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(54) **MARINE DRIVE UNIT WITH GYROSTABILISER**

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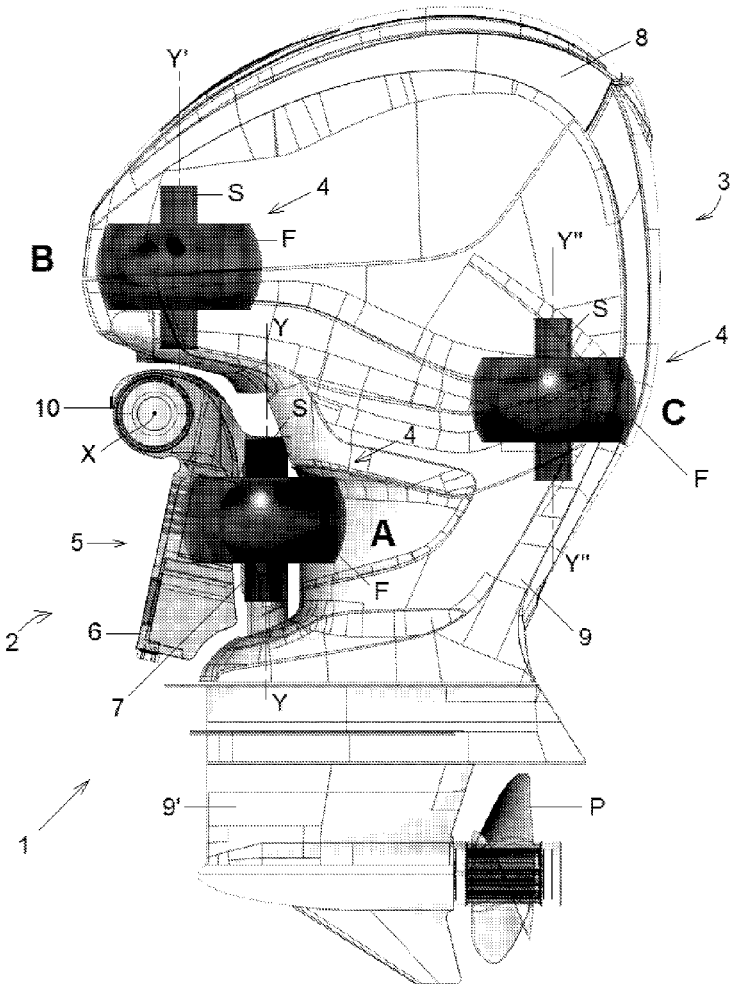
(57) **ABSTRACT**

The invention provides a marine drive unit (**1**), such as an outboard motor, for a marine vessel, comprising: an engine or power plant (E), such as an internal combustion; a drive transmission for transmitting or transferring mechanical power generated by the engine or power plant (E) to a propeller shaft for generating propulsion for the vessel; a casing (**3**) that houses or at least partially encloses the engine (E) and/or the drive transmission; a mounting assembly (**2**) configured to mount the marine drive unit (**1**) to a hull, preferably to a transom, of the marine vessel; and a gyro-stabiliser (**4**) arranged in or on the mounting assembly (**2**) or the casing (**3**). As an alternative to an outboard motor, the marine drive unit (**1**) may be provided as a stern drive unit or a pod drive unit. The invention also provides a marine vessel incorporating such a drive unit (**1**).



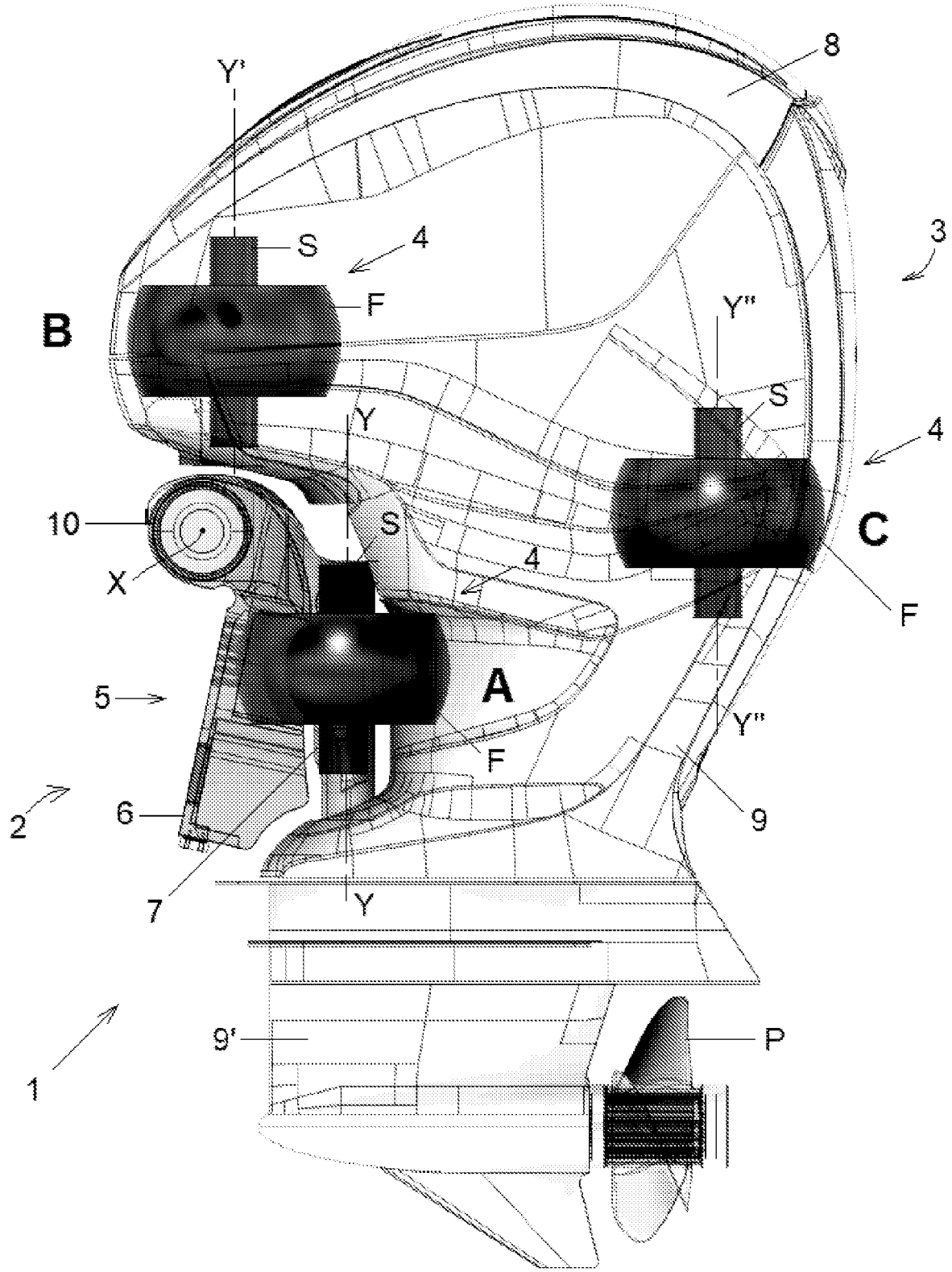


Fig. 1

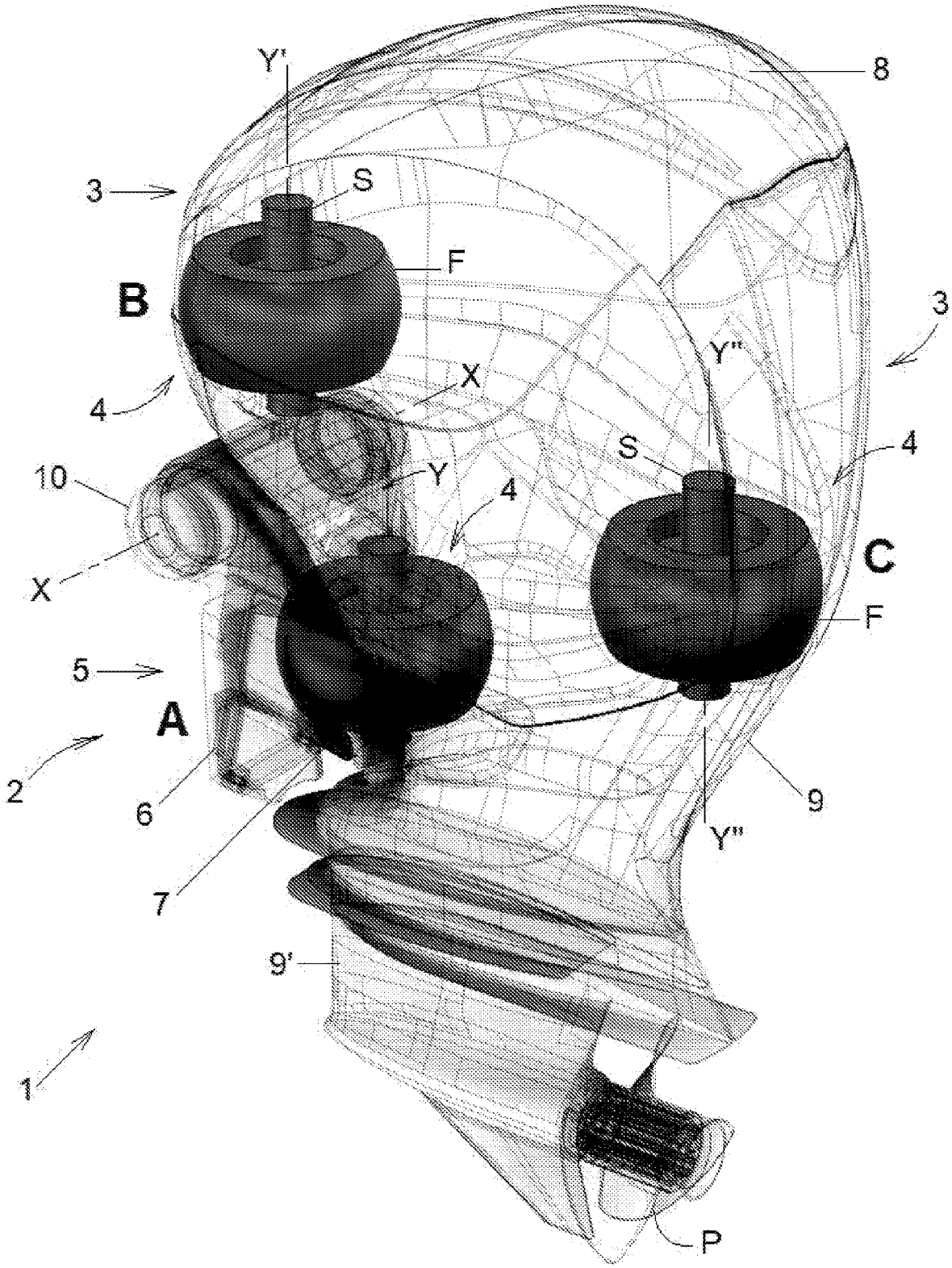


Fig. 2

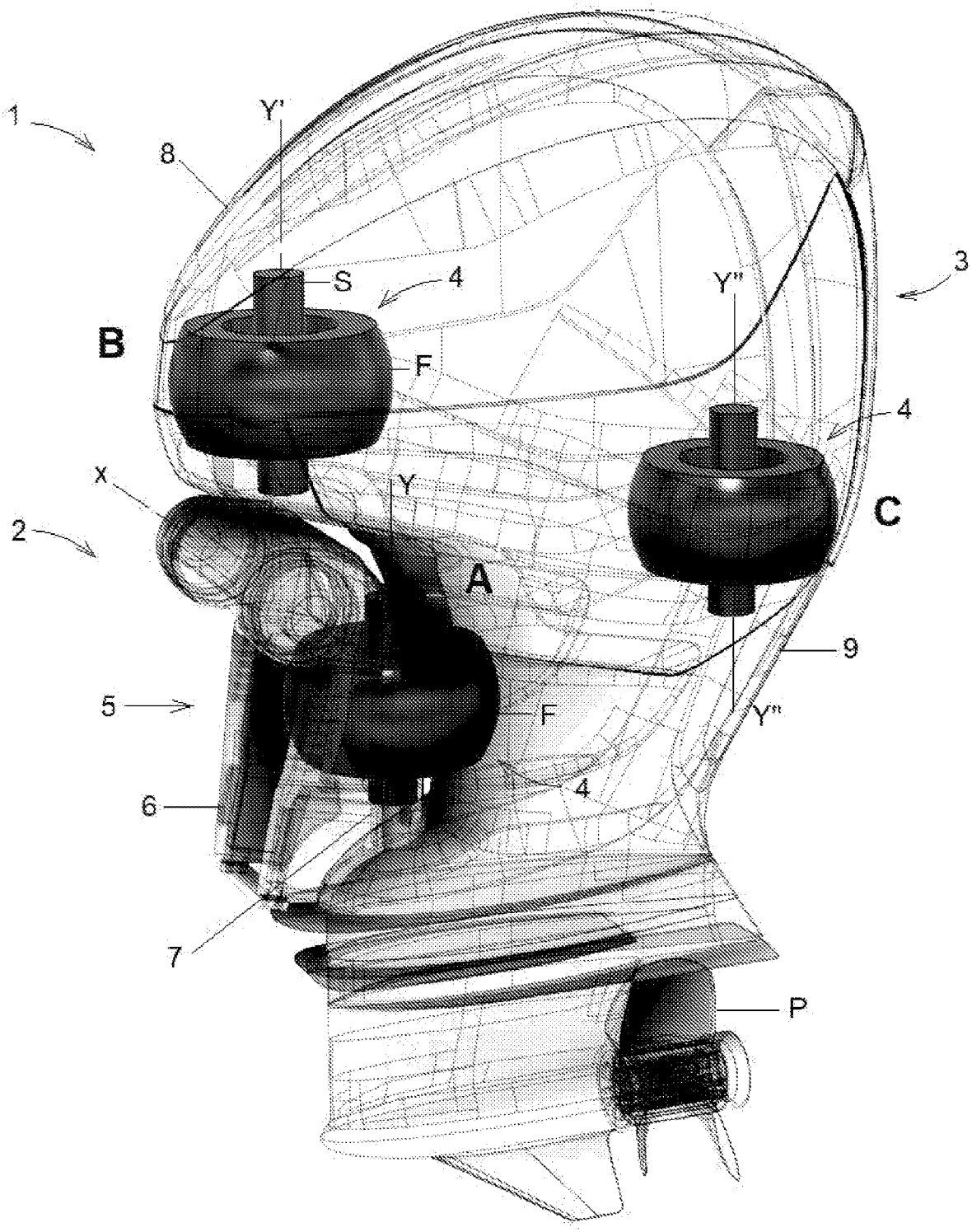


Fig. 3

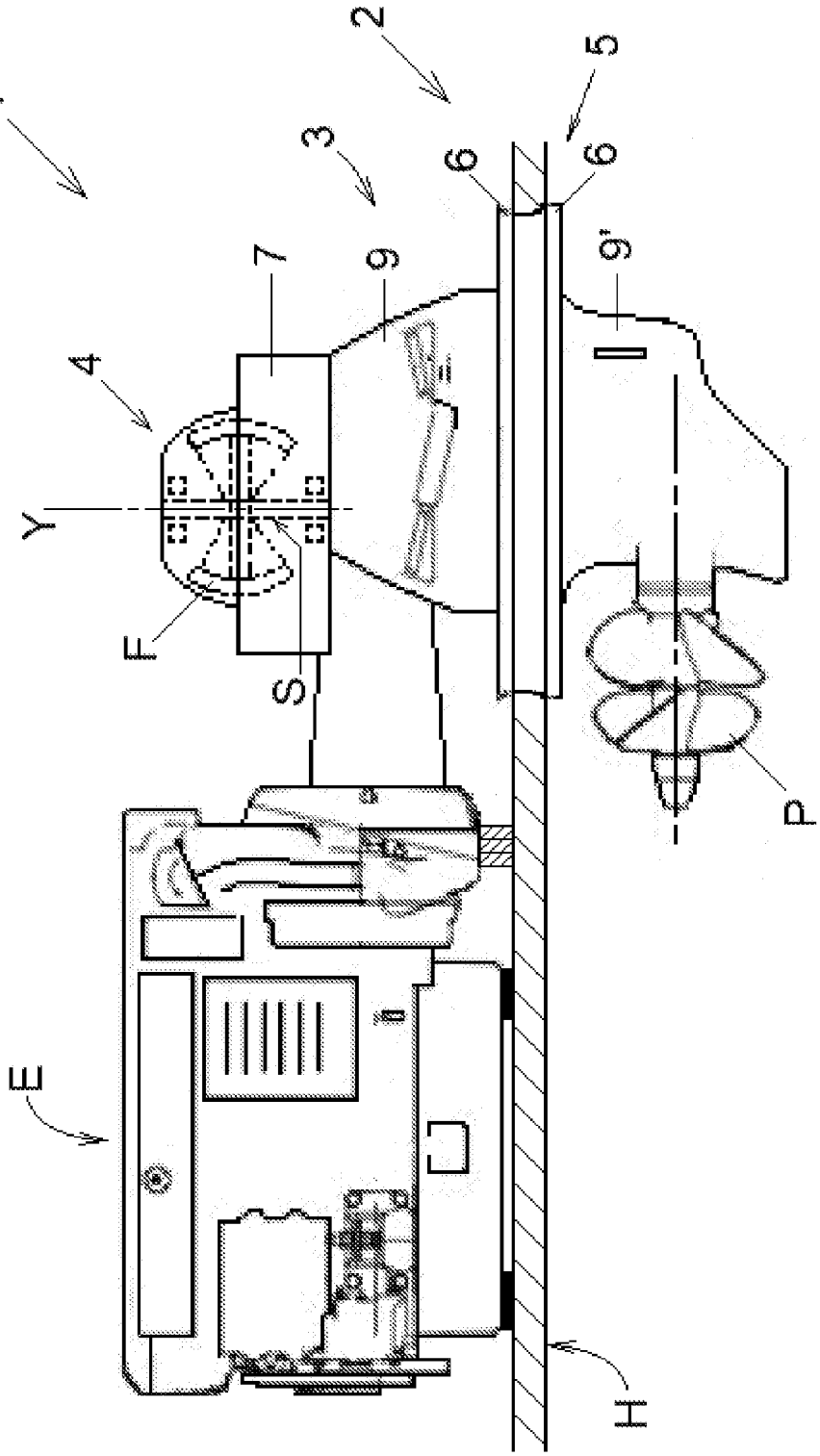


Fig. 4

MARINE DRIVE UNIT WITH GYROSTABILISER

FIELD OF THE INVENTION

[0001] The invention relates to a marine drive unit with a gyrostabiliser, and especially to a marine outboard motor assembly incorporating a gyrostabiliser.

[0002] The marine drive unit of the present invention will preferably be in the form of an outboard motor assembly having a gyrostabiliser and it will be convenient to describe the invention in this exemplary context. It will be understood, however, that the invention is not limited to that particular embodiment, but may be embodied in other marine drive units, such as a sterndrive or a pod drive unit.

BACKGROUND OF THE INVENTION

[0003] The following discussion of background in this specification should in no way be considered an admission that such background is prior art, nor that such background is widely known or forms part of the common general knowledge in the field in Australia or worldwide.

[0004] The structure and operation of marine gyrostabilisers are generally quite well understood and these devices are gaining increasing adoption in both commercial and recreational marine vessels. A gyrostabiliser will typically comprise a spinning flywheel mounted in a gimbal frame that allows two of the three possible rotational degrees of freedom, and the frame is rigidly mounted within the vessel. The specific way in which the flywheel is constrained in rotational motion allows the angular momentum of the spinning flywheel to combine with the flywheel's precession oscillation to generate large torques that vary with time to directly oppose the dynamic rolling motion of the vessel caused by waves. Without any intervention, the vessel rolling motion combines with the flywheel angular momentum to cause oscillating precession motion. This then combines with the angular momentum to create a stabilising torque, which directly opposes the wave induced rolling motion of the vessel. By arranging the gimbals in a specific way, a roll-stabilising device is created using the naturally occurring physics of gyro-dynamics, which requires no further intervention to function. An example of a marine gyrostabiliser is described in the applicant's co-pending Australian patent application no. **2017216483 A1**, the contents of which are incorporated herein in their entirety by direct reference.

[0005] In use, a gyrostabiliser generates a significant amount of torque which needs to be transmitted into the hull of the vessel. Hence, mounting structures for a gyrostabiliser similar to main engine bearers are typically designed into the vessel. In addition to the rotatably mounted flywheel, a gyrostabiliser unit may also include a supporting frame for its gimbal bearings, a water pump and a heat exchanger for cooling, a vacuum chamber enclosure for the flywheel, and an electrical power supply. In practice, a gyrostabiliser can be installed in a variety of locations onboard a vessel, even off centre. As vertical acceleration levels can reduce the life of the main spin bearings in a gyrostabiliser, however, locating a gyrostabiliser unit aft of midships is generally preferred.

[0006] Due to the relatively complex nature of gyrostabiliser units, and their associated cost and incorporation into the structure of a vessel, they have tended to find use only on larger recreational and commercial marine vessels. It would therefore be desirable to provide a new gyrostabiliser arrangement that is both suitable and accessible for use in smaller recreational vessels.

SUMMARY OF THE INVENTION

[0007] According to one aspect, the invention provides a marine drive unit, comprising:

[0008] a mounting assembly for mounting the drive unit to a hull of a marine vessel, especially to a transom at a stern of a marine vessel, the mounting assembly configured for substantially rigid attachment to the hull, and especially to the transom;

[0009] a drive casing enclosing at least part of a drive transmission of the drive unit, at least part of the drive casing being configured to be arranged outboard of the vessel and connected to the hull of the vessel, especially to the transom, via the mounting assembly; and

[0010] a gyrostabiliser included in or on the mounting assembly or the drive casing.

[0011] In this way, the invention is able to provide a marine drive unit embodied in the form of an outboard motor, a sterndrive unit, or a pod drive unit in which a gyrostabiliser is integrated for use on smaller boats and other small marine vessels. By integrating the gyrostabiliser into the drive unit in this manner, it is possible to simplify the gyrostabiliser by eliminating the duplication of systems or components otherwise found in both the drive units and the gyrostabiliser units, such as water pumps, electrical supply, housing and supporting structures, sound attenuation, and safety enclosures. Further, it enables a gyrostabiliser to be installed in the vessel simply by changing an outboard motor, or a sterndrive or pod drive, and thus requires little or no modification to an existing boat.

[0012] In a preferred embodiment, the mounting assembly has a generally rigid frame for substantially rigid attachment to the hull, especially to the transom but alternatively to a base of the hull. In this regard, the gyrostabiliser may be integrated or incorporated in the mounting assembly such that a shaft of the flywheel of the gyrostabiliser is mounted for rotation with respect to and supported by the frame of the mounting assembly, typically via gimbal bearings. Thus, the substantially rigid frame of the marine drive unit mounting assembly, preferably attached outboard of the transom, may also serve as the supporting structure for the gyrostabiliser for transmitting torque from the gyrostabiliser to the hull of the vessel. Furthermore, the transom of the vessel, where outboard motors and sterndrive units are usually mounted, is an area subjected to lower vertical acceleration, and thus one that is most suitable for gyrostabilisers. More particularly, these mounting areas and structures for outboards and sterndrives are designed to accommodate the significant forces associated with propelling the vessel and are ideally suited to transmit the gyrostabiliser's torque into the hull of the vessel. The substantially rigid frame of the mounting assembly configured for attachment to the hull, and especially to the transom, preferably includes a housing that encloses the gyrostabiliser. The enclosure provided by the mounting assembly can thus provide environmental and safety protection for the gyrostabiliser. Thus, a vacuum chamber that typically, but not always, encases the gyro flywheel may not be required.

[0013] In another embodiment, the frame of the mounting assembly of the marine drive unit is configured to be

attached or mounted to the hull such that it is at least partially inboard of the hull; for example, at least partially inboard of the transom. According to an embodiment, therefore, the marine drive unit may have the gyrostabiliser arranged forward of the transom. In the case of the marine drive unit being an outboard motor, the mounting assembly may comprise a transom bracket, at least part of which is configured to be arranged forward of the transom. By incorporating the gyrostabiliser with the transom bracket in this way, the gyrostabiliser can be integrated in the outboard motor assembly such that it will not rotate with the motor during turning or transmit load through the steering bearing of the outboard motor.

[0014] In another preferred embodiment, the substantially rigid frame of the mounting assembly may be configured for substantially rigid attachment to a base of the hull, and preferably through, a base of the hull. In this embodiment, therefore, the drive unit may be configured as a pod drive unit. In this embodiment, the gyrostabiliser may be readily incorporated into a top, side, or rear of an upper gear casing of a pod drive unit. As with the sterndrive embodiment, the structure supporting the pod drive is both significant and substantially rigid and may be suitable for transmitting to the hull the forces created by the gyrostabiliser with little or no modification.

[0015] In a preferred embodiment, therefore, the invention provides a marine drive unit comprising:

[0016] a mounting assembly for mounting the drive unit to a hull of a marine vessel, especially to a base of the hull of the vessel, the mounting assembly configured to be substantially rigidly attached the hull;

[0017] a drive casing enclosing at least part of a drive transmission of the drive unit, at least part of the drive casing being configured to be arranged outboard of the vessel and connected to the hull of the vessel via the mounting assembly; and

[0018] a gyrostabiliser incorporated in or on the mounting assembly and/or the drive casing.

[0019] Because, as noted above, the structure and operation of marine gyrostabilisers are generally quite well-understood, this specification does not aim to provide a detailed description of the basic components of a gyrostabiliser, such as the flywheel, flywheel shaft, gimbal bearings, or the like. Rather, this specification directs the skilled reader to other publications for a description or explanation of those components.

[0020] In a preferred embodiment, the drive casing of the marine drive unit is pivotally connected to the mounting assembly for pivoting movement relative to the vessel hull, and especially to the transom, about at least one of: a substantially horizontal axis for raising and lowering the drive casing, and a substantially vertical axis for steering the marine vessel. If the gyrostabiliser is incorporated in the mounting assembly, the drive casing is therefore pivotally movable relative to the gyrostabiliser in this embodiment.

[0021] In an alternative preferred embodiment, at least part of the drive casing is substantially rigid for mounting and supporting at least part of the drive transmission thereon, and the gyrostabiliser is integrated or incorporated in the drive casing such that the shaft of the flywheel of the gyrostabiliser is rotationally mounted with respect to and supported by the substantially rigid part of the drive casing, typically in laterally arranged gimbal bearings. In this embodiment, therefore, the gyrostabiliser may be integrated or incorporated (i.e. mounted and supported) in and/or on the drive casing, as opposed to the mounting assembly. In this way, the drive casing outboard of the vessel may serve as the supporting structure for the gyrostabiliser and also for transmitting torque from the gyrostabiliser to the vessel hull via its connection to the mounting assembly, which is designed to be rigidly attached to the hull, especially to the transom. The drive casing preferably substantially encloses the gyrostabiliser. The enclosure of the drive casing can thus provide environmental and safety protection for the gyrostabiliser. As a result, a vacuum chamber that typically, but not always, encases the gyro flywheel may not be required.

[0022] As noted above, in the case of an outboard motor or stern drive unit, the drive casing is typically pivotally connected to the mounting assembly for pivoting movement relative to the hull, and especially relative to the transom, about at least one of: a substantially horizontal axis to raise and lower the drive casing, and a substantially vertical axis to steer the marine vessel. Thus, in an embodiment with the gyrostabiliser integrated or incorporated in the drive casing, the gyrostabiliser may be arranged to be pivotally movable with the drive casing relative to the mounting assembly. Importantly, however, pivoting of the drive casing about the horizontal axis (i.e. to raise or lower the drive casing) does not typically occur during travel. Although pivoting movement of the gyrostabiliser about a substantially vertical axis (i.e. during steering) may cause some interference with or disturbance of the stabilising effect of the flywheel (which may also rotate about a vertical axis), it is envisaged that any such interference or disturbance will be minimal as the degree or extent of such steering movement will usually only be significant when manoeuvring at low speed and in areas that are often quite sheltered, e.g. in harbours or marinas.

[0023] In a preferred embodiment, the drive casing may enclose substantially an entire drive transmission of the drive unit and preferably also encloses an engine or motor that provides power to the drive transmission. In this regard, the marine drive unit may be preferably provided in the form of an outboard motor. In such an embodiment, where the gyrostabiliser is integrated or incorporated in the drive casing—e.g. with the shaft of the flywheel of the gyrostabiliser rotationally mounted with respect to and supported by the substantially rigid part of the drive casing, typically in lateral gimbal bearings—there are two main positions contemplated for location of the gyrostabiliser; namely (i) at the forward side or region of the drive casing, desirably above the mounting assembly, and (ii) at an aft side or region of the drive casing, desirably at about the level or height of the mounting assembly. By integrating a gyrostabiliser into an outboard motor according to the invention, a separate heat exchanger for the gyrostabiliser can be eliminated by utilising the outboard's seawater cooling system. Further, sound damping provisions for the engine can also be used for the gyrostabiliser.

[0024] In at least one embodiment, the invention therefore provides a marine drive unit, e.g. an outboard motor, for a marine vessel, comprising: an engine or power plant, such as an internal combustion engine; a drive transmission for transmitting or transferring mechanical power generated by the engine or power plant to a propeller shaft, i.e. for generating propulsion for the vessel; a casing that houses or at least partially encloses the engine and/or the drive transmission; a mounting assembly configured to mount the

outboard motor to a hull, e.g. to a transom, of the marine vessel; and a gyrostabiliser arranged in or on the mounting assembly or the casing. It will be noted that the engine or power plant of the marine drive unit may include a two-stroke, a four-stroke or diesel internal combustion engine, or it may also comprise one or more electric motor.

[0025] In an embodiment, the mounting assembly of the outboard motor comprises a substantially rigid mounting bracket configured to be secured to the transom of the vessel, e.g. via releasable clamping bolts, and the gyrostabiliser is arranged in or on the mounting assembly such that a shaft of a flywheel of the gyrostabiliser is rotationally mounted and/or supported on the rigid mounting bracket. In this regard, the mounting assembly will typically include a housing that encloses the gyrostabiliser.

[0026] In another embodiment, at least part of the casing of the outboard motor is substantially rigid for mounting and supporting the drive transmission therein and/or thereon, and the gyrostabiliser is arranged in the casing such that a shaft of a flywheel of the gyrostabiliser is rotationally mounted and/or supported in or on the substantially rigid part of the casing.

[0027] In another preferred embodiment, the marine drive unit is provided in the form of a sterndrive unit.

[0028] In a further preferred embodiment, as already noted, the marine drive unit may be configured as a pod drive unit.

[0029] According to another aspect, the invention provides a marine vessel, especially a boat, that comprises or incorporates a marine drive unit of the invention according to any one of the embodiments described above.

[0030] With a marine drive unit according to the invention, the main supporting frame of the gyrostabiliser can be eliminated by integrating the gyrostabiliser into the structural frame elements of an outboard, sterndrive or pod drive unit, such as the engine cylinder block or heads, the main gear casing, the lower leg casing, or the mounting flanges and brackets. Furthermore, as the invention requires little or no modifications to an existing boat or marine vessel structure, a gyrostabiliser can be installed in the vessel simply by exchanging an outboard motor or sterndrive or pod drive. This creates a retrofit market for gyrostabilisers and opens up a new replacement market for outboard motors, sterndrive units, and pod drive units.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] For a more complete understanding of the invention and advantages thereof, exemplary embodiments of the invention are explained in more detail in the following description with reference to the accompanying drawing figures, in which like reference signs designate like parts and in which:

[0032] FIG. **1** is a schematic side view of a marine outboard motor illustrating three possible positions A, B, C for a gyrostabiliser integrated according to embodiments of the invention;

[0033] FIG. **2** is a schematic rear perspective view of a marine outboard motor illustrating the three positions for a gyrostabiliser shown in FIG. **1**;

[0034] FIG. **3** is a schematic front perspective view of a marine outboard motor illustrating the three positions for a gyrostabiliser shown in FIG. **1**; and

[0035] FIG. **4** is a schematic side view of a marine pod drive unit according to an embodiment of the invention.

[0036] The accompanying drawings are included to provide a further understanding of the present invention and are incorporated in and constitute a part of this specification. The drawings illustrate particular embodiments of the invention and together with the description serve to explain the principles of the invention. Other embodiments of the invention and many of the attendant advantages will be readily appreciated as they become better understood with reference to the following detailed description.

[0037] It will be appreciated that common and/or well understood elements that may be useful or necessary in a commercially feasible embodiment are not necessarily depicted in order to facilitate a more abstracted view of the embodiments. The elements of the drawings are not necessarily illustrated to scale relative to each other. It will also be understood that certain actions and/or steps in an embodiment of a method may be described or depicted in a particular order of occurrences while those skilled in the art will understand that such specificity with respect to sequence is not actually required.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0038] Referring to FIGS. **1** to **3** of the drawings, a marine drive unit **1** according to the invention is embodied as an outboard motor and is shown in three views. Each of these drawing figures illustrates alternative embodiments of the marine drive unit **1**.

[0039] The marine drive unit or outboard motor **1** comprises a mounting assembly **2** for mounting the outboard motor **1** to a transom (not shown) at the stern of a marine vessel (not shown) and a drive casing **3** that encloses an engine and a drive transmission of the outboard motor **1**. A gyrostabiliser **4** is shown integrated in the outboard motor **1** in three different possible positions A, B, C and each of these positions A, B, C represents an alternative embodiment of the marine drive unit or outboard motor **1**.

[0040] Firstly, considering integration of the gyrostabiliser **4** in the outboard motor **1** at position A, it will be appreciated that the gyrostabiliser **4** is incorporated in the mounting assembly **2**, which is configured for substantially rigid attachment to the transom of the vessel. In this regard, the mounting assembly **2** comprises a substantially rigid frame **5** (e.g. comprised of steel) that includes a bracket **6** to be securely fastened or attached to the transom of the vessel via fasteners, such as bolts, especially releasable threaded clamping bolts, as is known in the art. As seen in FIG. **1**, the gyrostabiliser **4** is mounted and supported on the rigid frame **5** of the mounting assembly **2** in a position that will be outboard of the vessel and aft of the bracket **6**, arranged between the bracket **6** and the drive casing **3** of the outboard motor **1**. In this regard, the gyrostabiliser **4** is enclosed within a housing **7** on the rigid frame **5** of the mounting assembly **2** such that the shaft S of the flywheel F of the gyrostabiliser **4** is rotationally mounted with respect to and supported by the frame **5** via laterally arranged gimbal bearings (not shown). The housing **7** integrated with the rigid frame **5** of the mounting assembly **2** provides both environmental protection for the gyrostabiliser **4** as well as safety and sound attenuation for users of the marine vessel during operation the gyrostabiliser **4**. The location of the housing **7** on the frame **5** also enables the gyrostabiliser **4** to utilise the water pump and electrical supply of the outboard motor **1** during operation.

[0041] The drive casing **3** of the outboard motor **1** encloses the engine (not shown) below an upper cowling or cover **8** of the casing **3** in what is referred to as the power-head of the outboard motor **1**, and a gearbox and drive shaft (not shown) of the drive transmission within a mid-section **9** and a lower section or base **9'** of the casing **3** (i.e. below the powerhead), which then delivers or transmits power to a screw or propeller P of the outboard motor **1** via a propeller shaft. The drive casing **3** is pivotally connected to the mounting assembly **2** at a hinge or pivot joint **10** for pivoting movement relative to the transom about a substantially horizontal axis X for raising and lowering the drive casing **3**. The drive casing **3** is also pivotally connected to the mounting assembly **2** for pivoting movement relative to the transom about a substantially vertical axis Y for steering the vessel, and this axis is substantially aligned with the rotational axis Y of the flywheel shaft S of the gyrostabiliser **4**. As such, the drive casing **3** is configured to be pivotally movable about the axes X, Y relative to the gyrostabiliser **4** in position A in this embodiment.

[0042] Secondly, considering an embodiment in which the gyrostabiliser **4** is integrated in the drive unit or outboard motor **1** at position B, it will be seen that the gyrostabiliser **4** in this instance is incorporated in the drive casing **3**, at least part of which drive casing **3** (below an upper cowling or cover **8** that provides engine access) is substantially rigid (e.g. formed of steel) for mounting and supporting the engine and drive transmission therein. In this position B, the gyrostabiliser **4** is thus incorporated (i.e. mounted and supported) within the drive casing **3** at a forward side or region of the drive casing **3** above the mounting assembly **2**, as opposed to in or on the mounting assembly **2** as shown in position A. In this way, the drive casing **3** may serve as both a housing for the gyrostabiliser **4**—i.e. to protect the gyrostabiliser **4** against seawater and environmental influences—and as a supporting structure for the gyrostabiliser **4**—i.e. for transmitting torque from the gyrostabiliser **4** to the vessel hull via its connection to the mounting assembly **2**, which, in turn, is substantially rigidly attached to the transom (not shown).

[0043] As noted above, the drive casing **3** is here pivotally connected to the mounting assembly **2** for pivoting movement relative to the transom about each of a substantially horizontal axis X to raise and lower the drive casing, and a substantially vertical axis Y to steer the marine vessel. In this embodiment, therefore, the gyrostabiliser **4** is pivotally movable with the drive casing **3** relative to the mounting assembly **2**. However, pivoting of the drive casing **3** about the horizontal axis X to raise or lower the drive casing **3** will not typically occur during travel. Although pivoting movement of the gyrostabiliser **4** about the substantially vertical axis Y for steering may cause some interference with or disturbance of the stabilising effect of the flywheel F (which rotates about a substantially vertical axis Y'), it is envisaged that any such interference or disturbance will be minimal as the degree or extent of steering movement about axis Y will usually only be significant when manoeuvring at low speed and in areas that are typically quite sheltered, e.g. in harbours or marinas. By incorporating the gyrostabiliser **4** within the drive casing **3**, the safety and environmental protection, as well as sound attenuation, already provided by this casing **3** for the engine and transmission of the drive unit **1** can then be employed for the gyrostabiliser **4**. Again, the gyrostabiliser **4** of this embodiment is also able to take advantage of the water pump and electrical supply of the outboard motor **1** during operation.

[0044] Thirdly, considering integration of the gyrostabiliser **4** in the outboard motor **1** at position C, it will be seen that the gyrostabiliser **4** in this instance is incorporated within the drive casing **3** at an aft side or region of the drive casing at about the level or height of the mounting assembly **2**. In position C, the drive casing **3** again serves as both a housing and a supporting structure for the gyrostabiliser **4** for transmitting torque from the gyrostabiliser **4** (which rotates about a substantially vertical axis Y") to the hull of the vessel via its connection to the mounting assembly **2**, which, in turn, is substantially rigidly attached to the transom. In this regard, the gyrostabiliser **4** may be supported in the casing **3** with the shaft S of the flywheel F rotatably mounted in laterally arranged gimbal bearings (not shown). The outboard motor **1** of the invention will preferably be of a higher power rating, such as 50 Hp and above (e.g. 100-500 Hp), although smaller outboard motors **1** of a power below 50 Hp are technically feasible, but potentially less commercially feasible.

[0045] With reference now to FIG. **4** of the drawings, a marine drive unit **1** is shown in the form of a pod drive unit. The pod drive unit **1** includes a mounting assembly **2** for securely mounting the pod drive unit **1** to a base of a hull H of a marine vessel in a manner as is known in the art. The pod drive unit **1** further comprises a drive casing **3** that interconnects a output shaft (not shown) from an engine or power plant E of the pod drive unit **1** with a gearbox and drive train or drive transmission within a mid-section **9** and a lower section **9'** of the casing **3**, with the lower section **9'** incorporating a screw or propeller P on a propeller shaft mounted outboard of the hull H. In this embodiment, a gyrostabiliser **4** incorporating a flywheel F rotatably mounted on a shaft S for high-speed rotation about the axis Y is integrated on the drive casing **3** of the pod drive **1** enclosed within its own housing **7** such that the shaft S of the flywheel F is rotationally mounted with respect to and supported in the housing **7** on the casing **3** via gimbal bearings (not shown). Again, the rigid structure of the drive casing **3**, specifically the mid-section **9**, which is securely fastened to the hull H of the vessel serves to transmit the stabilising forces generated by the gyrostabiliser to the hull H. As before, the arrangement in this embodiment can eliminate the duplication of systems or components otherwise found in both the pod drive unit **1** and gyrostabiliser, like water pump, electrical supply, housing, supporting structure, sound attenuation, and safety enclosure. A similar configuration may apply for an embodiment of a stern drive unit according to the invention. Again, power ratings above 50 Hp are preferred for the pod drive and stern drive units.

[0046] Although specific embodiments of the invention are illustrated and described herein, it will be appreciated by persons of ordinary skill in the art that a variety of alternative and/or equivalent implementations exist. It should be appreciated that each exemplary embodiment is an example only and is not intended to limit the scope, applicability or configuration of the invention in any way. Rather, the foregoing summary and detailed description will provide those skilled in the art with a convenient road map for implementing at least one exemplary embodiment, it being understood that various changes may be made in the function and arrangement of elements described in an exemplary embodiment without departing from the scope as set forth in

the appended claims and their legal equivalents. Generally, this application is intended to cover any adaptations or variations of the specific embodiments discussed herein.

[0047] It will also be appreciated that the terms "comprise", "comprising", "include", "including", "contain", "containing", "have", "having", and any variations thereof, as used throughout this document are, unless the context requires otherwise, intended to be understood in an inclusive (i.e. non-exclusive) sense, such that the process, method, device, apparatus, or system described herein is not limited to those features, integers, parts, elements, or steps recited but may include other features, integers, parts, elements, or steps not expressly listed and/or inherent to such process, method, device, apparatus, or system. Furthermore, the terms "a" and "an" used herein are intended to be understood as meaning one or more unless explicitly stated otherwise. Moreover, the terms "first", "second", "third", etc. are used merely as labels, and are not intended to impose numerical requirements on or to establish a certain ranking of importance of their objects. In addition, reference to positional terms, such as "lower" and "upper", used in the above description are to be taken in context of the embodiments depicted in the figures, and are not to be taken as limiting the invention to the literal interpretation of the term but rather as would be understood by the skilled addressee in the appropriate context.

1. A marine drive unit, comprising:

a mounting assembly for mounting the drive unit to a hull of a marine vessel, especially to a transom at a stern of the marine vessel, the mounting assembly configured for substantially rigid attachment to the hull, and especially to the transom;

a drive casing enclosing at least part of a drive transmission of the drive unit, the drive casing configured to be arranged outboard of the marine vessel and to be connected to the hull, especially the transom, of the vessel via the mounting assembly; and

a gyrostabiliser incorporated in one of the mounting assembly and the drive casing.

2. A marine drive unit according to claim **1**, wherein the mounting assembly has a substantially rigid frame for substantially rigid attachment to the hull, especially the transom, and wherein the gyrostabiliser is incorporated in the mounting assembly such that a shaft of a flywheel of the gyrostabiliser is rotationally mounted with respect to and supported by the frame of the mounting assembly.

3. A marine drive unit according to claim **2**, wherein the substantially rigid frame of the mounting assembly includes a housing that encloses the gyrostabiliser.

4. A marine drive unit according to claim **1**, wherein the drive casing is pivotally connected to the mounting assembly for pivoting movement relative to the hull, especially the transom, about at least one of a substantially horizontal axis for raising and lowering the drive casing, and a substantially vertical axis for steering the marine vessel, wherein the drive casing is pivotally movable relative to the gyrostabiliser.

5. A marine drive unit according to claim **1**, wherein at least part of the drive casing is substantially rigid for mounting and supporting said at least part of the drive transmission thereon, and wherein the gyrostabiliser is incorporated in the drive casing such that a shaft of a flywheel of the gyrostabiliser is rotationally mounted with respect to and supported by the substantially rigid part of the drive casing.

6. A marine drive unit according to claim **5**, wherein the drive casing substantially encloses the gyrostabiliser, and wherein a rotational axis of the flywheel is in use substantially vertical.

7. A marine drive unit according to claim **5**, wherein the drive casing is pivotally connected to the mounting assembly for pivoting movement relative to the hull, especially the transom, about at least one of a substantially horizontal axis to raise and lower the drive casing, and a substantially vertical axis to steer the marine vessel, wherein the gyrostabiliser is pivotally movable with the drive casing relative to the mounting assembly.

8. A marine drive unit according to claim **1**, wherein the drive casing encloses substantially an entire drive transmission of the drive unit and preferably also an engine or motor providing power to the drive transmission.

9. A marine drive unit according to claim **8**, wherein the marine drive unit is in the form of an outboard motor.

10. A marine drive unit according to claim **1**, wherein the marine drive unit is in the form of a sterndrive unit.

11. A marine drive unit according to claim **1**, wherein the marine drive unit is in the form of a pod drive unit.

12. An outboard motor for a marine vessel, the outboard motor comprising:

an engine or power plant, preferably an internal combustion engine;

a drive transmission for transmitting or transferring mechanical power generated by the engine or power plant to a propeller shaft;

a casing which houses or at least partially encloses the engine and/or the drive transmission;

a mounting assembly configured to mount the outboard motor to a hull, especially to a transom, of the marine vessel; and

a gyrostabiliser arranged in or on the mounting assembly or the casing.

13. An outboard motor according to claim **12**, wherein the mounting assembly comprises a substantially rigid mounting bracket configured to be secured to the transom of the vessel, and the gyrostabiliser is arranged in or on the mounting assembly such that a shaft of a flywheel of the gyrostabiliser is rotationally mounted and/or supported on the rigid mounting bracket.

14. A marine drive unit according to claim **13**, wherein the mounting assembly has a housing that encloses the gyrostabiliser.

15. A marine drive unit according to claim **12**, wherein at least part of the casing is substantially rigid for mounting and supporting the drive transmission therein, wherein the gyrostabiliser is arranged in the casing such that a shaft of a flywheel of the gyrostabiliser is rotationally mounted and supported in or on the substantially rigid part of the casing, and wherein a rotational axis of the flywheel is in use substantially vertical.

16. A marine vessel, especially a boat, comprising a marine drive unit, said marine drive unit comprising:

a mounting assembly for mounting the drive unit to a hull of the marine vessel, especially to a transom at a stern of the marine vessel, the mounting assembly configured for substantially rigid attachment to the hull, and especially to the transom;

a drive casing enclosing at least part of a drive transmission of the drive unit, the drive casing configured to be arranged outboard of the marine vessel and to be

connected to the hull, especially the transom, of the vessel via the mounting assembly; and

a gyrostabiliser incorporated in one of the mounting assembly and the drive casing, wherein the gyrostabiliser in use operates to oppose a rolling motion of the vessel.

17. A marine vessel according to claim **16**, wherein the mounting assembly has a substantially rigid frame for substantially rigid attachment to the hull, especially the transom, and wherein the gyrostabiliser is incorporated in the mounting assembly such that a shaft of a flywheel of the gyrostabiliser is rotationally mounted with respect to and supported by the frame of the mounting assembly.

18. A marine vessel according to claim **16**, wherein the drive casing is pivotally connected to the mounting assembly for pivoting movement relative to the hull, especially the transom, about at least one of a substantially horizontal axis for raising and lowering the drive casing, and a substantially vertical axis for steering the marine vessel, wherein the drive casing is pivotally movable relative to the gyrostabiliser.

19. A marine vessel according to claim **16**, wherein at least part of the drive casing is substantially rigid for mounting and supporting said at least part of the drive transmission thereon, wherein the gyrostabiliser is incorporated in the drive casing such that a shaft of a flywheel of the gyrostabiliser is rotationally mounted with respect to and supported by the substantially rigid part of the drive casing, and wherein a rotational axis of the flywheel is in use substantially vertical.

20. A marine vessel according to claim **16**, wherein the drive casing encloses substantially an entire drive transmission of the drive unit and preferably also an engine or motor providing power to the drive transmission.

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