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(54) **A MARINE PROPULSION SYSTEM WITH A CONTAINED TRIM CYLINDER**

(57) The present disclosure relates to propulsion system (1) for a marine vessel (40), the propulsion system (1) comprising a drive unit (10), a transom bracket (20) for attaching the drive unit (10) to a transom (42) of the marine vessel (40), and an actuator (30) for moving the drive unit (10), wherein the transom bracket (20) comprises a wall structure (22) that is arranged to shield the actuator (30) from the water. The disclosure further relates to a marine vessel (40).

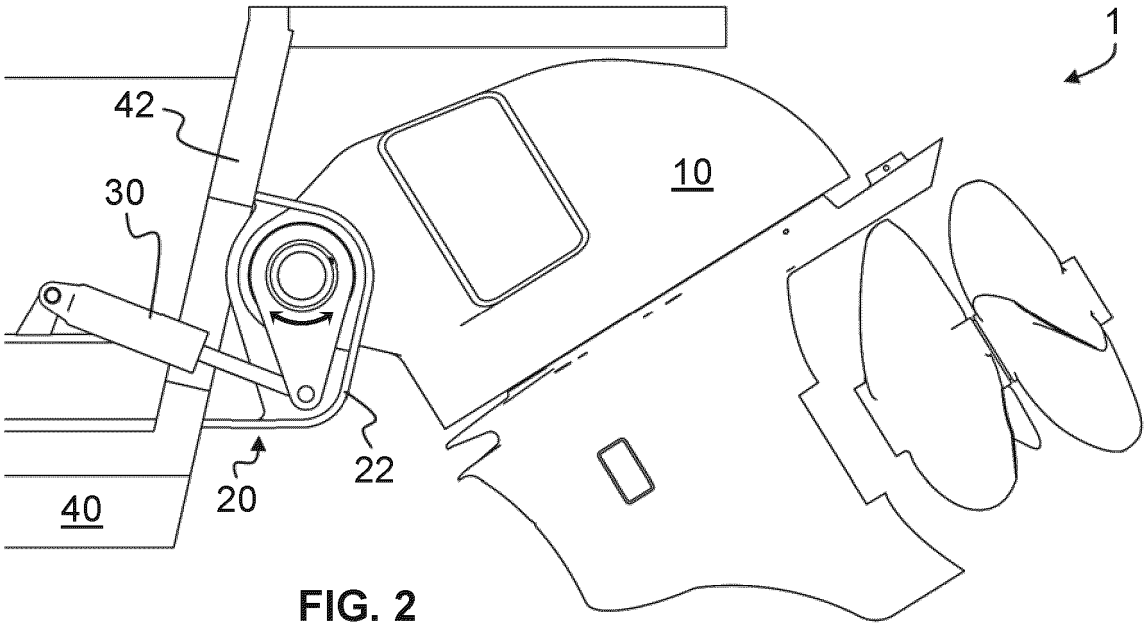

FIG. 2

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Description

TECHNICAL FIELD

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

BACKGROUND

[0002] Marine vessels may be provided with one or more drive units to propel the marine vessel in water. There exist various solutions to suspend a drive unit, some of which solutions are configured to move the drive unit. For example, the prior art solutions may allow the drive unit to be partly or completely raised above the water line of the vessel. Some prior art solutions may allow the drive unit to be rotated with respect to the vessel, e.g. to control the thrust angle of the drive unit.

[0003] Prior art solutions are marred with various drawbacks such as bulky, complex and high-cost designs and/or a relatively high demand for repair and service.

SUMMARY

[0004] According to a first aspect of the disclosure, there is provided a propulsion system for a marine vessel, the propulsion system comprising a drive unit, a transom bracket for attaching the drive unit to a transom of the marine vessel, and an actuator for moving the drive unit, wherein the transom bracket comprises a wall structure that is arranged to shield the actuator from the water.

[0005] The first aspect of the disclosure may seek to protect the actuator. For example, the actuator may be protected from mechanical damage and/or from water and other substances. Since the actuator is shielded from the water, marine growth thereon may be avoided or at least minimised. In addition, corrosion may be avoided or minimised. Utilising the transom bracket per se for shielding the actuator may be particularly cost-effective. Further, the actuator may be readily accessible for service and other purposes through the transom bracket from an in-board side of the vessel.

[0006] Optionally, the propulsion system is configured such that the actuator may pivot the drive unit about an axis. Said axis may be essentially horizontal and may be referred to as a trim axis.

[0007] Optionally, the wall structure defines a bracket volume adapted to contain at least a section of the actuator. If the wall structure contains at least a section of the actuator, a particularly good protection may be offered by the wall structure. The wall structure may be adapted to support the drive unit.

[0008] Optionally, the actuator comprises a drive end adapted to be connected to the drive unit and a vessel end adapted to be connected to the marine vessel, and the bracket volume is adapted to contain the drive end of the actuator.

[0009] Optionally, the wall structure comprises one open side, or a wall structure opening, that faces the transom. The open side, or wall structure opening, may be positioned on a bow end of the wall structure. The open side, or wall structure opening, may connect to an in-board volume of the vessel. Access to the interior of the wall structure may thus be provided from inside the in-board volume.

[0010] Optionally, the open side, or wall structure opening, is adapted to be positioned over a transom opening in the transom. Thereby, the wall structure may seal the transom opening.

[0011] Optionally, the wall structure comprises a bottom portion, a stern portion, a starboard portion and a port portion. The wall structure may further comprise a top portion. Thus, the wall structure may shield the actuator from a plurality of directions.

[0012] Optionally, the actuator is a linear actuator such as hydraulic or pneumatic cylinder or an electric actuator.

[0013] Optionally, the actuator comprises a drive end adapted to be connected to the drive unit and a vessel end adapted to be connected to the marine vessel, the propulsion system further comprising a lever adapted to connect the drive end of the actuator to the drive unit. The lever may be arranged inside the wall structure.

[0014] Optionally, the lever is connected to a shaft that may be rotated to pivot the drive unit. Said shaft may be essentially horizontal.

[0015] Optionally, the actuator is adapted to be connected to the hull of the marine vessel. Thereby, the actuator may be rigidly connected to the vessel.

[0016] Optionally, the actuator is adapted to be connected to a reinforcement structure of the hull. Such a structure may provide a particularly stable attachment point.

[0017] Optionally, the actuator extends through the transom. For example, the transom may comprise a transom opening through which the actuator extends. The wall structure of the transom bracket may comprise a wall structure opening that is adapted to be positioned over the transom opening. The actuator may extend through the transom opening and through the wall structure opening. The wall structure may be adapted to contain at least the section of the actuator that extends through the wall structure opening. In this way, the transom opening may be sealed by the wall structure of the transom bracket, and the actuator may be completely shielded by the wall structure per se.

[0018] Optionally, the drive unit comprises a support part and a thrust part, wherein the thrust part is rotatable with respect to the support part about a steering axis to direct the thrust of the drive unit. A technical benefit may include that the design of the above described transom

bracket and other components may be simplified, as the thrust may be directed by rotating the thrust part with respect to the support part. In other words, the drive unit need not be movably attached to the vessel to allow for directing the thrust for steering purposes. The steering axis may be essentially vertical when the propulsion unit is operated to propel the vessel.

[0019] Optionally, the drive unit comprises an electric propulsion motor. Thus, the propulsion system may be an electric propulsion system. The propulsion system may be a forward or a rearward drive propulsion system. For example, the propulsion system may be a forward drive electric propulsion system. If the drive unit comprises a support part and a thrust part that is rotatable with respect to the support part about a steering axis to direct the thrust of the drive unit, the propulsion system may be a forward and rearward drive propulsion system. Thus, the propulsion system may be a forward and rearward drive electric propulsion system. The drive unit may comprise one propeller or two contra-rotating propellers.

[0020] According to a second aspect of the disclosure, there is provided a marine vessel comprising the propulsion system described herein. Advantages of the second aspect of the disclosure correspond to those of the first aspect.

[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.

FIG. 1 is an exemplary side view of a marine propulsion system comprising a drive unit.

FIG. 2 corresponds to figure 1, but illustrates the drive unit in another pivot position.

FIG. 3 is a second exemplary view of a marine propulsion system.

FIG. 4 is a third exemplary view of a marine propulsion system.

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] The inventive concept of the present disclosure involves utilising a transom bracket to shield, optionally contain, a drive unit actuator. The disclosure may solve the problem of providing a cost-effective, compact, sturdy and long life marine propulsion system that requires less repair and service as compared to prior art solutions.

[0025] **FIG. 1** and **2** show a first exemplary propulsion system 1 for a marine vessel 40. The propulsion system 1 comprises a drive unit 10 and a transom bracket 20 for attaching the drive unit 10 to the marine vessel 40. **FIG. 1** illustrates the drive unit 10 in a neutral trim position (pivot position) whereas **FIG. 2** illustrates the drive unit 10 in a trimmed-up position. A stern of a vessel 40, comprising a transom 42 to which the transom bracket 20 is secured, is also schematically illustrated.

[0026] The propulsion system 1 comprises an actuator 30 for moving the drive unit 10. In the present examples, the actuator 30 is arranged to tilt or trim the drive unit 10 about a trim or tilt axis A (denoted in figure 1). A trimming motion (pivoting about an essentially horizontal axis) of the drive unit is denoted by an arc-shaped double-headed arrow in **FIG. 2.**

[0027] According to the present disclosure, the transom bracket 20 comprises a wall structure 22 that is arranged to shield the actuator 30 from the water in which the marine vessel 40 operates. As is to be apprehended, the wall structure 22 may also shield the actuator 30 from water and other substances when the marine vessel 40 is not in water.

[0028] Referring in particular to **FIG. 2** the propulsion system 1 may be configured such that the actuator 30 may pivot (double-headed arrow) the drive unit 10 about the axis A. The axis A may be at least essentially horizontal, and may in the present examples be referred to as a trim axis A.

[0029] As is illustrated, the wall structure 22 of the transom bracket 20 may define a bracket volume 20v that is adapted to contain at least a section of the actuator 30. **FIG. 1** and **2** show examples where the volume 20v is adapted to contain a section of the actuator 30, whereas **FIG. 3** and **4** show examples where the volume 20v is adapted to contain the entire actuator 30. Thus, the transom bracket 20 may contain at least a section of the actuator 30 or may contain the entire actuator 30. As is disclosed in **FIG. 3** and **4,** the shape of the wall structure 22 may be adapted to contain the lever 36 and to allow the lever 36 to pivot inside the wall structure 22. The below description applies to all examples disclosed in **FIG. 1** to **4,** unless otherwise stated.

[0030] The actuator 30 may comprises a drive end 32 adapted to be connected to the drive unit 10 and a vessel end 34 adapted to be connected to the marine vessel 40. The present bracket volume 20v is adapted to contain at least the drive end 32 of the actuator 30.

[0031] As may be apprehended from **FIG. 1** to **4,** even though the wall structure 22 is only illustrated in a schematic cross-sectional side view, the present wall structure 22 may be essentially box-shaped. The present wall structure 22 comprises one open side (to the left) that faces the transom 42. In undepicted examples, the wall structure may instead comprise a wall structure opening that is comprised in a side that faces the transom 42. In

other words, such a wall structure opening may form a part of a side of the wall structure.

[0032] As is illustrated, the open side of the wall structure 22 may be adapted to be positioned over a transom opening 44 in the transom 42. Thus, the transom opening 44 may be sealed by the wall structure 22 of the transom bracket 20.

[0033] Again, even though the wall structure 22 is only illustrated in a schematic cross-sectional side view, it is to be apprehended that the wall structure 22 may comprise a bottom portion 22a, a stern portion 22b, a starboard portion 22e and a port portion 22d. These portions (denoted in **FIG. 1**) may form an enclosure that shields the actuator 30. In the present examples, the wall structure 22 comprises a top portion 22c, such that the wall structure 22 surrounds the actuator section 30 on all sides but the side that faces the transom 42.

[0034] The present actuator 30 is a linear actuator. The linear actuator 30 may be a hydraulic or pneumatic cylinder or an electric actuator.

[0035] Again, the actuator 30 may comprise a drive end 32 and a vessel end 34. The drive end 32 may be adapted to be connected to the drive unit 10 and the vessel end 34a vessel end may be adapted to be connected to the marine vessel 40. There may be provided a lever 36 (denoted in **FIG. 1**) that is adapted to connect the drive end 32 of the actuator 30 to the drive unit 10.

[0036] As is illustrated, the drive unit 10 may be secured to a shaft 24. The shaft 24 may be rotatable to pivot the drive unit 10. The shaft 24 may be referred to as a trim shaft or a tilt shaft. The lever 36 may be connected to shaft 24 such that the linear actuator 30 may pivot the drive unit 10. The shaft 24 may be aligned with a vertically upper portion of the wall structure 22. The lever 36 may be contained inside the wall structure 22, and may extend from the shaft 24 generally vertically downwards from the shaft 24. The linear actuator 30 may be referred to as a trim actuator or a tilt actuator. The linear actuator 30 may be referred to as a trim cylinder.

[0037] Referring to **FIG. 1** and **2,** the actuator 30 may be adapted to be connected to the hull of the marine vessel 40. More precisely, the vessel end 34 of the actuator 30 may be adapted to be connected to the hull of the marine vessel 40. As is illustrated, the actuator 30 may be adapted to be connected to a reinforcement structure, such as a stringer structure, of the hull.

[0038] Typically, the transom bracket 20 is primarily made of metal to provide a rigid support for the drive unit 10. At least the load-bearing parts of the transom bracket 20 may be made of metal. The wall structure 22 may be primarily made of metal, and may be adapted to support the drive unit 10. In the present examples, the wall structure 22 is adapted to support the shaft 24 that in turn supports the drive unit 10. Thus, the wall structure 22 may serve the purpose of supporting the drive unit 10 and also shield the actuator 30. In alternative, the transom bracket 20 may comprise an undepicted internal support structure that supports the shaft 24.

[0039] The propulsion system 1 may comprising an undepicted electric power line that extends through the transom bracket 20 to the drive unit 10. The drive unit 10 may comprise an electric propulsion motor that is powered by the electric power line.

[0040] Referring to the example of **FIG. 1** and **2,** the actuator 30 may extend through the transom 42, more precisely thought the above-mentioned transom opening 44 in the transom 42. In the examples of **FIG. 3** and **4,** the actuator 30 does not extend through the transom 42 but is instead entirely positioned inside the transom bracket 20.

[0041] As is shown in of **FIG. 2** and **4,** in the present examples the propulsion system 1 is not configured such that the actuator 30 may raise (pivot) the entire drive unit 10 above the water line of the vessel 40. The water line is not illustrated in the drawings, but is typically located above the transom bracket 20, i.e. just above the top portion 22c of the wall structure 22. In the present examples, the drive unit 10 is pivotable a few degrees towards the vessel 40 (negative trim, here counter-clockwise) and approximately 30 degrees away from the vessel (positive trim, here clockwise). The present linear actuator 30 may therefore be referred to as a trim actuator, or a trim cylinder.

[0042] In undepicted embodiments, the propulsion system may be configured such that the drive unit may be almost entirely, or entirely, tilted up above the water line of the vessel.

[0043] The present transom bracket 20 is configured to be arranged on the aft side of the transom 42 of the marine vessel 40 and to not extend to the bow side of the transom 42. Even though not disclosed in detail, it is to be appended that the transom bracket 20 may for example comprise a plurality of attachment through-holes that facilitate bolting to a marine vessel.

[0044] Referring in particular to **FIG. 1,** the drive unit 10 may comprise a support part 10a and a thrust part 10b. Typically, the support part 10a is an upper part and the thrust part 10b is a lower part. An electric propulsion motor (not visible) may be arranged inside the thrust part 10b. A steering actuator (not visible) may be arranged inside the support part 10a. The thrust part 10b may be rotatable (double-headed arrow about axis B in **FIG. 1**) with respect to the support part 10a about a steering axis B to direct the thrust of the drive unit 10. Thus, the drive unit 10 (the support part 10a and the thrust part 10b) may be pivotable about the trim axis A and the thrust part 10b of the drive unit 10 may be rotatable about the steering axis B. In the present examples, the support part 10a is not rotatable about the steering axis B. The examples of **FIG. 3** and **4** may also comprise such support and thrust parts 10a, 10b.

[0045] It is to be apprehended that the present propulsion system 1 may also find use together with other types of drive units that are pivotally attached to a marine vessel for steering purposes. For example, propulsion units that do not comprise a support part 10a and a thrust part 10b

as described above.

[0046] The drive unit may (as disclosed) comprise two propellers that are arranged to rotate in opposite directions, or only one propeller, or another type of propulsion solution such as a waterjet.

[0047] The propulsion system 1 may be an electric propulsion system, i.e. the propulsion may be driven by an electric motor (not visible) powered by an on-board battery (not shown). The electric motor may be arranged in the thrust part 10b as described above. However, the present disclosure does not exclude there being a combustion engine that powers a generator driving an electric motor, e.g. arranged in a thrust part. Alternatively, the drive unit 10 may comprise a combustion engine.

[0048] The propulsion system 1 may be a forward or a rearward drive propulsion system, more precisely a forward or a rearward electric drive propulsion system. **FIG. 1, 2** and **4** disclose a rearward drive electric propulsion system and **FIG. 3** discloses a forward drive propulsion system. If the drive unit comprises a support part 10a and a thrust part 10b that is rotatable with respect to the support part about a steering axis to direct the thrust of the drive unit, the propulsion system may be a forward and rearward drive propulsion system.

[0049] In the Figures, the wall structure 22 of the transom bracket 20 is illustrated as being located in front of the drive unit 10, i.e. closer to the viewer. In other words, the present wall structure 22 is located on the port side of the drive unit 10. Alternately, the wall structure 22 may be located on the starboard side of the drive unit 10. In a real implementation of the present examples, the transom bracket 20 may comprise a wall structure, or separate wall structures, located on both the port side and the starboard side of the drive unit 10. The shaft 24 may extend from the port wall structure to the starboard wall structure. The actuator 20 may be positioned (partly or entirely) in one of the port wall structure and the starboard wall structure.

[0050] In some more detail, the present Figures illustrate the marine vessel 40 with the transom 42. The transom bracket 20 is bolted to the transom 42, and comprises a box-like wall structure 22 that protrudes aft the transom 42. The wall structure 42 pivotally supports the shaft 24 to which the drive unit 10 is secured. Thus, the shaft 24 may be pivoted to raise and lower the drive unit 10 with respect to the vessel 40. In the present examples, the shaft may only be pivoted to such an extent that the trim of the drive unit 10 is controlled, the drive unit 10 is thus not pivotable (tiltable) above the water line of the vessel 40. The present shaft 24 extends aft the transom 42 in a lateral direction (port to starboard). The trim cylinder 30 is connected to the shaft 24 via the lever 36. Thus, as the length of the trim cylinder is modified, typically by an operator or by an on-board computer, the trim of the drive unit is controlled. As is to be apprehended, the stroke of the trim cylinder 30 and the dimensions of the lever 36 may be modified to achieve a desired trim (or tilt) behaviour. It is the support part 10a of the drive unit 10 that is attached to the shaft 24, the thrust part 10b is rotatable with respect to the support part 10a to steer the vessel and, optionally, rotationally to such an extent that the thrust is reversed.

[0051] Also disclosed are examples according to the following clauses:

1. A propulsion system (1) for a marine vessel (40), the propulsion system (1) comprising

- a drive unit (10),
- a transom bracket (20) for attaching the drive unit (10) to a transom (42) of the marine vessel (40), and
- an actuator (30) for moving the drive unit (10),

wherein the transom bracket (20) comprises a wall structure (22) that is arranged to shield the actuator (30) from the water.

2. The propulsion system (1) of clause 1, configured such that the actuator (30) may pivot the drive unit (10) about an axis (A).

3. The propulsion system (1) of clause 1, configured such that the actuator (30) may pivot the drive unit (10) about an essentially horizontal axis (A).

4. The propulsion system (1) of any preceding clause, wherein the wall structure (22) of the transom bracket (20) is configured to support the drive unit (10).

5. The propulsion system (1) of any preceding clause, wherein the wall structure (22) defines a bracket volume (20v) adapted to contain at least a section of the actuator (30).

6. The propulsion system (1) of clause 5, wherein the actuator (30) comprises a drive end (32) adapted to be connected to the drive unit (10) and a vessel end (34) adapted to be connected to the marine vessel (40), and wherein the bracket volume (20v) is adapted to contain the drive end (32) of the actuator (30).

7. The propulsion system (1) of any preceding clause, wherein the wall structure (22) comprises one open side, or a wall structure opening, that faces the transom (42).

8. The propulsion system (1) of any preceding clause, wherein the wall structure (22) is essentially box-shaped.

9. The propulsion system (1) of clause 8, wherein the open side, or wall structure opening, is adapted to be positioned over a transom opening (44) in the transom (42).

10. The propulsion system (1) of any preceding clause, wherein the wall structure (22) comprises a bottom portion (22a), a stern portion (22b), a starboard portion (22e) and a port portion (22d), and optionally a top portion (22c).

11. The propulsion system (1) of any preceding clause, wherein the actuator (30) is a linear actuator.

12. The propulsion system (1) of clause 11, wherein the actuator (30) comprises a drive end (32) adapted to be connected to the drive unit (10) and a vessel end (34) adapted to be connected to the marine vessel (40), the propulsion system (1) further comprising a lever (36) adapted to connect the drive end (32) of the actuator (30) to the drive unit (10).

13. The propulsion system (1) of clause 12, wherein the lever (36) is connected to a shaft (24) that may be rotated to pivot the drive unit (10).

14. The propulsion system (1) of any preceding clause, wherein the actuator (30) is adapted to be connected to the hull of the marine vessel (40).

15. The propulsion system (1) of clause 14, wherein the actuator (30) is adapted to be connected to a reinforcement structure of the hull.

16. The propulsion system (1) of clause 15, wherein the actuator (30) is adapted to be connected to a stringer structure (44).

17. The propulsion system (1) of any preceding clause, wherein the transom bracket (20) is primarily made of metal.

18. The propulsion system (1) of any preceding clause, comprising an electric power line that extends through the transom bracket (20) to the drive unit (10).

19. The propulsion system (1) of any preceding clause, wherein the drive unit (10) comprises an electric propulsion motor.

20. The propulsion system (1) of any preceding clause, wherein the actuator (30) extends through the transom (42).

21. The propulsion system (1) of any preceding clause, configured such that the actuator (30) may raise the drive unit (10) above the water line of the vessel (40).

22. The propulsion system (1) of the preceding clause, wherein the linear actuator (30) is a hydraulic or pneumatic cylinder or an electric rod actuator.

23. The propulsion system (1) of any preceding clause, wherein the transom bracket (20) is configured to be arranged on the aft side of the transom (42) of the marine vessel (40) and to not extend to the bow side of the transom.

24. The propulsion system (1) of any preceding clause, wherein the drive unit (10) is pivotally attached to the marine vessel (60), optionally about an at least essentially horizontal axis.

25. The propulsion system (1) of any preceding clause configured such that a thrust angle, e.g. a trim angle, of the drive unit (10) may be controlled by the actuator (30).

26. The propulsion system (1) of any preceding clause, where the drive unit (10) comprises a support part (10a) and a thrust part (10b), wherein the thrust part (10b) is rotatable with respect to the support part (10a) about a steering axis (B) to direct the thrust of the drive unit (10).

27. A marine vessel (40) comprising the propulsion system (1) of any preceding clause.

[0052] 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.

[0053] 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.

[0054] 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.

[0055] 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.

[0056] 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 propulsion system (1) for a marine vessel (40), the propulsion system (1) comprising

   - a drive unit (10),
   - a transom bracket (20) for attaching the drive unit (10) to a transom (42) of the marine vessel (40), and
   - an actuator (30) for moving the drive unit (10),

   wherein the transom bracket (20) comprises a wall structure (22) that is arranged to shield the actuator (30) from the water.

2. The propulsion system (1) of claim 1, configured such that the actuator (30) may pivot the drive unit (10) about an axis (A), optionally an essentially horizontal axis.

3. The propulsion system (1) of claim 1 or 2, wherein the wall structure (22) defines a bracket volume (20v) adapted to contain at least a section of the actuator (30).

4. The propulsion system (1) of claim 3, wherein the actuator (30) comprises a drive end (32) adapted to be connected to the drive unit (10) and a vessel end (34) adapted to be connected to the marine vessel (40), and wherein the bracket volume (20v) is adapted to contain the drive end (32) of the actuator (30).

5. The propulsion system (1) of any preceding claim, wherein the wall structure (22) comprises a wall structure opening that faces the transom (42), and the wall structure opening is adapted to be positioned over a transom opening (44) in the transom (42).

6. The propulsion system (1) of any preceding claim, wherein the wall structure (22) comprises a bottom portion (22a), a stern portion (22b), a starboard portion (22e) and a port portion (22d), and optionally a top portion (22c).

7. The propulsion system (1) of any preceding claim, wherein the actuator (30) is a linear actuator.

8. The propulsion system (1) of claim 7, wherein the actuator (30) comprises a drive end (32) adapted to be connected to the drive unit (10) and a vessel end (34) adapted to be connected to the marine vessel (40), the propulsion system (1) further comprising a lever (36) adapted to connect the drive end (32) of the actuator (30) to the drive unit (10).

9. The propulsion system (1) of claim 8, wherein the lever (36) is connected to a shaft (24) that may be rotated to pivot the drive unit (10).

10. The propulsion system (1) of any preceding claim, wherein the actuator (30) is adapted to be connected to the hull of the marine vessel (40).

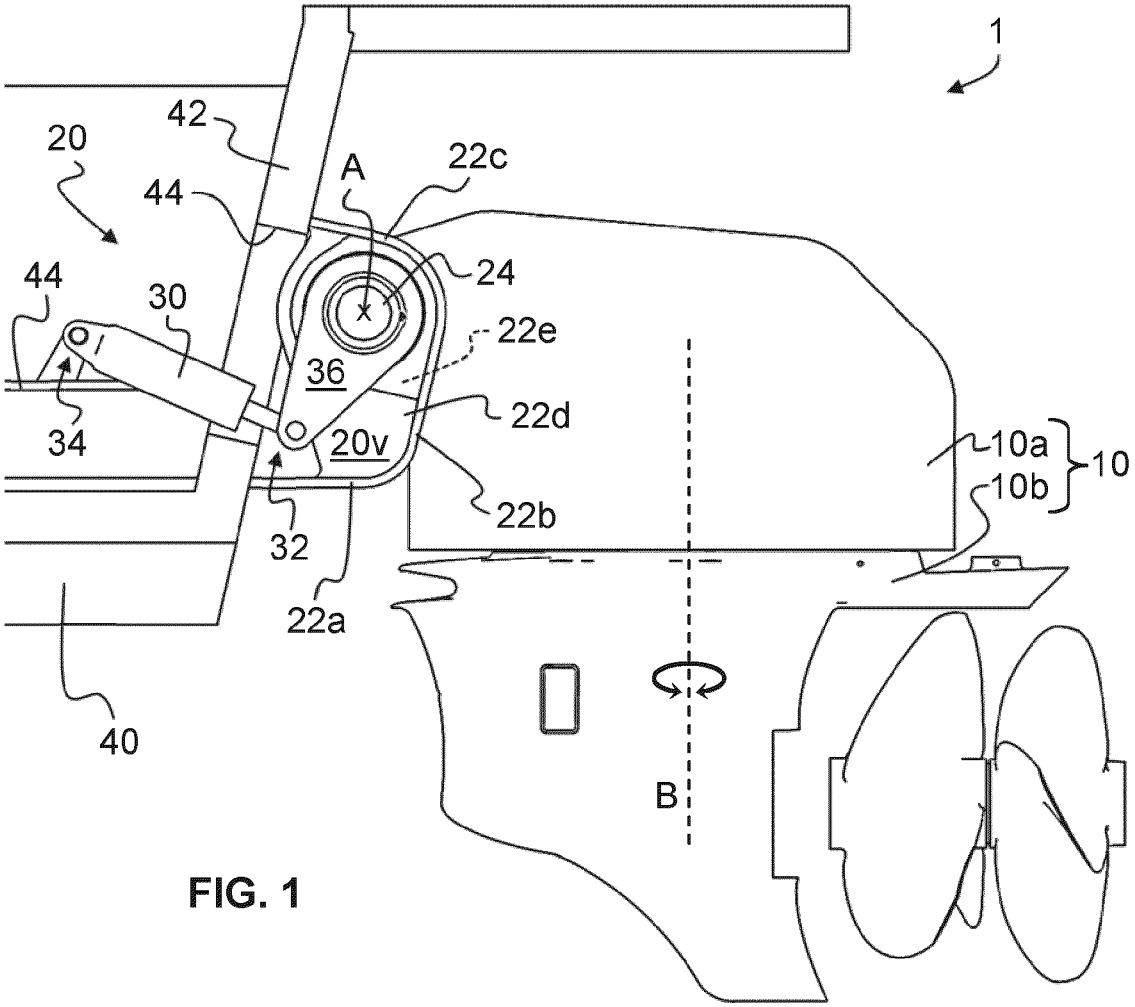
11. The propulsion system (1) of claim 10, wherein the actuator (30) is adapted to be connected to a reinforcement structure of the hull.

12. The propulsion system (1) of any preceding claim, comprising an electric power line that extends through the transom bracket (20) to the drive unit (10), and wherein the drive unit (10) comprises an electric propulsion motor.

13. The propulsion system (1) of any preceding claim, wherein the actuator (30) extends through the transom (42).

14. The propulsion system (1) of any preceding claim, where the drive unit (10) comprises a support part (10a) and a thrust part (10b), wherein the thrust part (10b) is rotatable with respect to the support part (10a) about a steering axis (B) to direct the thrust of the drive unit (10).

15. A marine vessel (40) comprising the propulsion system (1) of any preceding claim.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36
22d
34
20v
10a
10
10b
22b
32
22a
40
B

FIG. 1

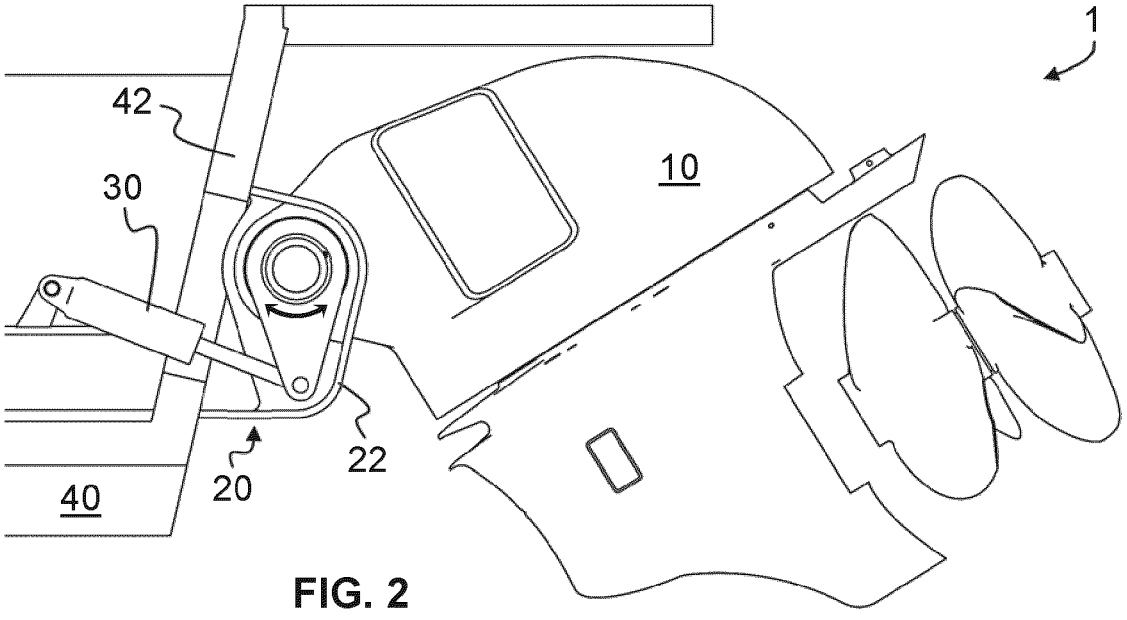
1
42
10
30
22
20
40

FIG. 2

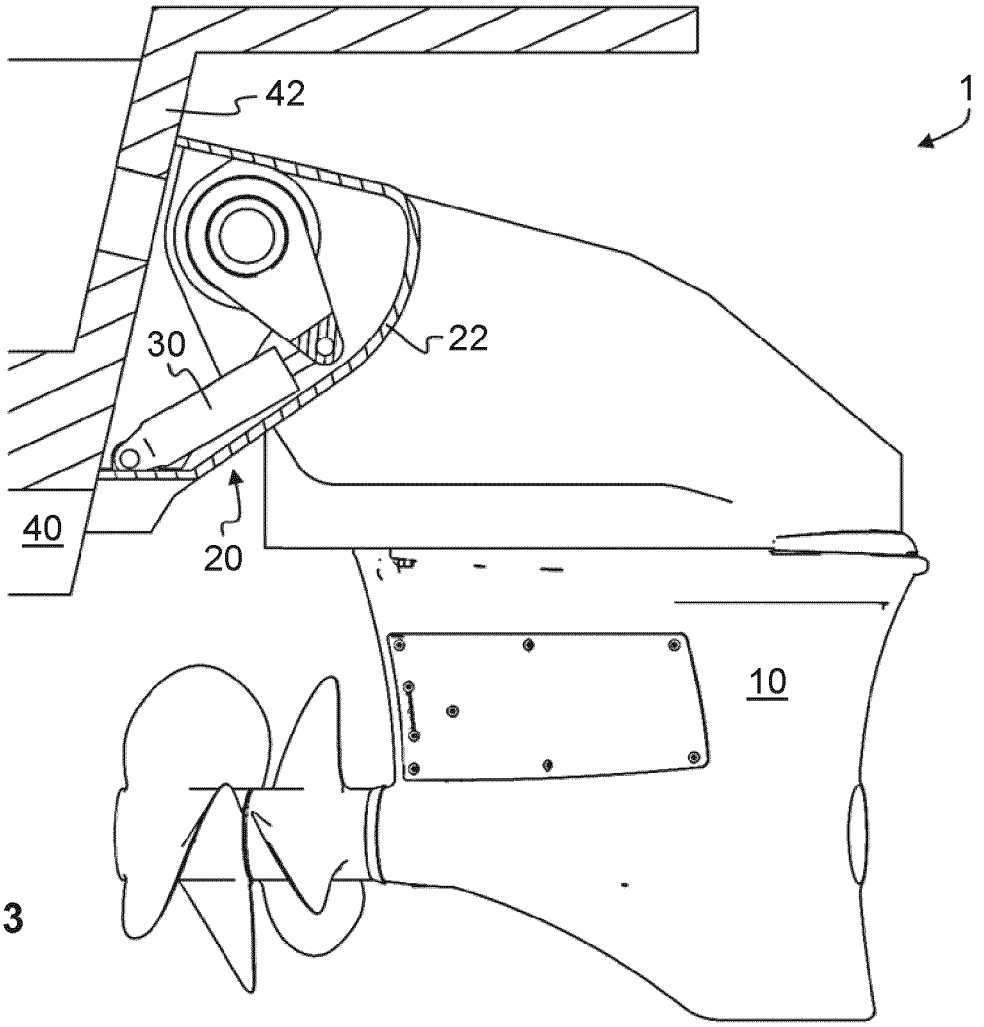

FIG. 3

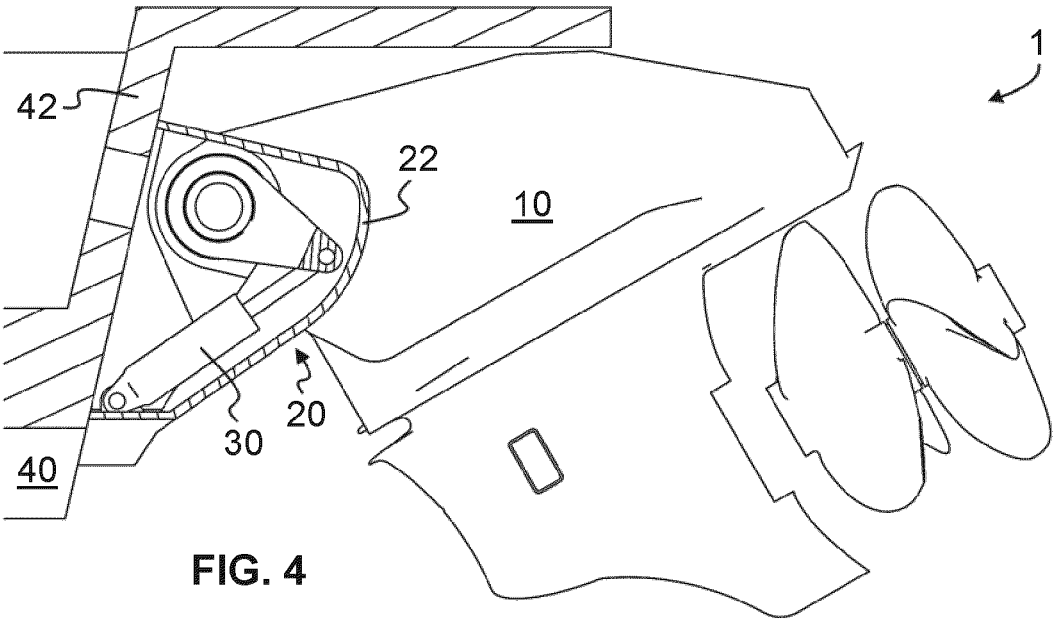

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 24 16 9832

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 2010/323565 A1 (BERNOGGER JOHANNES [AT] ET AL) 23 December 2010 (2010-12-23) * figures 1-14 * * paragraph [0052] *	1-15	INV. B63H20/10 B63H21/17
X	US 4 618 327 A (KITAI TOSHIO [JP]) 21 October 1986 (1986-10-21) * figures 1-5 *	1-15	
X	US 2002/034899 A1 (KIM YOUNG JU [KR]) 21 March 2002 (2002-03-21) * figures 1-4 *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			B63H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	1 October 2024	Freire Gomez, Jon

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01-10-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010323565 A1	23-12-2010	AT 503798 A4	15-01-2008
		AT E469823 T1	15-06-2010
		CA 2653995 A1	06-12-2007
		CN 101454198 A	10-06-2009
		DK 2021234 T3	30-08-2010
		EP 2021234 A1	11-02-2009
		ES 2346708 T3	19-10-2010
		JP 2009538765 A	12-11-2009
		PL 2021234 T3	30-11-2010
		PT 2021234 E	06-07-2010
		US 2010323565 A1	23-12-2010
		WO 2007137312 A1	06-12-2007
US 4618327 A	21-10-1986	JP H034439 B2	23-01-1991
		JP S6064097 A	12-04-1985
		US 4618327 A	21-10-1986
US 2002034899 A1	21-03-2002	JP 3462475 B2	05-11-2003
		JP 2002114194 A	16-04-2002
		KR 20020021462 A	21-03-2002
		US 2002034899 A1	21-03-2002

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