FIG. 2,** the drive unit **3** has been pivoted in a clockwise direction in relation to the marine vessel so as to position the drive unit **3** in a negative trim having a negative angle of thrust A of the first propeller **13a** and the second propeller **13b.**

[0032] In **FIG. 3,** the drive unit **3** has been pivoted in an anticlockwise direction in relation to the marine vessel **100** so as to position the drive unit **3** in a positive trim having a positive angle of thrust A of the first propeller **13a** and the second propeller **13b.**

[0033] **FIG. 4** is the marine propulsion system **1** of **FIG. 1** shown in a beach mode where the lower part **21** has been rotated around the axis R in relation to the upper part **20.** The control unit **23,** in response to receiving a swim mode activation message from the input unit **22,** has rotated the lower part **21** to a position with the one or more propellers **13a, 13b** facing forward towards the marine vessel **100.** In the example the first and second propellers **13a, 13b** have been rotated 180 degrees compared to their position shown in **FIG. 1.** According to the disclosure, the control unit **23** may rotate the first and second propellers **13a, 13b** minimum 90 degrees compared to an aft facing position of the one or more propellers **13a, 13b.** In addition, the control unit **23** may be configured to lower the drive unit **3** to its lowermost position so that the swimmers are further protected from the one or more propellers **13a, 13b.**

[0034] In an example, the activation message is activated by an operator or captain on the marine vessel **100** and/or is an automatically generated activation message. The operator or captain may activate the beach mode activating message at the input unit **22,** and/or the operator or captain may activate the swim mode activating message at the input unit **22.**

[0035] Moreover, the drive unit **3** may be locked in the swim mode until swim mode activation message is deactivated by the operator or captain. In an example, the drive unit **3** is configured to be started with a special acknowledgement operation when in swim mode, such as unlocking by a physical or digital key. Hereby an additional security is added to the system **1** so that the drive unit **3** is not operated unintendedly when swimmers are near the drive unit **3.**

[0036] In addition, the one or more propellers **13a, 13b** may be locked when in the swim mode so that they are unable to rotate. Also, when the swim mode activation message is deactivated, the lower part **21** is rotated to its intended position before the one or more propellers **13a, 13b** is/are allowed to rotate.

[0037] The drive unit **3** may also comprise one or more unit sensors **25** configured to detect a position of the lower part **21** of the drive unit **3** and/or the position of the one or more propellers **13a, 13b.** The one or more unit sensors **25** may be configured to detect a height position of the drive unit **3.** Furthermore, the one or more unit sensors **25** are operatively connected with the control unit **23.** Hence, the control unit **23** is configured to control the drive unit **3** with the additional assistance of the detection of the one or more unit sensors **25.**

[0038] In **FIG. 5,** the propulsion system **1** of **FIG. 1** is shown in a top view. The first and second propellers **13a, 13b** are arranged in their pushing position facing aft as described in connection with **FIG. 1.** The automatically generated activation message may also be based on sensor data obtained from one or more sensor(s) **24.** The one or more sensor(s) **24** may be configured to detect a draught around the marine vessel **100** and based on the detected draught activates the beach mode activating message. In another example, the one or more sensor(s) **24** may be configured to detect an obstacle and/or humans or animals around the marine vessel **100** and based on the detection activates the swim mode activating message. The one or more sensor(s) **24** may also be configured to detect obstacles and/or humans or animals in the vicinity of the one or more propellers **13a, 13b**). The one or more sensors **24** are operatively connected with the control unit **23.**

[0039] The one or more sensors **24** may be arranged on the vessel and/or on the drive unit **3.** The sensor **24** may be a LiDAR sensor, a Sonar sensor, a speed log, a

torque sensor, and/or a depth sensor. The one or more sensors **24** may be a basic on/off switch, sensing or detecting if a gate to the bathing platform is opened or closed, or other mechanical parts. The one or more sensors **24** is/are configured to provide the control unit **23** with feedback to what mode the control unit **23** is allowed to activate.

[0040] Furthermore, the control unit **23** may be configured to issue a notification that the drive unit **3** is in the beach mode when the lower part **21** of the drive unit **3** has been rotated the position with the one or more propellers **13a, 13b** facing aft in relation to the marine vessel **100,** whereby the drive unit **3** can run the marine vessel in shallow water.

[0041] Moreover, the control unit **23** may be configured to issue one or more indications for indicating when the swim mode is active and thereby it is safe to swim around the drive unit **3.** At least the swim mode may be associated with a green light or indication **30** arranged in connection to a bathing platform **103** of the marine vessel **100** so that it is visible for the swimmers in the water and/or onboard the marine vessel **100** that it is safe to swim around the marine vessel.

[0042] The control unit **23** is also configured to issue a notification that it is safe to swim around the drive unit **3** when the lower part **21** of the drive unit **3** has been rotated the position with the one or more propellers **13a, 13b** at least facing forward in the position of minimum 90 degrees compared to the aft facing position of the one or more propellers **13a, 13b,** and the one or more propellers **13a, 13b** are locked for rotation.

[0043] In addition, LiDAR vessel sensors **40** may be arranged around the marine vessel **100** for detecting obstacles and/or humans around the marine vessel **100.** In **FIG. 5** the LiDAR vessel sensors **40** are arranged in each corner of the marine vessel **100.** The LiDAR vessel sensors **40** are operatively connected with the control unit **23** so that the control unit **23** is configured to control the drive unit **3** with the additional assistance of the detection of the LiDAR vessel sensors **40.** The control unit **23** may also be configured to process the detected obstacles and/or humans and to present the detected obstacles and/or humans on a display for the operator or captain so that the captain is presented with real-time data about the objects around the drive unit **3.**

[0044] The drive unit **3** may be an outboard motor. The motor may be an electric motor.

[0045] In **FIGS. 6a-6g,** an example of rotating the lower part **21** is shown as a sequence. The sequence is shown in a top view and is based on the drive unit shown in **FIG. 5.** As an example the position of the lower part **21** where the first and second propellers **13a, 13b** are facing aft is set as zero degrees. In **FIG. 6a,** the lower part **21** has been rotated in a clockwise direction to a position 45 degrees compared to the position of **FIG. 5.** In **FIG. 6b,** the lower part **21** has been rotated in the clockwise direction to a position 90 degrees compared to the position of **FIG. 5.** In this position, the drive unit **3** is in the swim mode position. In **FIG. 6c,** the lower part **21** has been rotated further in the clockwise direction to a position 135 degrees compared to the position of **FIG. 5.** In this position, the drive unit **3** is in the swim mode position. In this position, the drive unit **3** is in the swim mode position. In **FIG. 6d,** the lower part **21** has been rotated further in the clockwise direction to a position 180 degrees compared to the position of **FIG. 5.** It is the same position as shown in **FIG. 4** and the drive unit **3** is in the swim mode position. In this position, the drive unit **3** is in the swim mode position. In **FIG. 6e,** the lower part **21** has been rotated further in the clockwise direction to a position 225 degrees compared to the position of **FIG. 5.** In this position, the drive unit **3** is in the swim mode position. In this position, the drive unit **3** is in the swim mode position. In **FIG. 6f,** the lower part **21** has been rotated further in the clockwise direction to a position 270 degrees compared to the position of **FIG. 5.** In this position, the drive unit **3** is in the swim mode position. In this position, the drive unit **3** is in the swim mode position. In **FIG. 6g,** the lower part **21** has been rotated further in the clockwise direction to a position 315 degrees compared to the position of **FIG. 5.**

[0046] In the example, the lower part **21** has been rotated in the clockwise direction. In another example, it may be rotated in an anti-clockwise direction or it may be rotated in both directions.

[0047] The lower part **21** may be rotatably connected with the upper part **20** over 360 degrees.

[0048] In **FIGS. 7-9,** the propellers **13a, 13b** are configured to be a pulling drive, hence in normal operation they are pulling the marine vessel **100.** In the example, the first and second propellers **13a, 13b** are arranged in front of the lower part **21** so that when rotated they will pull the lower part **21** as seen in the example in **FIG. 7.** Since, the first and second propellers **13a, 13b** in the normal mode of operation are facing forward against the marine vessel **100,** they are being locked in a position with the one or more propellers **13a, 13b** at least facing forward in a position of minimum 90 degrees compared to an aft facing position of the one or more propellers **13a, 13b,** when the control unit **23** receives a swim mode activation message from the input unit **22.** In addition, the control unit **23** may bring the drive unit **3** to a maximum draught position. The lower part **21** rotate around the axis R.

[0049] In **FIG. 8,** the control unit **23,** in response to receiving a beach mode activation message from the input unit **22,** has rotated the lower part **21** with the one or more propellers **13a, 13b** facing aft in relation to the marine vessel **100.** The drive unit **3** has in the shown example been translated rearward as the same time it has been raised.

[0050] In **FIG. 9,** the drive unit of **FIG. 7** is still in the beach mode having the first and second propeller **13a, 13b** facing aft. In the example shown in **FIG. 9** the control unit **23** has brought the drive unit **3** to a lower draught than shown in **FIG. 8.**

[0051] **FIG. 10** is an exemplary view of a propulsion system **1** for a marine vessel **100** according to an ex-

ample. The propulsion system **1** comprises a transom bracket **2** configured to be connected with a transom **101** of the marine vessel **100,** and a drive unit **3.** The drive unit **3** is arranged to be moved in relation to the transom bracket **2** for moving the drive unit **3** in the water and out of the water. The drive unit **3** comprises an upper part **20** and a lower part **21,** the upper part **20** being pivotable in relation to the marine vessel **100** and the lower part **21** is rotatably connected with the upper part **20,** the lower part **21** comprises in the present example a first propeller **13a,** and a second propeller **13b.** The drive unit **3** is connected with the transom bracket **2** via a connecting arm **4** having a first pivot joint **5** connected with the transom bracket **2** and a second pivot joint **6** connected with the drive unit **3.** The drive unit **3** is configured to be moved in the water and out of the water by the connecting arm **4** pivots around the first pivot joint **5** or the drive unit **3** pivots around the second pivot joint **6** or the connecting arm **4** and the drive unit **3** pivot around both pivot joints **5, 6.** Hereby is obtained that the drive unit **3** may be moved up and down and trimmed.

[0052] In **FIG. 10,** the drive unit **3** has been moved rearwards while it has been tilted up by rotating the connecting arm **5** around the first pivot joint **5.** In addition, the drive unit **3** has been rotated around the second pivot joint **6** of the connecting arm **4** so that a positive trim angle A is obtained of the drive unit **3.**

[0053] The drive unit **3** is configured to be moved by the connecting arm **4** is pivoted around the first pivot joint **5** in a clockwise direction or an anticlockwise direction independently of any pivoting of the drive unit around the second pivot joint **6.** In **FIG. 10,** the connecting arm **4** has been pivoted in an anticlockwise direction around the first pivot joint **5.**

[0054] In addition, the drive unit **3** is configured to be moved by the drive unit is pivoted around the second pivot joint **6** in a clockwise direction or an anticlockwise direction independently of any pivoting of the connecting arm **4** around the first pivot joint **5.** In **FIG. 10,** the drive unit **3** has been pivoted in an anticlockwise direction around the second pivot joint **6.**

[0055] The drive unit **3** is configured to be moved by the connecting arm **4** is pivoted around the first pivot joint **5** in a clockwise direction or an anticlockwise direction at the same time as the drive unit **3** is pivoted around the second pivot joint **6** in a clockwise direction or an anticlockwise direction. In **FIG. 10,** the connecting arm **4** has pivoted in an anticlockwise direction around the first pivot joint **5** and the drive unit **3** has been pivoted in an anticlockwise direction around the second pivot joint **6.** Hence, the drive unit **3** may be trimmed in different trim positions by pivoting the drive unit **3** around the second pivot joint **6** and the position in the water of the drive unit may at the same time been obtained by pivoting the connecting arm **4** around the first pivot joint **5.** Freedom to position the drive unit **3** in relation the transom bracket **2** is obtained. Additionally, the drive unit **3** may be moved up and down as well as translated rearwards in relation to the transom bracket **2** while maintaining an improved angle of thrust A.

[0056] In an example, the drive unit **3** comprises one or more propellers. In **FIG. 10,** the drive unit **3** comprises a first propeller **13a** and a second propeller **13b.** In the example, the first propeller **13a** and the second propeller **13b** are configured to push the marine vessel **100** in a forward motion of the marine vessel **100.** In another example the one or more propellers are configured to pull the marine vessel **100** in a forward motion of the marine vessel.

[0057] In **FIG. 10** the first propeller **13a** and second propeller **13b** have an angle of thrust A, indicated by the angle between the dotted line and the arrow in **FIG. 10.** The drive unit **3** has been pivoted in the anticlockwise direction around the second pivot joint **6** so that a positive trim angle and thereby angle of thrust A for the first propeller **13a** and the second propeller **13b.** In an example, the first propeller **13a** is arranged to be counter-rotating compared to the second propeller **13b.** By the disclosure it is obtained that the drive unit **3** may be positioned freely in relation to a transom bracket **2** and thereby the transom **101** of the marine vessel **100** both in rotation but also vertical movements as well as horizontal movements.

[0058] In **FIG. 10,** a linear actuator **7** is arranged between the connecting arm **4** and the drive unit **3.** The linear actuator **7** is configured to pivot the drive unit **3** around the second pivot joint **6** in either the clockwise direction or the anticlockwise direction and thereby a trim angle of the drive unit **3** and the angle of thrust may be set in relation to the circumstance. The linear actuator **7** is connected with the drive unit **3** in a distance below the second pivot joint **6** and is connected with the drive unit **3** via a drive pivot joint **12** so that it is ensured that the linear actuator **7** transfer force to pivot the drive unit **3** around the second pivot joint **6.**

[0059] In **FIG. 11,** the drive unit **3** has been tilted further up by rotating the connecting arm **4** around the first pivot joint **5** compared to in **FIG. 10.** In addition, the drive unit **3** has been rotated in anticlockwise direction around the second pivot joint **6** of the connecting arm **4** so that an improved angle of thrust A of the first propeller **13a** and the second propeller **13b** is obtained even though the drive unit **3** has been raised to a positon being higher than a bottom **102** of the marine vessel **100.** Hereby the drive unit **3** may be trimmed to an optimum position irrespective of the operating in shallow waters since the bottom **102** of the marine vessel **100** is protecting the drive unit **3** and its propellers against impact.

[0060] Compared to **FIG. 10,** the connecting arm **4** in **FIG. 11** has been pivoted further around the first pivot joint **5** in an anticlockwise direction thereby tilting the drive unit **3** upwards. The connecting arm **4** is configured to be pivoted around the first pivot point **5** in maximum 200 degrees, preferably maximum 180 degrees.

[0061] In addition, the drive unit **3** may also be positioned so that it is raised out of the water in a parked

position, when not in use, for instance when the marine vessel **100** is in the harbor or at the beach.

[0062] In **FIG. 10,** the drive unit **3** is positioned in neutral trim. The drive unit **3** is positioned in its low position where the connecting arm has been pivoted around the first pivot joint **5** in a clockwise direction. In addition, the drive unit **3** has been pivoted around the second pivot joint **6** of the connecting arm so as to be in a neutral trim where the angle of thrust of the first propeller **13**a and the second propeller **13**b are zero.

[0063] In **FIGS. 12-15** an example is shown, where a number of linear actuators **7** are arranged. Two linear actuators **7** are arranged adjacent to each other and are connected with the connecting arm **4** at one end and is configured to be connected with the drive unit in the opposite end. The linear actuators **7** may be hydraulic cylinders. The linear actuators **7** may be arranged to pivot the drive unit around the second pivot joint **6** by extracting the cylinders or retracting the cylinders. In **FIG. 12,** the connecting arm **4** is not pivoted around the first pivot joint **5** whereby the connecting arm **4** is positioned along the transom bracket **2.** In **FIG. 13,** the connecting arm **4** has been pivoted in an anticlockwise direction around the first pivot joint **5** whereby the connecting arm **4** is projecting from the transom bracket **2.** In the example an additional linear actuator **7'** is connected with the connecting arm **4** at one end and at the opposite end to the transom bracket **2.** The linear actuator **7'** is arranged to pivot the connecting arm **4** around the first pivot joint **5** by extracting the cylinder or retracting the cylinder. In **FIG.14,** the cylinder has been extracted so that the connecting arm **4** is rotated in the anticlockwise direction. The additional linear actuator **7'** is assisting in raising and lowering the connecting arm **4** and thereby the drive unit. In **FIG. 14** is shown that the connecting arm **4** may have two parts spaced apart so that the additional linear actuator **7'** may be arranged in the space between the two parts. Hereby a compact design of the connecting arm **4** and the transom bracket **2** is obtained. As shown in **FIG. 14** the first pivot joint **5** may be hollow. In **FIG. 15,** the example is shown in a side view. The linear actuators **7** may be longer than the additional linear actuator 7'. A hydraulic system may be arranged for powering the linear actuator(s). The hydraulic system may be arranged in the drive unit or at the marine vessel.

[0064] In another example, a rotation motor is arranged in connection with the first pivot joint. The rotation motor is configured to rotate the connecting arm around the first pivot joint in a clockwise and anticlockwise direction. A rotation motor may also be arranged in connection with the second pivot joint. The rotation motor is configured to rotate the drive unit around the second pivot joint in a clockwise and anticlockwise direction.

[0065] In **FIG. 16,** another example is shown. A gearing unit **8** is arranged in the first pivot joint **5** and a motor or a step motor **9** is arranged for powering the gearing unit **8.** The gearing unit **8** may have different designs and may be a planetary gearing unit. The gearing unit **8** together with the step motor is configured to rotate the connecting arm **4** around the first pivot joint 5 in a clockwise and anticlockwise direction. A gearing unit may also be arranged in the second pivot joint and a motor or a step motor may be arranged for powering the gearing unit. The gearing unit together with the step motor may be configured to rotate the drive unit around the second pivot joint **6** in a clockwise and anticlockwise direction. In **FIG. 16,** two linear actuators **7** are arranged between the connecting arm **4** and the drive unit for rotating the drive unit around the second pivot joint **6.** In **FIG. 17,** a side view of the gearing unit **8** arranged in connection with the first pivot joint **8** is shown.

[0066] In **FIGS. 18-19,** another example is shown where a slew drive **11** in arranged in connection with first pivot joint **5** for rotating the connecting arm **4** around the first pivot joint in the clockwise and anticlockwise directions. Two linear actuators **7** are arranged between the connecting arm **4** and the drive unit for rotating the drive unit around the second pivot joint **6.**

[0067] In **FIG. 20,** another example is shown a double gearing unit or a double planetary gearing unit **10** is arranged with individual step motors **9** in connection with the pivot joints **5, 6**

[0068] In another example, the double gearing unit or double planetary gearing unit may be powered by a step motor.

[0069] In another example, a hydraulic radial piston motor may be arranged in the second pivot joint.

[0070] According to the disclosure, many different combinations of rotating either the first pivot joint and/or the second pivot joint are feasible.

[0071] The propulsion system may further comprise a kick up function.

[0072] The marine propulsion system may comprise two or more drive units **3,** each drive unit **3** comprises an upper part **20** and a lower part **21,** the upper part **20** being pivotable in relation to the marine vessel **100** and the lower part **21** is rotatably connected with the upper part **20,** the lower part **21** comprises one or more propellers **13a, 13b.** The control unit **23,** in response to receiving a beach mode activation message from the input unit **22,** is configured to rotate the lower part **21** to a position with the one or more propellers **13a, 13b** facing aft in relation to the marine vessel, and/or wherein the control unit **23,** in response to receiving a swim mode activation message from the input unit **22,** is configured to rotate the lower part **21** to a position with the one or more propellers **13a, 13b** at least facing forward in a position of minimum 90 degrees compared to an aft facing position of the one or more propellers **13a, 13b.** The control unit **23** may rotate each lower part **21** in the same direction or in opposite directions.

[0073] The propulsion system may further comprises two or more transom brackets **2** configured to be connected with the transom of the marine vessel, and two or more drive units **3,** each drive unit **3** is arranged to be moved in relation to the transom bracket **2** to move the

drive unit **3** in the water and out of the water, each drive unit **3** is connected with the transom bracket **2** via a connecting arm **4** having a first pivot joint **5** connected with the transom bracket **2** and a second pivot joint **6** connected with the drive unit **3.**

[0074] In addition, the control unit **23** may be operatively connected with the first pivot joint, the second pivot j oint, the linear actuator, the rotation motor, the electric motor, the hydraulic system and/or the step motor.

[0075] Moreover, the lower part **21** is rotatably connected with the upper part **20** whereby the marine vessel may be maneuvered and steered by the lower part **21** is rotated.

[0076] The disclosure also relates to a marine vessel **100** comprising a marine propulsion system **1** as disclosed above. The marine vessel **100** may further comprise a bathing platform **103** and/or a transom **101.**

[0077] The disclosure also relates to a method of operating a marine propulsion system **1** as described above, the method comprising

- providing a marine propulsion system **1** as described above on a marine vessel **100,**
- receiving an activation message indicative of an operation mode for the drive unit **3,**
- controlling the drive unit **3** on basis of the activation message,
- receiving a beach mode activation message,
- rotating, in response to receiving the beach mode activation message, the lower part **21** to a position with the one or more propellers **13a, 13b** facing aft in relation to the marine vessel, and/or
- receiving a swim mode activation message,
- rotating, in response to receiving the swim mode activation message, the lower part **21** to a position with the one or more propellers **13a, 13b** at least facing forward in a position of minimum 90 degrees compared to an aft facing position of the one or more propellers.

[0078] In addition, the activation message is activated by an operator or captain and/or is an automatically generated activation message.

[0079] **FIG. 21** is another view of an example. **FIG. 21** shows a marine propulsion system **1** for a marine vessel **100,** comprising a drive unit **3** comprising an upper part **20** and a lower part **21,** the upper part **20** being pivotable in relation to the marine vessel **100** and the lower part **21** is rotatably connected with the upper part **20,** the lower part **21** comprises one or more propellers **13a, 13b,** an input unit **22** configured to receive an activation message indicative of an operation mode for the drive unit **3,** a control unit **23** being operatively connected with the drive unit **3** and the input unit **22,** the control unit **23** is configured to control the drive unit **3** on basis of the activation message received from the input unit **22,** wherein the control unit **23,** in response to receiving a beach mode activation message from the input unit **22,** is configured to rotate the lower part **21** to a position with the one or more propellers **13a, 13b** facing aft in relation to the marine vessel **100,** and/or wherein the control unit **23,** in response to receiving a swim mode activation message from the input unit **22,** is configured to rotate the lower part **21** to a position with the one or more propellers **13a, 13b** at least facing forward in a position of minimum 90 degrees compared to an aft facing position of the one or more propellers **13a, 13b.** In addition, the marine propulsion system **1** comprising a tilt and trim arrangement **50,** the control unit **23** is operatively connected with the tilt and trim arrangement **50.** An indication **30** may be arranged in connection to a bathing platform **103** of the marine vessel **100** so that it is visible for the swimmers in the water and/or onboard the marine vessel **100** that it is safe to swim around the marine vessel **100.**

[0080] Example **1:** A marine propulsion system (**1**) for a marine vessel (**100**), comprising

- a drive unit (**3**) comprising an upper part (**20**) and a lower part (**21**), the upper part (**20**) being pivotable in relation to the marine vessel (**100**) and the lower part (**21**) is rotatably connected with the upper part (**20**), the lower part (**21**) comprises one or more propellers (**13a, 13b**),
- an input unit (**22**) configured to receive an activation message indicative of an operation mode for the drive unit (**3**),
- a control unit (**23**) being operatively connected with the drive unit (**3**) and the input unit (**22**), the control unit (**23**) is configured to control the drive unit (**3**) on basis of the activation message received from the input unit (**22**),

wherein the control unit (**23**), in response to receiving a beach mode activation message from the input unit (**22**), is configured to rotate the lower part (**21**) to a position with the one or more propellers (**13a**, **13b**) facing aft in relation to the marine vessel, and/or wherein the control unit (**23**), in response to receiving a swim mode activation message from the input unit (**22**), is configured to rotate the lower part (**21**) to a position with the one or more propellers (**13a**, **13b)** at least facing forward in a position of minimum 90 degrees compared to an aft facing position of the one or more propellers (**13a**, **13b).**

[0081] Example **2:** The marine propulsion system (**1**) of Example 1, wherein the control unit (**23**), in response to receiving a beach mode activation message from the input unit (**22**), is configured to bring the drive unit to a reduced draught mode of operation, and/or wherein the control unit (**23**), in response to receiving a swim mode activation message from the input unit (**22**), is configured to bring the drive unit to a maximum draught position.

[0082] Example 3: The marine propulsion system (**1**) of any of the preceding Examples, wherein the drive unit (**3**) is moved upwards to the reduced draught position when

the control unit (**23**) receives the beach mode activation message.

[0083] Example 4: The marine propulsion system (**1**) of Example **1,** wherein the drive unit (3) is moved downwards to the maximum draught position when the control unit (**23**) receives the swim mode activation message.

[0084] Example 5: The marine propulsion system (**1**) of any of the preceding Examples, wherein the one or more propellers (**13a**, **13b)** is/are configured to be a pushing drive.

[0085] Example 6: The marine propulsion system (**1**) of any of the Examples 1 to 4, wherein the one or more propellers (**13a, 13b)** is/are configured to be a pulling drive.

[0086] Example 7: The marine propulsion system (**1**) of Example 5, wherein the lower part (**21**) of the pushing drive is/are configured to be rotated the position with the one or more propellers (**13a**, **13b)** at least facing forward in the position of minimum 90 degrees compared to an aft facing position of the one or more propellers (**13a**, **13b),** when the control unit (**23**) receives the swim mode activation message.

[0087] Example 8: The marine propulsion system (**1**) of Example 6, wherein the lower part (**21**) of the pulling drive is/are configured to be rotated the position with the one or more propellers (**13a**, **13b)** facing aft in relation to the marine vessel (**100**), when the control unit (**23**) receives the beach mode activation message.

[0088] Example 9: The marine propulsion system (**1**) of any of the preceding Examples, wherein the activation message is activated by an operator or captain and/or is an automatically generated activation message.

[0089] Example 10: The marine propulsion system (**1**) of Example 9, wherein the automatically generated activation message is sensor data obtained from one or more sensor(s) (**24**).

[0090] Example 11: The marine propulsion system (**1**) of Example 9, wherein the operator or captain activates the beach mode activating message at the input unit (**22**).

[0091] Example 12: The marine propulsion system (**1**) of Example 9, wherein the operator or captain activates the swim mode activating message at the input unit (**22**).

[0092] Example 13: The marine propulsion system (**1**) of Example 10, wherein the one or more sensor(s) (**24**) is/are configured to detect a draught around the marine vessel (**100**) and based on the detected draught activates the beach mode activating message.

[0093] Example 14: The marine propulsion system (**1**) of Example 10, wherein the one or more sensor(s) (**24**) is/are configured to detect an obstacle and/or humans or animals around the marine vessel (**100**) and based on the detection activates the swim mode activating message.

[0094] Example 15: The marine propulsion system (**1**) of Example 10, wherein the one or more sensor(s) (**24**) is/are configured to detect obstacles and/or humans or animals in the vicinity of the one or more propellers (**13a**, **13b).**

[0095] Example 16: The marine propulsion system (**1**) of Example 10, 13, 14 and/or 15, wherein the one or more sensors (**24**) are operatively connected with the control unit (**23**).

[0096] Example 17: The marine propulsion system (**1**) of Example 10, 13 ,14, 15 and/or 16, wherein the sensor (**24**) is a LiDAR sensor, a Sonar sensor, a speed log, a torque sensor, a depth sensor, a basic in/off switch sensor, or similar.

[0097] Example 18: The marine propulsion system (**1**) of any of the preceding Examples, wherein the drive unit (**3**) is locked in the swim mode until swim mode activation message is deactivated by the operator or captain.

[0098] Example 19: The marine propulsion system (**1**) of any of the preceding Examples, wherein the drive unit (**3**) is configured to be started with a special acknowledgement operation when in swim mode, such as unlocking by a physical or digital key.

[0099] Example 20: The marine propulsion system (**1**) of any of the preceding Examples, wherein the one or more propellers (**13a**, **13b)** is/are locked when in the swim mode so that they are unable to rotate.

[0100] Example 21: The marine propulsion system (**1**) of any of the preceding Examples, wherein, when the swim mode activation message is deactivated, the lower part (**21**) is rotated to its intended position before it the one or more propellers (**13a**, **13b)** is/are allowed to rotate.

[0101] Example 22: The marine propulsion system (**1**) of any of the preceding Examples, wherein the control unit (**23**) is configured to issue a notification that it is safe to swim around the drive unit (**3**) when the lower part (**21**) of the drive unit (**3**) has been rotated the position with the one or more propellers (**13a**, **13b)** at least facing forward in the position of minimum 90 degrees compared to the aft facing position of the one or more propellers (**13a**, **13b**), and the one or more propellers (**13a**, **13b)** are locked.

[0102] Example 23: The marine propulsion system (**1**) of any of the preceding Examples, wherein the control unit (**23**) is configured to issue a notification that the drive unit (**3**) is in the beach mode when the lower part (**21**) of the drive unit (**3**) has been rotated the position with the one or more propellers (**13a**, **13b)** facing aft in relation to the marine vessel (**100**), whereby the drive unit (**3**) can operate the marine vessel in shallow water.

[0103] Example 24: The marine propulsion system (**1**) of any of the preceding Examples, wherein the control unit (**23**) is configured is issue one or more indications for indicating when the swim mode is active and thereby it is safe to swim around the drive unit (**3**).

[0104] Example 25: The marine propulsion system (**1**) of any of the preceding Examples, wherein at least the swim mode is associated with a green light arranged in connection to a bathing platform (**103**) of the marine vessel (**100**).

[0105] Example 26: The marine propulsion system (**1**) of any of the preceding Examples, wherein LiDAR vessel sensors (**40**) are arranged around the marine vessel (**100**) for detecting obstacles and/or humans around

the marine vessel (**100**).

[0106] Example 27: The marine propulsion system (**1**) of Example 26, wherein the LiDAR vessel sensors (**40**) are operatively connected with the control unit (**23**).

[0107] Example 28: The marine propulsion system (**1**) of Example 27, wherein the control unit (**23**) is configured to process the detected obstacles and/or humans and to present the detected obstacles and/or humans on a display for the operator or captain.

[0108] Example 29: The marine propulsion system (**1**) of any of the preceding Examples, wherein the drive unit (**3**) is an outboard motor.

[0109] Example 30: The marine propulsion system (**1**) of Example 29, wherein the motor is an electric motor.

[0110] Example 31: The marine propulsion system (**1**) of any of the preceding Examples, wherein the drive unit (**3**) comprises one or more unit sensors (**25**) configured to detect a position of the lower part (**21**) of the drive unit (**3**) and/or the position of the one or more propellers (**13a**, **13b).**

[0111] Example 32: The marine propulsion system (**1**) of Example 31, wherein the one or more unit sensors (**25**) is/are configured to detect a height position of the drive unit (**3**).

[0112] Example 33: The marine propulsion system (**1**) of Example 31 and/or 32, wherein the one or more unit sensors (**25**) are operatively connected with the control unit (**23**).

[0113] Example 34: The marine propulsion system (**1**) of any of the preceding Examples, further comprising a tilt and trim arrangement (**50**), the control unit (**23**) is operatively connected with the tilt and trim arrangement.

[0114] Example 35: The marine propulsion system (**1**) of Example 34, wherein the control unit (**23**) is configured to automatically set the drive unit (**3**) in a predetermined mode of operation based on the tilt and/or trim of the drive unit (**3**).

[0115] Example 36: The marine propulsion system (**1**) of any of the preceding Examples, wherein the drive unit (**3**) is connected with a transom (**101**) of the marine vessel (**100**) via a transom bracket (**2**).

[0116] Example 37: The marine propulsion system (**1**) of Example 36, wherein the drive unit (**3**) is arranged to be moved in relation to the transom bracket (**2**) for moving the drive unit (**3**) in the water and out of the water, the drive unit (**3**) is connected with the transom bracket (**2**) via a connecting arm (**4**) having a first pivot joint (**5**) connected with the transom bracket (**2**) and a second pivot joint (**6**) connected with the drive unit (**3**), wherein the drive unit (**3**) is configured to be moved in the water and out of the water by the connecting arm (**4**) pivots around the first pivot joint (**5**) or the drive unit (**3**) pivots around the second pivot joint (**6**) or the connecting arm (**4**) and the drive unit (**3**) pivot around both pivot joints (**5, 6**).

[0117] Example 38: The marine propulsion system (**1**) of Example 37, wherein the drive unit (**3**) is configured to be moved by the connecting arm (**4**) is pivoted around the first pivot joint (**5**) in a clockwise direction or an anticlockwise direction independently of any pivoting of the drive unit (**3**) around the second pivot joint (**6**).

[0118] Example 39: The marine propulsion system (**1**) of Example 37, wherein the drive unit (**3**) is configured to be moved by the drive unit (**3**) is pivoted around the second pivot joint (**6**) in a clockwise direction or an anticlockwise direction independently of any pivoting of the connecting arm (**4**) around the first pivot joint (**5**).

[0119] Example 40: The marine propulsion system (**1**) of Example 37, wherein the drive unit (**3**) is configured to be moved by the connecting arm (**4**) is pivoted around the first pivot joint (**5**) in a clockwise direction or an anticlockwise direction at the same time as the drive unit (**3**) is pivoted around the second pivot joint (**6**) in a clockwise direction or an anticlockwise direction.

[0120] Example 41: The marine propulsion system (**1**) of any of the Examples 37 to 40, wherein a rotation motor is arranged in the first pivot joint (**5**) and/or in the second pivot joint (**6**).

[0121] Example 42: The marine propulsion system (**1**) of any of the Examples 37 to 41, wherein a linear actuator (**7**) is arranged between the transom bracket (**2**) and the connecting arm (**4**), or between the connecting arm (**4**) and the drive unit (**3**).

[0122] Example 43: The marine propulsion system (**1**) of any of the preceding Examples, wherein a plurality of linear actuators (**7**) are arranged between the transom bracket (**2**) and the connecting arm (**4**), or between the connecting arm (**4**) and the drive unit (**3**).

[0123] Example 44: The marine propulsion system (**1**) of any of Examples 42 to 43, wherein a hydraulic system is arranged for powering the linear actuator(s) (**7**).

[0124] Example 45: The marine propulsion system (**1**) of any of the Examples 41 to 44, wherein the rotation motor and the linear actuator(s) (**7**) are configured to pivot the connecting arm (**4**) around the first pivot joint (**5**) and/or the drive unit (**3**) around the second pivot joint (**6**).

[0125] Example 46: The marine propulsion system (**1**) of Example 37, wherein a gearing unit (**8**) is arranged in the first pivot joint (**5**) and/or in the second pivot joint (**6**).

[0126] Example 47: The marine propulsion system (**1**) of Example 46, wherein the gearing unit (**8**) is a planetary gearing unit arranged in the first pivot joint (**5**) and/or in the second pivot joint (**6**).

[0127] Example 48: The marine propulsion system (**1**) of Example 46, wherein a motor or a step motor (**9**) is arranged for powering the gearing unit and/or planetary gearing unit.

[0128] Example 49: The marine propulsion system (**1**) of any of the Examples 46 to 48, wherein the gearing unit and/or the planetary gearing unit and/or the linear actuator(s) are configured to move the drive unit (**3**) by pivoting the connecting arm (**4**) around the first pivot joint (**5**) and/or by pivoting the drive unit (**3**) around the second pivot joint (**6**).

[0129] Example 50: The marine propulsion system (**1**) of any of the preceding Examples, wherein the control unit (**23**) is operatively connected with the drive unit (**3**),

the first pivot joint (**5**), the second pivot joint (**6**), the linear actuator (**7**), the rotation motor (**9**), the electric motor, the hydraulic system and/or the step motor.

[0130] Example 51: The marine propulsion system (**1**) of any of the preceding Examples, wherein the drive unit (**3**) is configured to function as a bathing ladder in the swim mode.

[0131] Example 52: The marine propulsion system (**1**) of any of the preceding Examples, wherein the lower part (**21**) is rotatably connected with the upper part (**20**) over 360 degrees.

[0132] Example 53: The marine propulsion system (**1**) of any of the preceding claims, further comprising two or more drive units (**3**), each drive unit (**3**) comprises an upper part (**20**) and a lower part (**21**), the upper part (**20**) being pivotable in relation to the marine vessel (**100**) and the lower part (**21**) is rotatably connected with the upper part (**20**), the lower part (**21**) comprises one or more propellers (**13a, 13b**), wherein the control unit (**23**), in response to receiving a beach mode activation message from the input unit (**22**), is configured to rotate the lower part (**21**) to a position with the one or more propellers (**13a, 13b**) facing aft in relation to the marine vessel, and/or wherein the control unit (**23**), in response to receiving a swim mode activation message from the input unit (**22**), is configured to rotate the lower part (**21**) to a position with the one or more propellers (**13a, 13b**) at least facing forward in a position of minimum 90 degrees compared to an aft facing position of the one or more propellers (**13a**, **13b).**

[0133] Example 54: The marine propulsion system (**1**) of Example 54, wherein the control unit (**23**) is configured to rotate each lower part (**21**) in the same direction or in opposite directions.

[0134] Example 55: A marine vessel (**100**) comprising a marine propulsion system (**1**) of any of the preceding Examples.

[0135] Example 56: The marine vessel (**100**) of Example 55, further comprising a bathing platform (**103**).

[0136] Example 57: The marine vessel (**100**) of Example 55 and/or 56, further comprising a transom (**101**).

[0137] Example 58: A method of operating a marine propulsion system (**1**) of any of the Examples **1** to 54, comprising

- providing a marine propulsion system (**1**) of any of the Examples 1 to 54, on a marine vessel (**100**),
- receiving an activation message indicative of an operation mode for the drive unit (**3**),
- controlling the drive unit (**3**) on basis of the activation message,
- receiving a beach mode activation message,
- rotating, in response to receiving the beach mode activation message, the lower part (**21**) to a position with the one or more propellers (**13a**, **13b)** facing aft in relation to the marine vessel, and/or
- receiving a swim mode activation message,
- rotating, in response to receiving the swim mode activation message, the lower part (**21**) to a position with the one or more propellers (**13a**, **13b)** at least facing forward in a position of minimum 90 degrees compared to an aft facing position of the one or more propellers. (**13a**, **13b**).

[0138] Example 56: The method of Example 55, whereby the activation message is activated by an operator or captain and/or is an automatically generated activation message.

[0139] Example 57: The method of Example 55 and/or 56, further comprising bringing, in response to receiving a beach mode activation message, the drive unit to a reduced draught mode of operation, and/or

bringing, in response to receiving a swim mode activation message, the drive unit to a maximum draught position.

[0140] The terminology used herein is for the purpose of describing particular aspects only and is not intended to be limiting of the disclosure. As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items. It will be further understood that the terms "comprises," "comprising," "includes," and/or "including" when used herein specify the presence of stated features, integers, actions, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, actions, steps, operations, elements, components, and/or groups thereof.

[0141] It will be understood that, although the terms first, second, etc., may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another. For example, a first element could be termed a second element, and, similarly, a second element could be termed a first element without departing from the scope of the present disclosure.

[0142] Relative terms such as "below" or "above" or "upper" or "lower" or "horizontal" or "vertical" may be used herein to describe a relationship of one element to another element as illustrated in the Figures. It will be understood that these terms and those discussed above are intended to encompass different orientations of the device in addition to the orientation depicted in the Figures. It will be understood that when an element is referred to as being "connected" or "coupled" to another element, it can be directly connected or coupled to the other element, or intervening elements may be present. In contrast, when an element is referred to as being "directly connected" or "directly coupled" to another element, there are no intervening elements present.

[0143] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure belongs. It will be further understood that terms used herein should be

interpreted as having a meaning consistent with their meaning in the context of this specification and the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0144] It is to be understood that the present disclosure is not limited to the aspects described above and illustrated in the drawings; rather, the skilled person will recognize that many changes and modifications may be made within the scope of the present disclosure and appended claims. In the drawings and specification, there have been disclosed aspects for purposes of illustration only and not for purposes of limitation, the scope of the disclosure being set forth in the following claims.

Claims

1. A marine propulsion system (**1**) for a marine vessel (**100**), comprising

- a drive unit (**3**) comprising an upper part (**20**) and a lower part (**21**), the upper part (**20**) being pivotable in relation to the marine vessel and the lower part (**21**) is rotatably connected with the upper part (**20**), the lower part comprises one or more propellers (**13a, 13b**),
- an input unit (**22**) configured to receive an activation message indicative of an operation mode for the drive unit (**3**),
- a control unit (**23**) being operatively connected with the drive unit (**3**) and the input unit (**22**), the control unit (**23**) is configured to control the drive unit (**3**) on basis of the activation message received from the input unit (**22**),

wherein the control unit (**23**), in response to receiving a beach mode activation message from the input unit (**22**), is configured to rotate the lower part (**21**) to a position with the one or more propellers (**13a, 13b**) facing aft in relation to the marine vessel, and/or

wherein the control unit (**23**), in response to receiving a swim mode activation message from the input unit (**22**), is configured to rotate the lower part (**21**) to a position with the one or more propellers (**13a, 13b**) at least facing forward in a position of minimum **90** degrees compared to an aft facing position of the one or more propellers (**13a, 13b**).

2. The marine propulsion system (**1**) of claim 1, wherein the control unit (**23**), in response to receiving a beach mode activation message from the input unit (**22**), is configured to bring the drive unit (**3**) to a reduced draught mode of operation, and/or wherein the control unit (**23**), in response to receiving a swim mode activation message from the input unit (**22**), is configured to bring the drive unit to a maximum draught position.

3. The marine propulsion system (**1**) of any of the preceding claims, wherein the activation message is activated by an operator or captain and/or is an automatically generated activation message.

4. The marine propulsion system (**1**) of claim 3, wherein the automatically generated activation message is sensor data obtained from one or more sensor(s) (**24**).

5. The marine propulsion system (**1**) of claim 3, wherein the operator or captain activates the beach mode activating message at the input unit (**22**), and/or the operator or captain activates the swim mode activating message at the input unit (**22**).

6. The marine propulsion system (**1**) of claim 4, wherein the one or more sensor(s) (**24**) is/are configured to detect a draught around the marine vessel (**100**) and based on the detected draught activates the beach mode activating message, and/or wherein the one or more sensor(s) (**24**) is/are configured to detect an obstacle and/or humans or animals around the marine vessel and based on the detection activates the swim mode activating message.

7. The marine propulsion system (**1**) of any of the preceding claims, wherein the drive unit (**3**) is locked in the swim mode until swim mode activation message is deactivated by the operator or captain.

8. The marine propulsion system (**1**) of any of the preceding claims, wherein the drive unit (**3**) is configured to be started with a special acknowledgement operation when in swim mode, such as unlocking by a physical or digital key.

9. The marine propulsion system (**1**) of any of the preceding claims, wherein the one or more propellers (**13a**, **13b)** is/are locked when in the swim mode so that they are unable to rotate.

10. The marine propulsion system (**1**) of any of the preceding claims, wherein, when the swim mode activation message is deactivated, the lower part (**21**) is rotated to its intended position before it the one or more propellers (**13a**, **13b)** is/are allowed to rotate.

11. The marine propulsion system (**1**) of any of the preceding claims, wherein the control unit (**23**) is configured to issue a notification that it is safe to swim around the drive unit (**3**) when the lower part (**21**) of the drive unit (**3**) has been rotated the position with the one or more propellers (**13a**, **13b**) at least facing forward in the position of minimum 90 degrees compared to the aft facing position of the one or more propellers (**13a**, **13b**), and the one or more propellers

(**13a**, **13b**) are locked.

12. The marine propulsion system (**1**) of any of the preceding claims, wherein the drive unit (**3**) comprises one or more unit sensors (**25**) configured to detect a position of the lower part (**21**) of the drive unit (**3**) and/or the position of the one or more propellers (**13a, 13b**).

13. The marine propulsion system (**1**) of any of the preceding claims, wherein the drive unit (**3**) is connected with a transom (**101**) of the marine vessel via a transom bracket (**2**).

14. The marine propulsion system (**1**) of claim 13, wherein the drive unit (**3**) is arranged to be moved in relation to the transom bracket (**2**) for moving the drive unit (**3**) in the water and out of the water,

the drive unit (**3**) is connected with the transom bracket (**2**) via a connecting arm (**4**) having a first pivot joint (**5**) connected with the transom bracket (**2**) and a second pivot joint (**6**) connected with the drive unit (**3**),
wherein the drive unit (**3**) is configured to be moved in the water and out of the water by the connecting arm (**4**) pivots around the first pivot joint (**5**) or the drive unit (**3**) pivots around the second pivot joint (**6**) or the connecting arm (**4**) and the drive unit (**3**) pivot around both pivot joints (**5**, **6**).

15. A method of operating a marine propulsion system (**1**) of any of the preceding claims, comprising

- providing a marine propulsion system (**1**) of any of the preceding claims, on a marine vessel (**100**),
- receiving an activation message indicative of an operation mode for the drive unit (**3**),
- controlling the drive unit (**3**) on basis of the activation message,
- receiving a beach mode activation message,
- rotating, in response to receiving the beach mode activation message, the lower part (**21**) to a position with the one or more propellers (**13a**, **13b)** facing aft in relation to the marine vessel, and/or
- receiving a swim mode activation message,
- rotating, in response to receiving the swim mode activation message, the lower part (**21**) to a position with the one or more propellers (**13a, 13b**) at least facing forward in a position of minimum 90 degrees compared to an aft facing position of the one or more propellers.

Amended claims in accordance with Rule 137(2) EPC.

1. A marine propulsion system (**1**) for a marine vessel (**100**), comprising

- a drive unit (**3**) comprising an upper part (**20**) and a lower part (**21**), the upper part (**20**) being pivotable in relation to the marine vessel and the lower part (**21**) is rotatably connected with the upper part (**20**), the lower part comprises one or more propellers (**13a**, **13b**),
- an input unit (**22**) configured to receive an activation message indicative of an operation mode for the drive unit (**3**),
- a control unit (**23**) being operatively connected with the drive unit (**3**) and the input unit (**22**), the control unit (**23**) is configured to control the drive unit (**3**) on basis of the activation message received from the input unit (**22**),
wherein the control unit (**23**), in response to receiving a beach mode activation message from the input unit (**22**), is configured to rotate the lower part (**21**) to a position with the one or more propellers (**13a**, **13b**) facing aft in relation to the marine vessel, and/or
wherein the control unit (**23**), in response to receiving a swim mode activation message from the input unit (**22**), is configured to rotate the lower part (**21**) to a position with the one or more propellers (**13a**, **13b**) at least facing forward in a position of minimum **90** degrees compared to an aft facing position of the one or more propellers (**13a**, **13b**).

2. The marine propulsion system (**1**) of claim 1, wherein the control unit (**23**), in response to receiving a beach mode activation message from the input unit (**22**), is configured to bring the drive unit (**3**) to a reduced draught mode of operation, and/or wherein the control unit (**23**), in response to receiving a swim mode activation message from the input unit (**22**), is configured to bring the drive unit to a maximum draught position.

3. The marine propulsion system (**1**) of any of the preceding claims, wherein the activation message is activated by an operator or captain and/or is an automatically generated activation message.

4. The marine propulsion system (**1**) of claim 3, wherein the automatically generated activation message is sensor data obtained from one or more sensor(s) (**24**).

5. The marine propulsion system (**1**) of claim 3, wherein the operator or captain activates the beach mode activating message at the input unit (**22**), and/or the

operator or captain activates the swim mode activating message at the input unit (**22**).

6. The marine propulsion system (**1**) of claim 4, wherein the one or more sensor(s) (**24**) is/are configured to detect a draught around the marine vessel (**100**) and based on the detected draught activates the beach mode activating message, and/or wherein the one or more sensor(s) (**24**) is/are configured to detect an obstacle and/or humans or animals around the marine vessel and based on the detection activates the swim mode activating message.

7. The marine propulsion system (**1**) of any of the preceding claims, wherein the drive unit (**3**) is locked in the swim mode until swim mode activation message is deactivated by the operator or captain.

8. The marine propulsion system (**1**) of any of the preceding claims, wherein the drive unit (**3**) is configured to be started with a special acknowledgement operation when in swim mode, such as unlocking by a physical or digital key.

9. The marine propulsion system (**1**) of any of the preceding claims, wherein the one or more propellers (**13a**, **13b**) is/are locked when in the swim mode so that they are unable to rotate.

10. The marine propulsion system (**1**) of any of the preceding claims, wherein, when the swim mode activation message is deactivated, the lower part (**21**) is rotated to its intended position before the one or more propellers (**13a**, **13b**) is/are allowed to rotate.

11. The marine propulsion system (**1**) of any of the preceding claims, wherein the control unit (**23**) is configured to issue a notification that it is safe to swim around the drive unit (**3**) when the lower part (**21**) of the drive unit (**3**) has been rotated the position with the one or more propellers (**13a**, **13b**) at least facing forward in the position of minimum 90 degrees compared to the aft facing position of the one or more propellers (**13a**, **13b**), and the one or more propellers (**13a**, **13b**) are locked.

12. The marine propulsion system (**1**) of any of the preceding claims, wherein the drive unit (**3**) comprises one or more unit sensors (**25**) configured to detect a position of the lower part (**21**) of the drive unit (**3**) and/or the position of the one or more propellers (**13a**, **13b**).

13. The marine propulsion system (**1**) of any of the preceding claims, wherein the drive unit (**3**) is connected with a transom (**101**) of the marine vessel via a transom bracket (**2**).

14. The marine propulsion system (**1**) of claim 13, wherein the drive unit (**3**) is arranged to be moved in relation to the transom bracket (**2**) for moving the drive unit (**3**) in the water and out of the water,

the drive unit (**3**) is connected with the transom bracket (**2**) via a connecting arm (**4**) having a first pivot joint (**5**) connected with the transom bracket (**2**) and a second pivot joint (**6**) connected with the drive unit (**3**),
wherein the drive unit (**3**) is configured to be moved in the water and out of the water by the connecting arm (**4**) pivots around the first pivot joint (**5**) or the drive unit (**3**) pivots around the second pivot joint (**6**) or the connecting arm (**4**) and the drive unit (**3**) pivot around both pivot joints (**5**, **6**).

15. A method of operating a marine propulsion system (**1**) of any of the preceding claims, comprising

- providing a marine propulsion system (**1**) of any of the preceding claims, on a marine vessel (**100**),
- receiving an activation message indicative of an operation mode for the drive unit (**3**),
- controlling the drive unit (**3**) on basis of the activation message,
- receiving a beach mode activation message,
- rotating, in response to receiving the beach mode activation message, the lower part (**21**) to a position with the one or more propellers (**13a**, **13b**) facing aft in relation to the marine vessel, and/or
- receiving a swim mode activation message,
- rotating, in response to receiving the swim mode activation message, the lower part (21) to a position with the one or more propellers (**13a**, **13b**) at least facing forward in a position of minimum 90 degrees compared to an aft facing position of the one or more propellers.

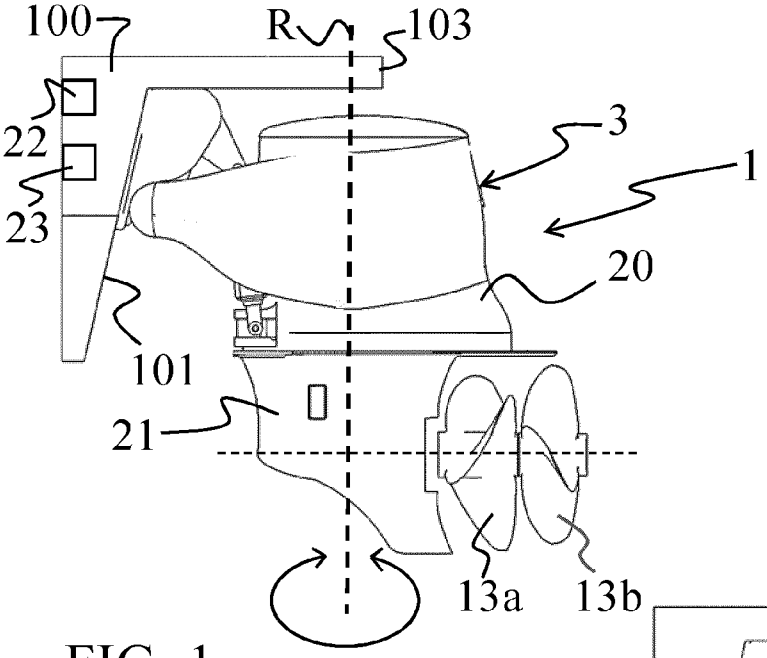

FIG. 1

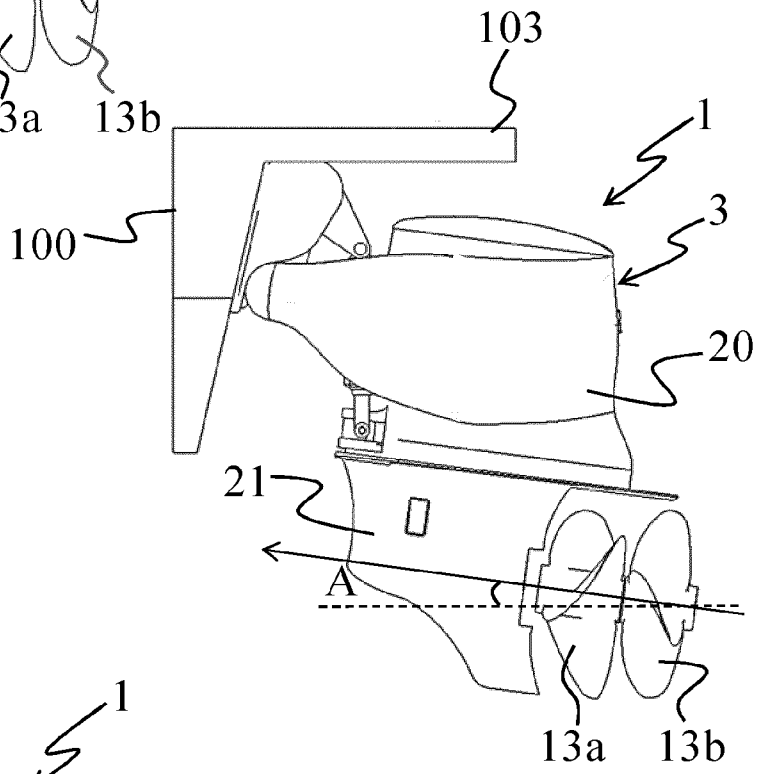

FIG. 2

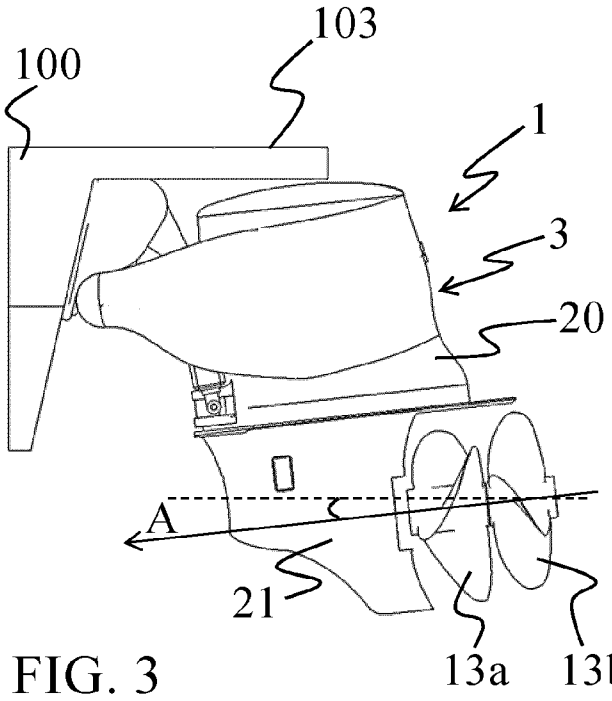

FIG. 3

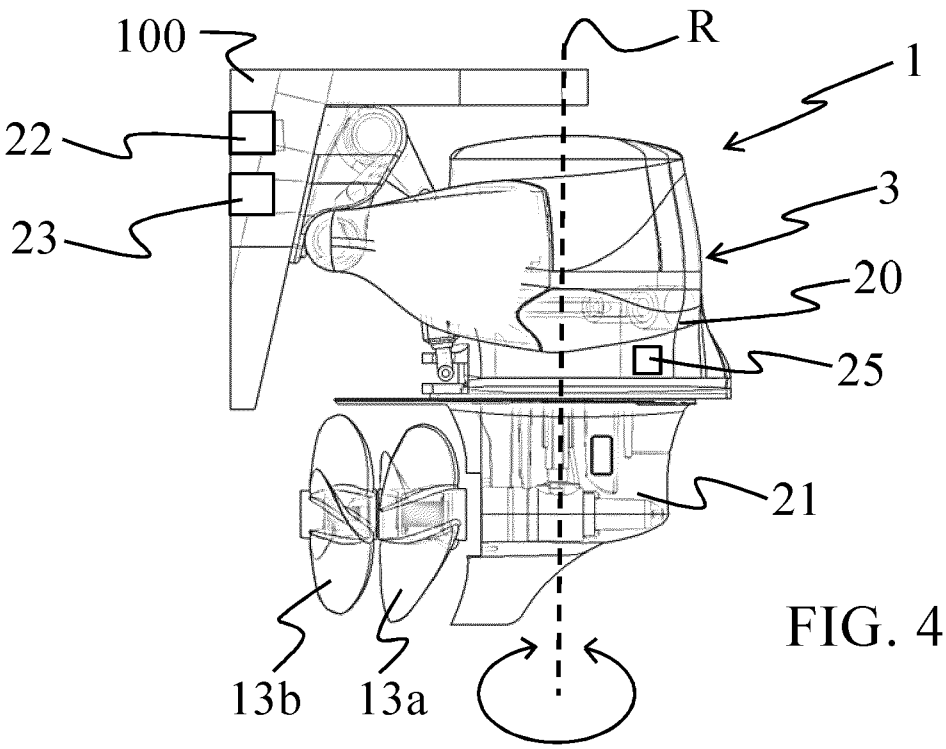
100
R
1
22
3
23
20
25
21
13b
13a

FIG. 4

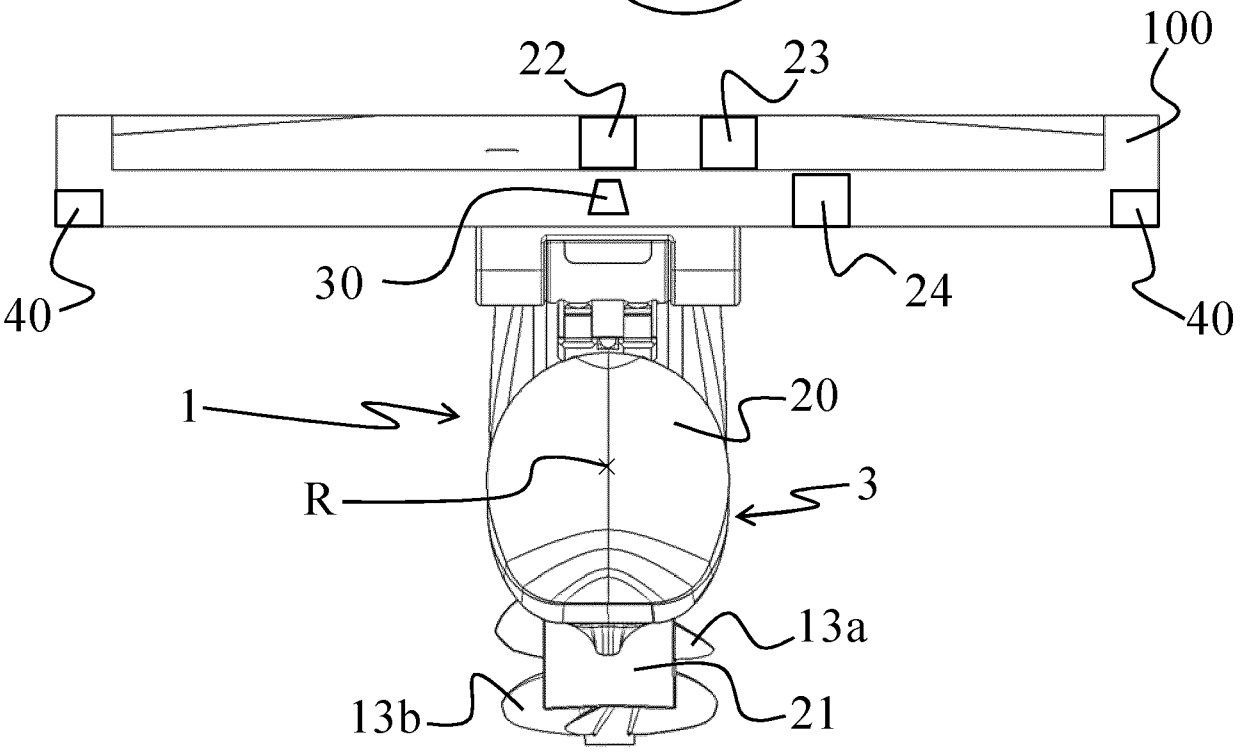
100
22
23
40
30
24
40
1
20
R
3
13a
13b
21

FIG. 5

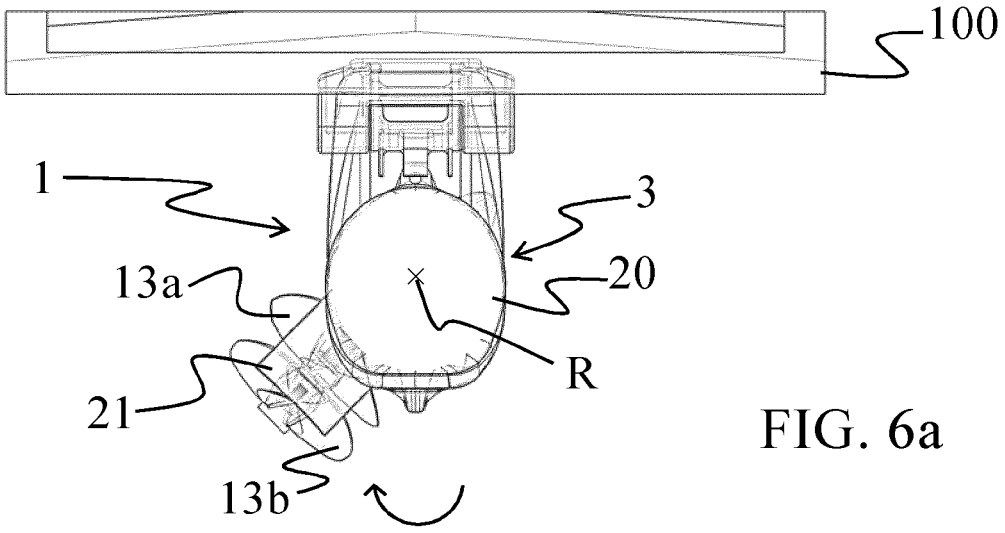

FIG. 6a

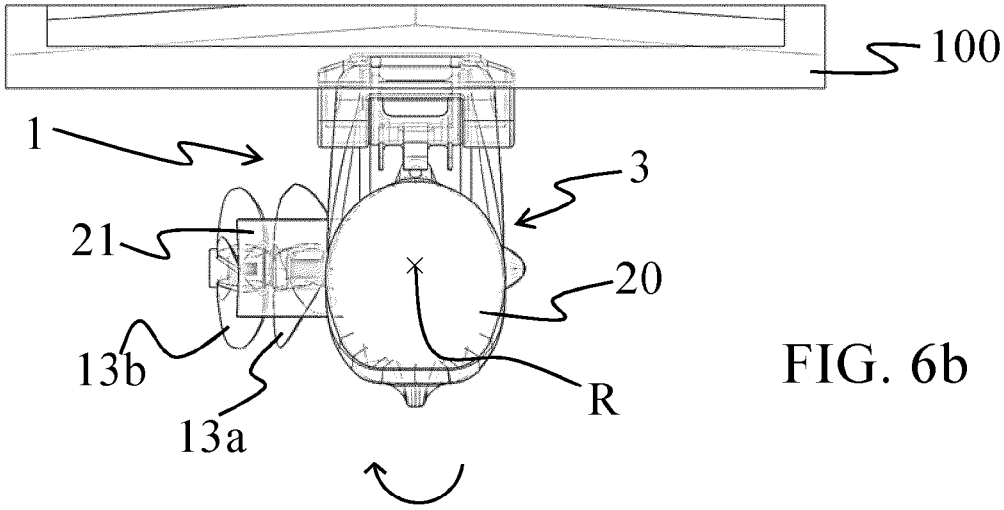

FIG. 6b

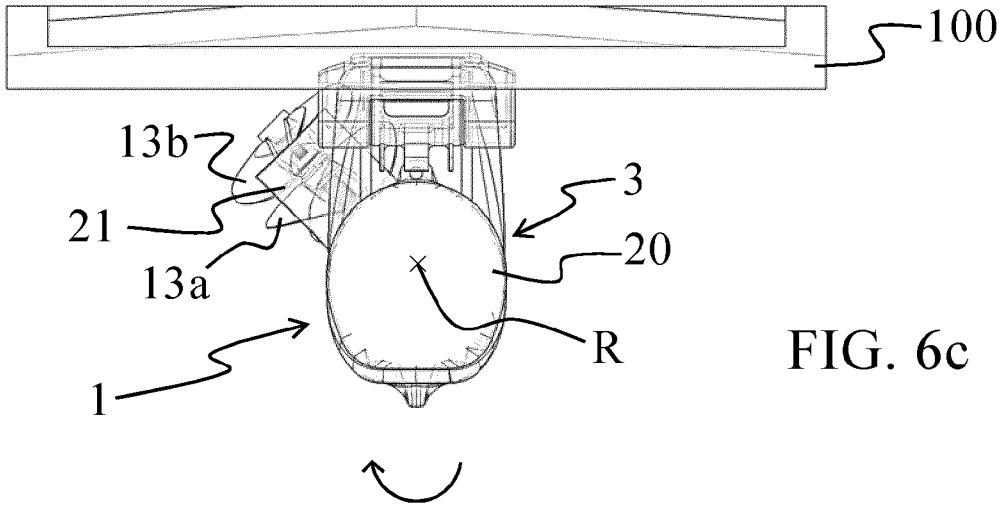

FIG. 6c

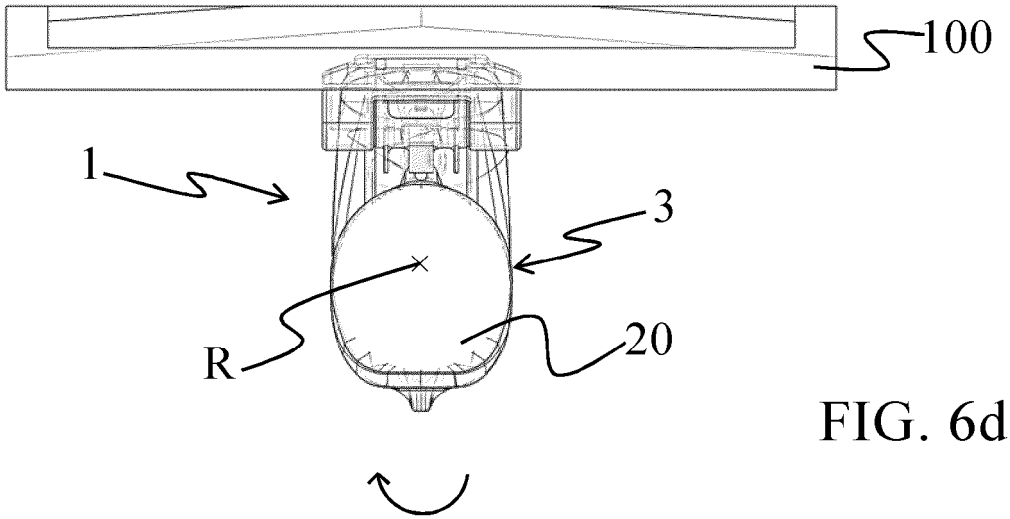

FIG. 6d

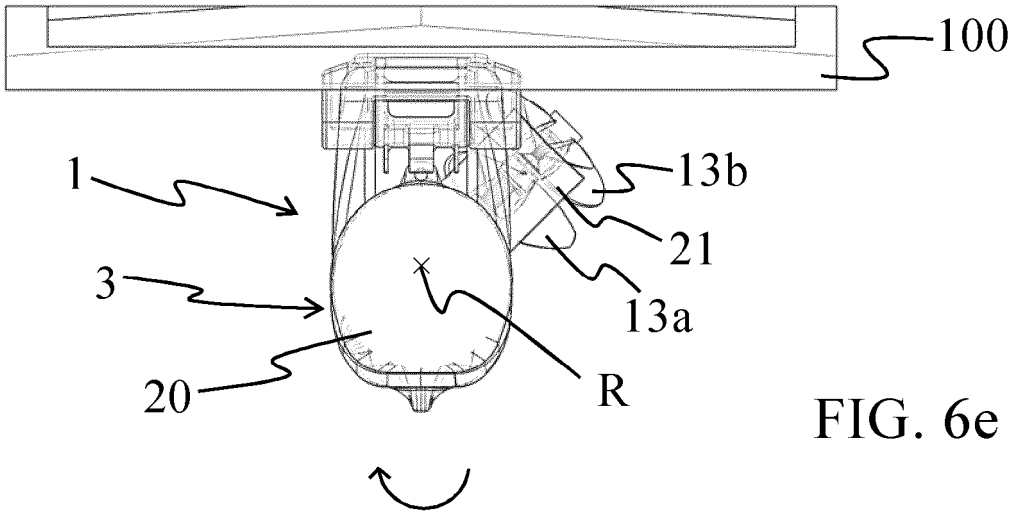

FIG. 6e

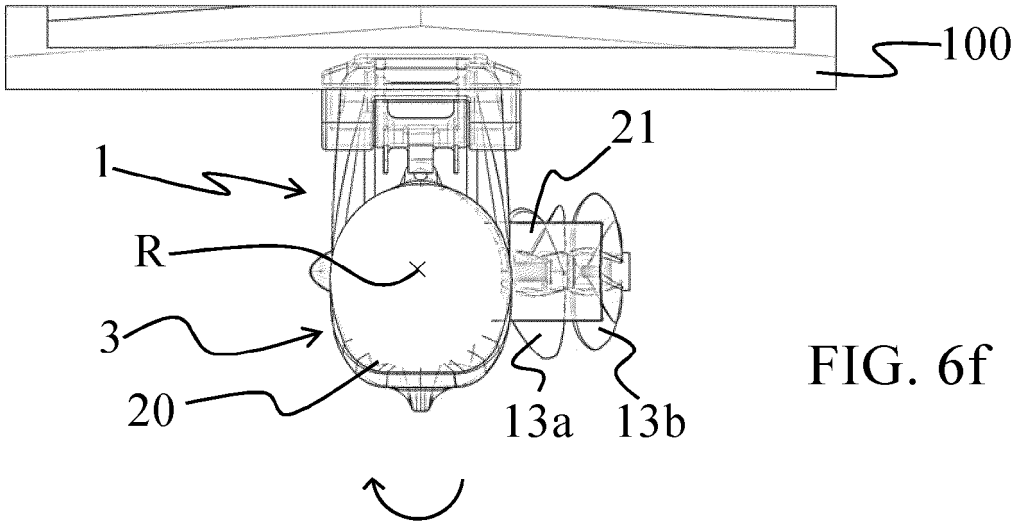

FIG. 6f

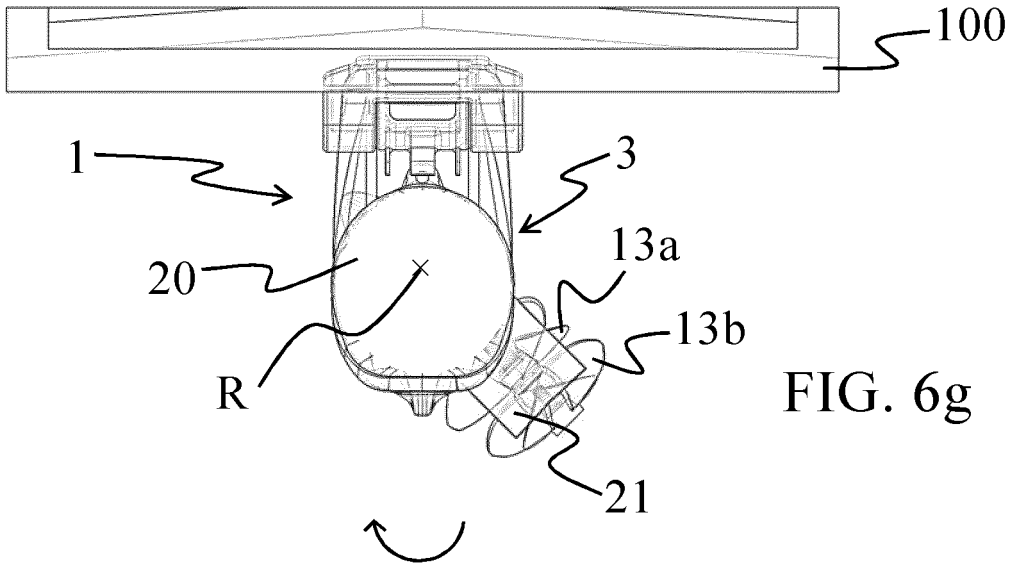

FIG. 6g

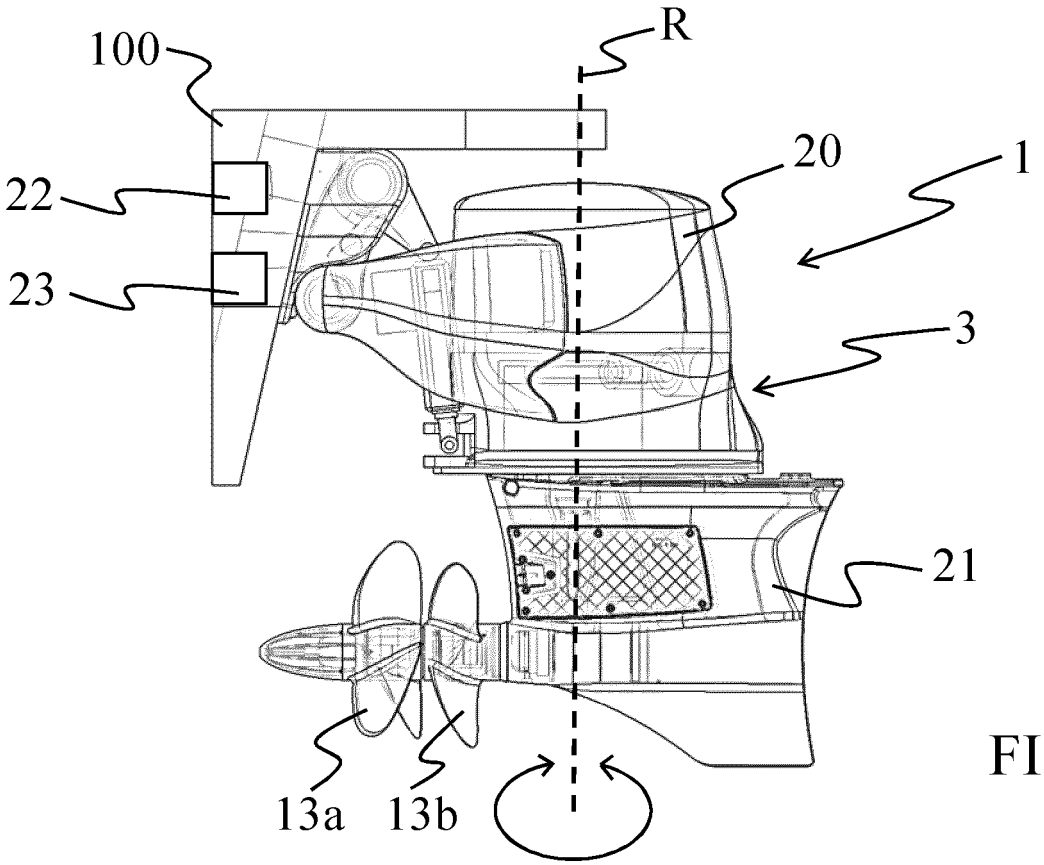

FIG. 7

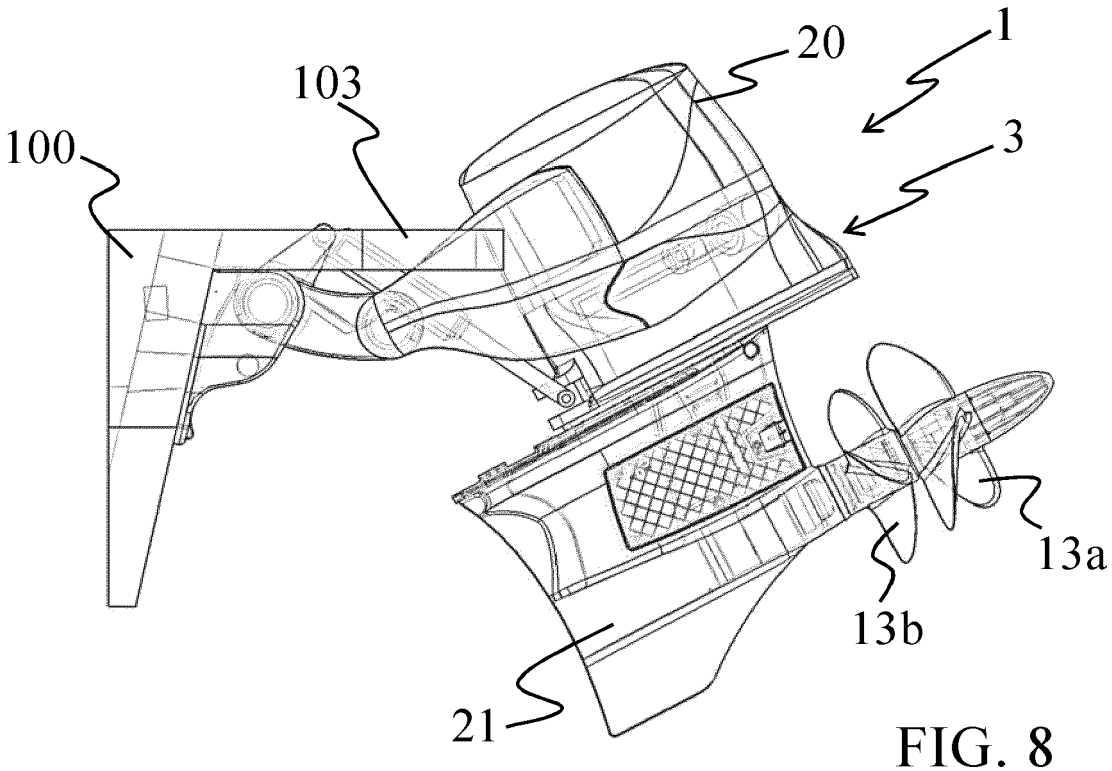

FIG. 8

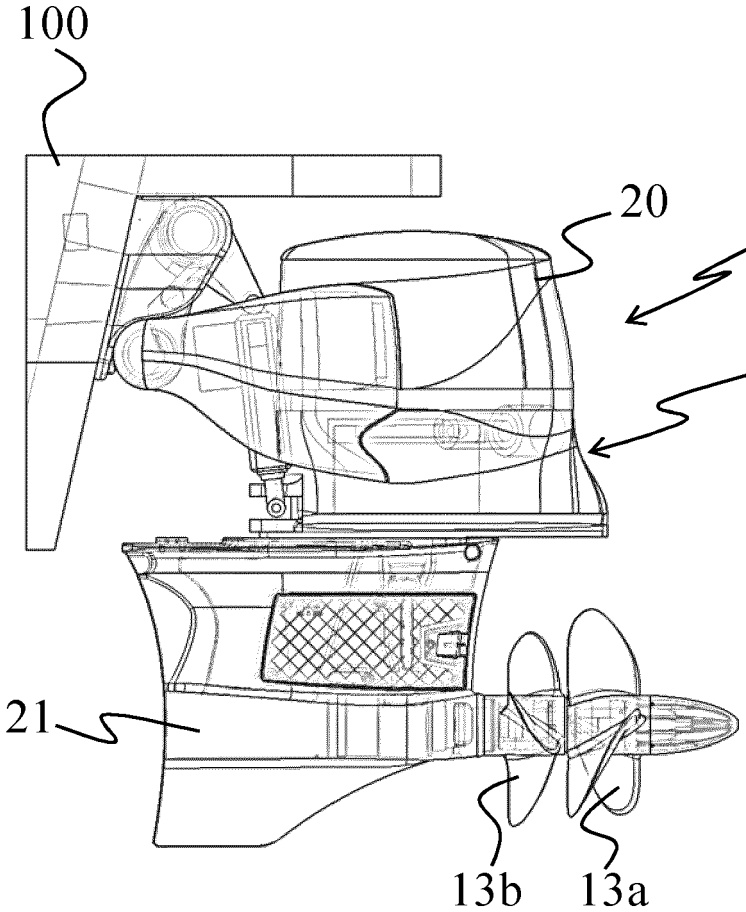

FIG. 9

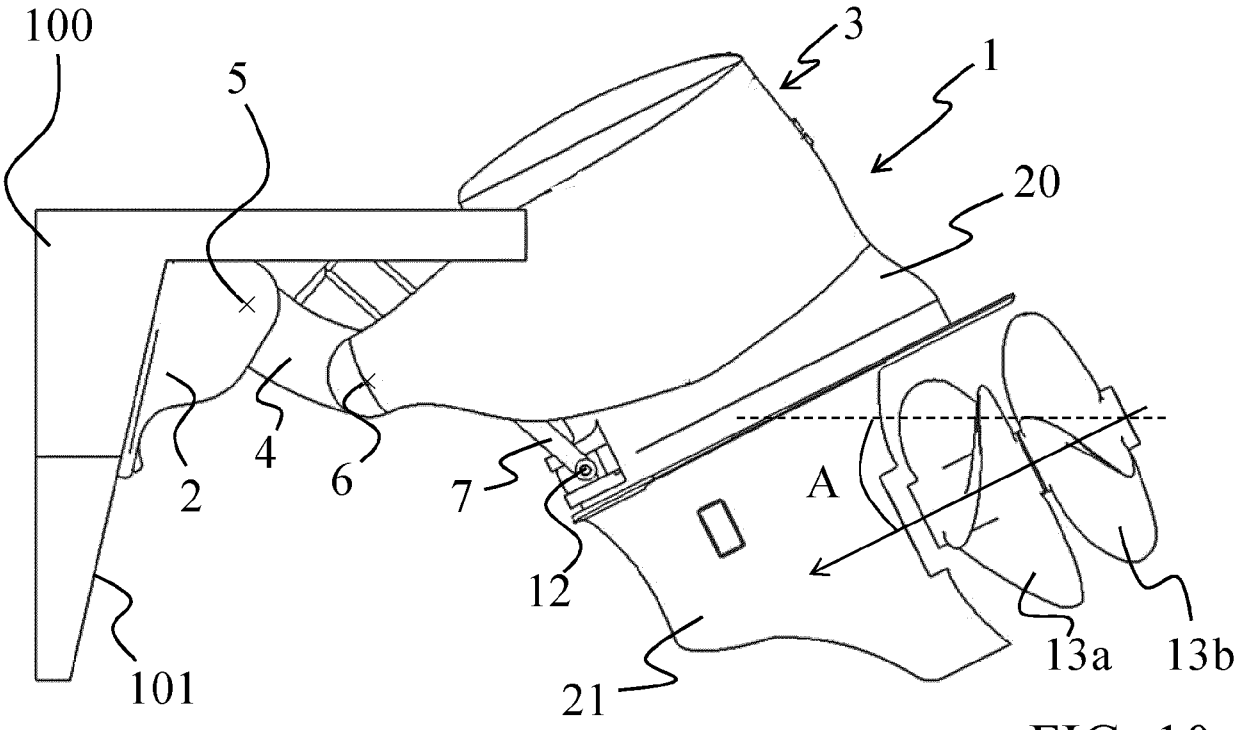
100
5
3
1
20
2
4
6
7
A
12
101
21
13a
13b

FIG. 10

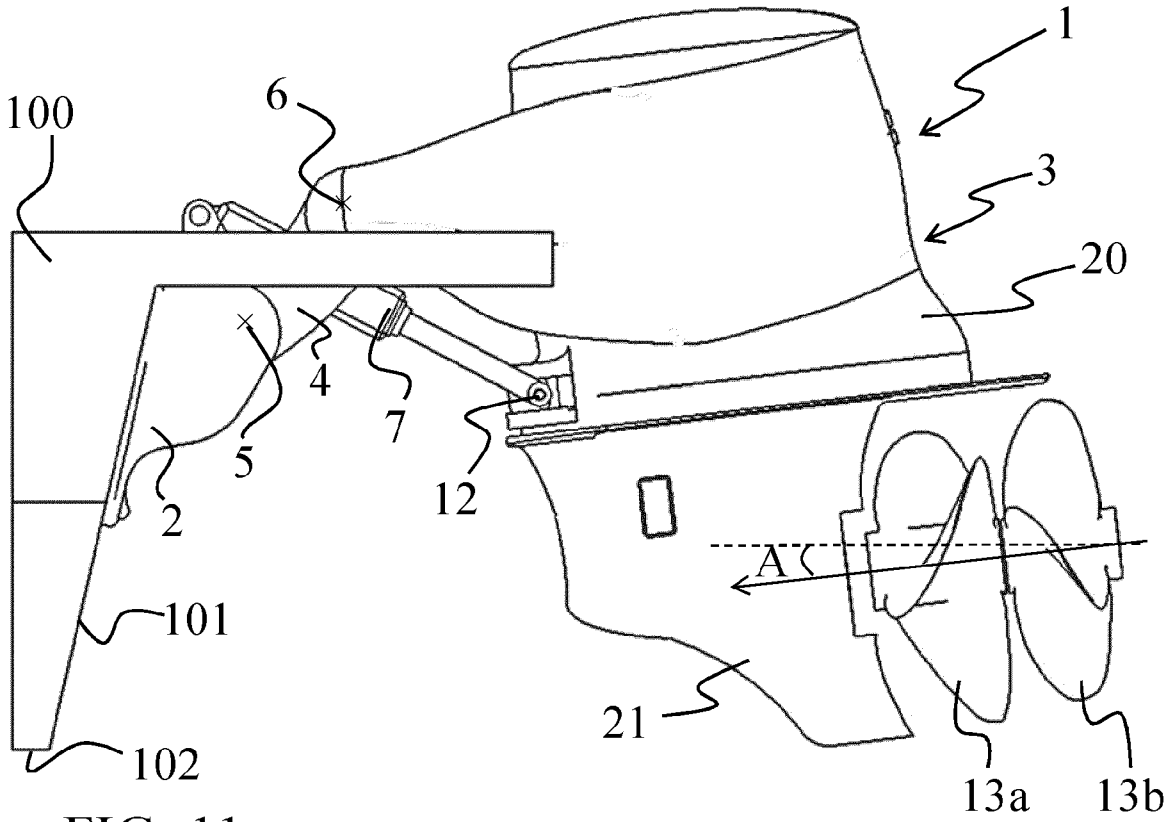
1
100
6
3
20
4
7
5
12
2
A
101
21
102
13a
13b

FIG. 11

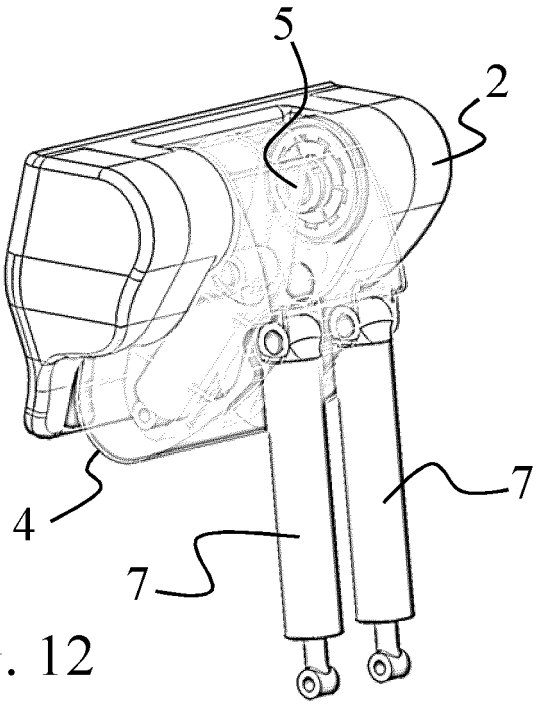

FIG. 12

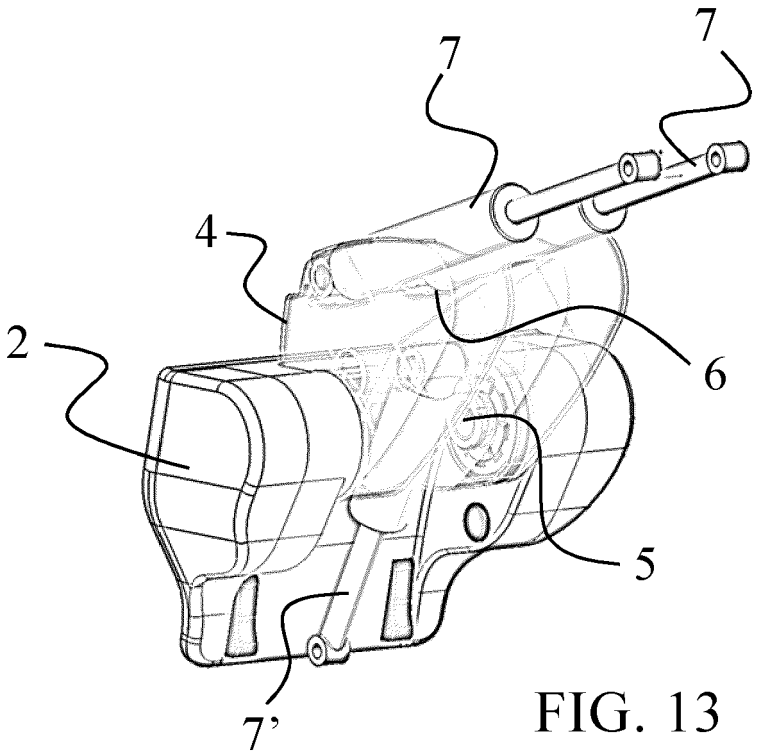

FIG. 13

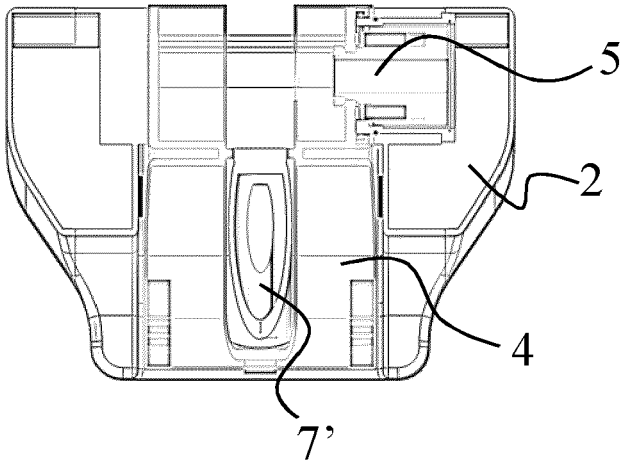

FIG. 14

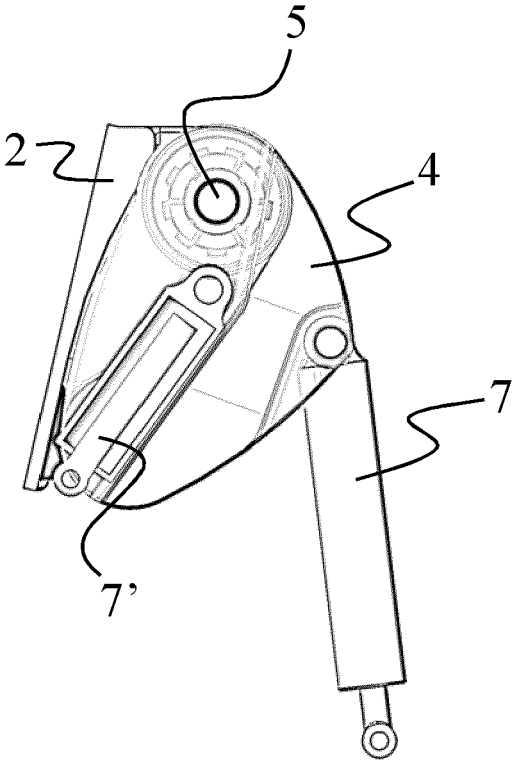

FIG. 15

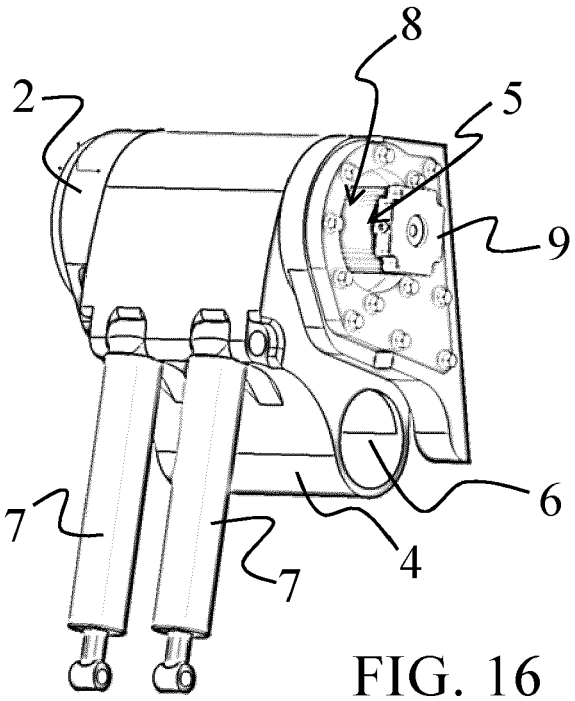

FIG. 16

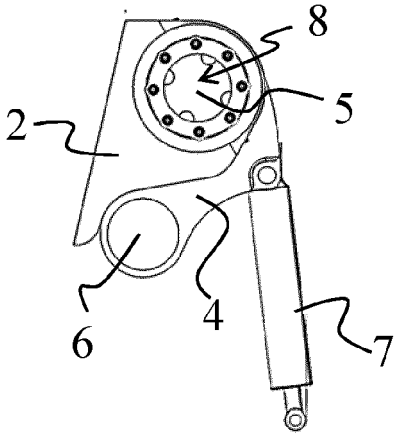

FIG. 17

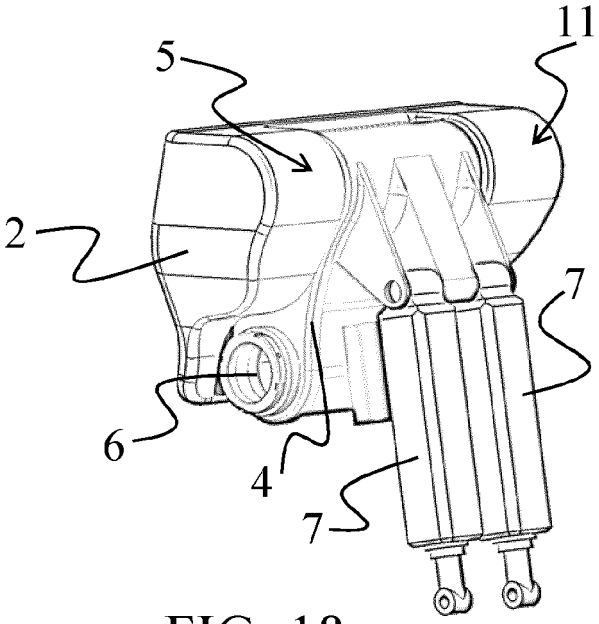

FIG. 18

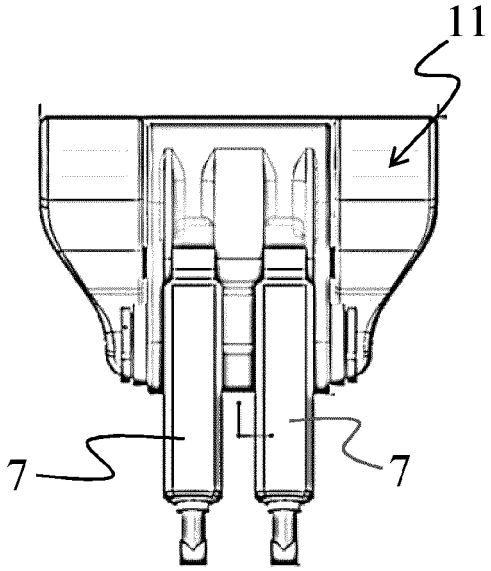

FIG. 19

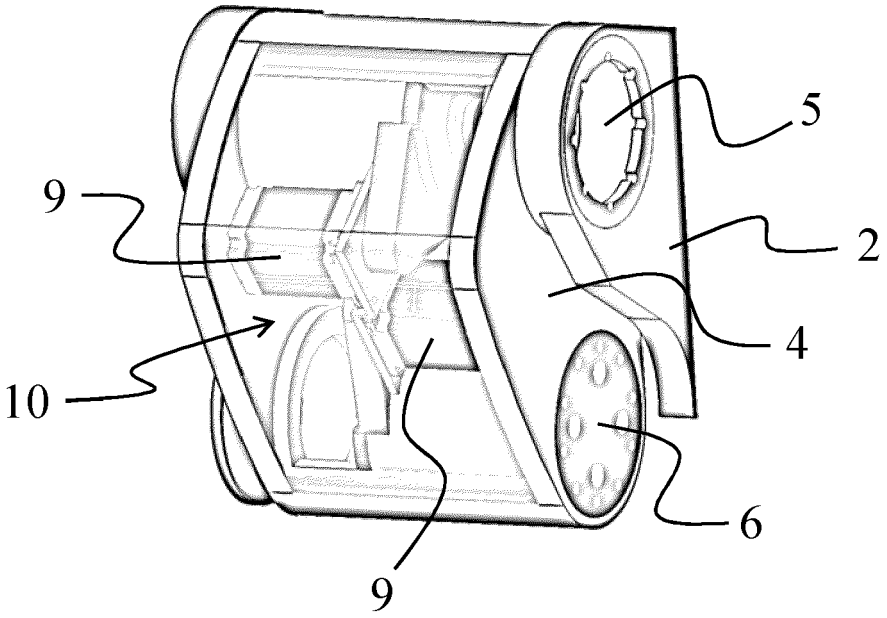

FIG. 20

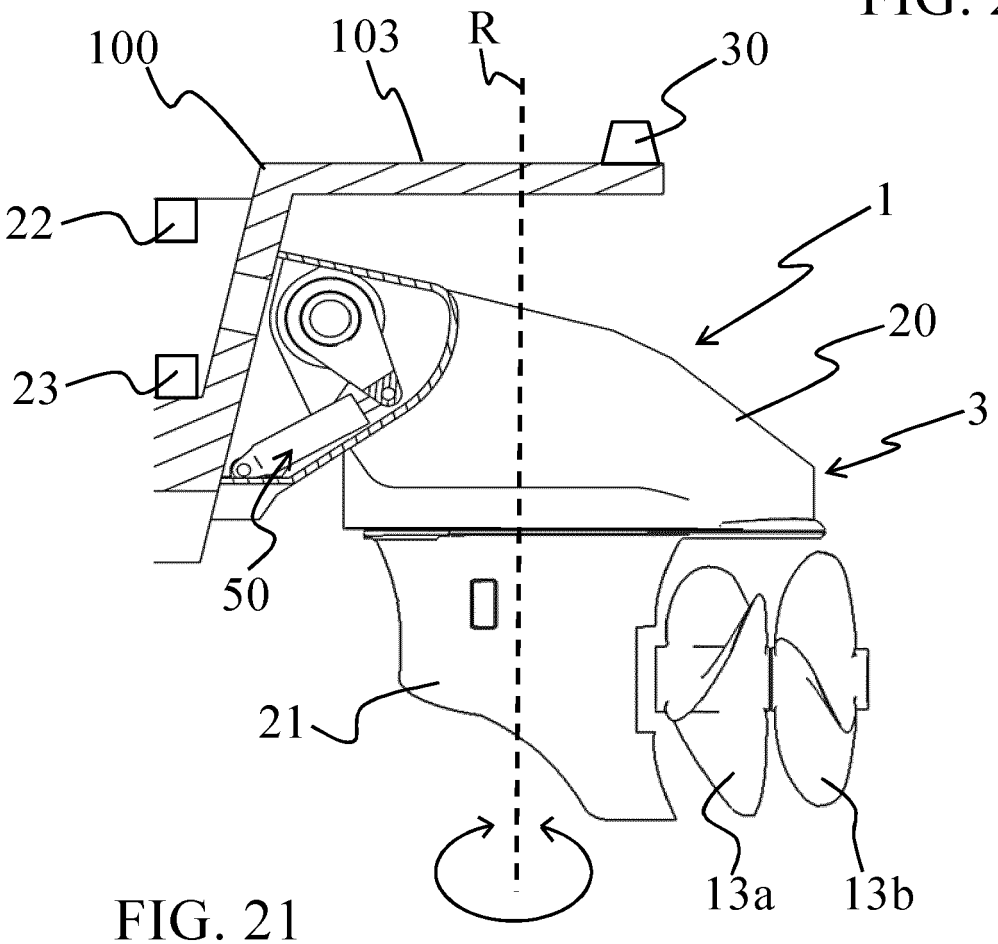

FIG. 21

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 19 4882

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2022/306257 A1 (AFMAN JUAN-PABLO [US] ET AL) 29 September 2022 (2022-09-29) * figures 1-16 * * paragraphs [0053], [0059] *	1-15	INV. B63B43/18 B63H20/10 B63H20/16
X	US 2008/096447 A1 (DE MASI DOUGLAS D [US]) 24 April 2008 (2008-04-24) * figures 1-23 * * claims 1-3, 13 *	1-15	
X	US 2006/258233 A1 (WILSON JIM [US] ET AL) 16 November 2006 (2006-11-16) * figures 1-12 * * paragraphs [0031], [0035], [0036] *	1-15	
X	US 2010/323565 A1 (BERNOGGER JOHANNES [AT] ET AL) 23 December 2010 (2010-12-23) * figures 1-24 *	1-15	
A	US 2016/090164 A1 (HASL EMIL [US] ET AL) 31 March 2016 (2016-03-31) * paragraph [0018] *	1-15	TECHNICAL FIELDS SEARCHED (IPC) B63B B63H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	19 February 2024	Freire Gomez, Jon

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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