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Lambrecht et al.

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[54] **STERN DRIVE UNIT PROPELLER TRIMMING ARRANGEMENT**

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[21] Appl. No.: **479,193**

Related U.S. Patent Documents

Reissue of:

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Issued: **Mar. 27, 1973**
Appl. No.: **177,070**
Filed: **Sept. 1, 1971**

[52] **U.S. Cl.** ..... **115/41 R**; 115/34 R
[51] **Int. Cl.²** **B63H 5/12**
[58] **Field of Search** ..... 115/41 R, 41 HT, 34 R, 115/12, .5 B

[56] **References Cited**

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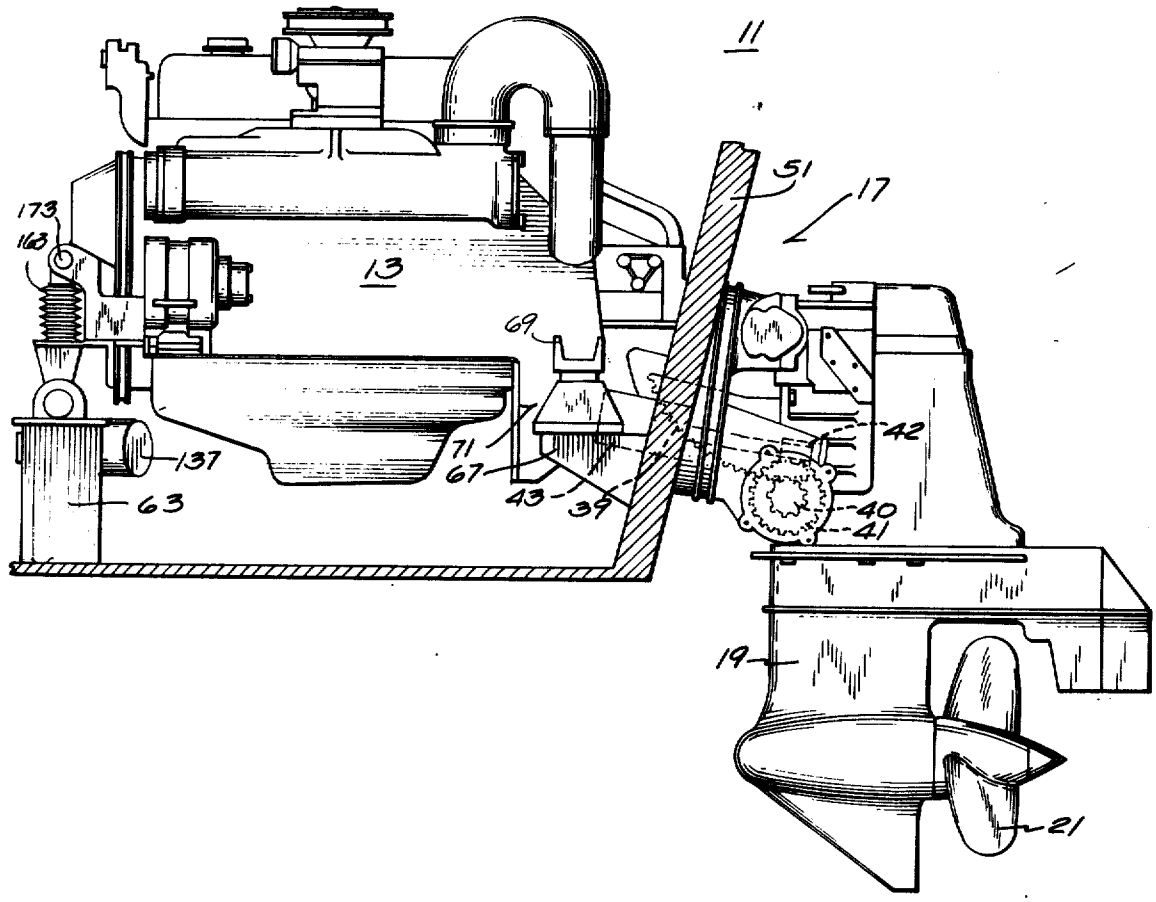
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[57] **ABSTRACT**

Disclosed herein is the combination of a boat hull and a stern drive unit which includes and is supported by an engine and which further includes a marine propulsion lower unit tiltable vertically and swingable horizontally independently of the engine, together with means mounting the stern drive unit on the boat hull including means for selectively vertically displacing or tilting the forward end of the engine relative to the rear of the engine.

33 Claims, 6 Drawing Figures



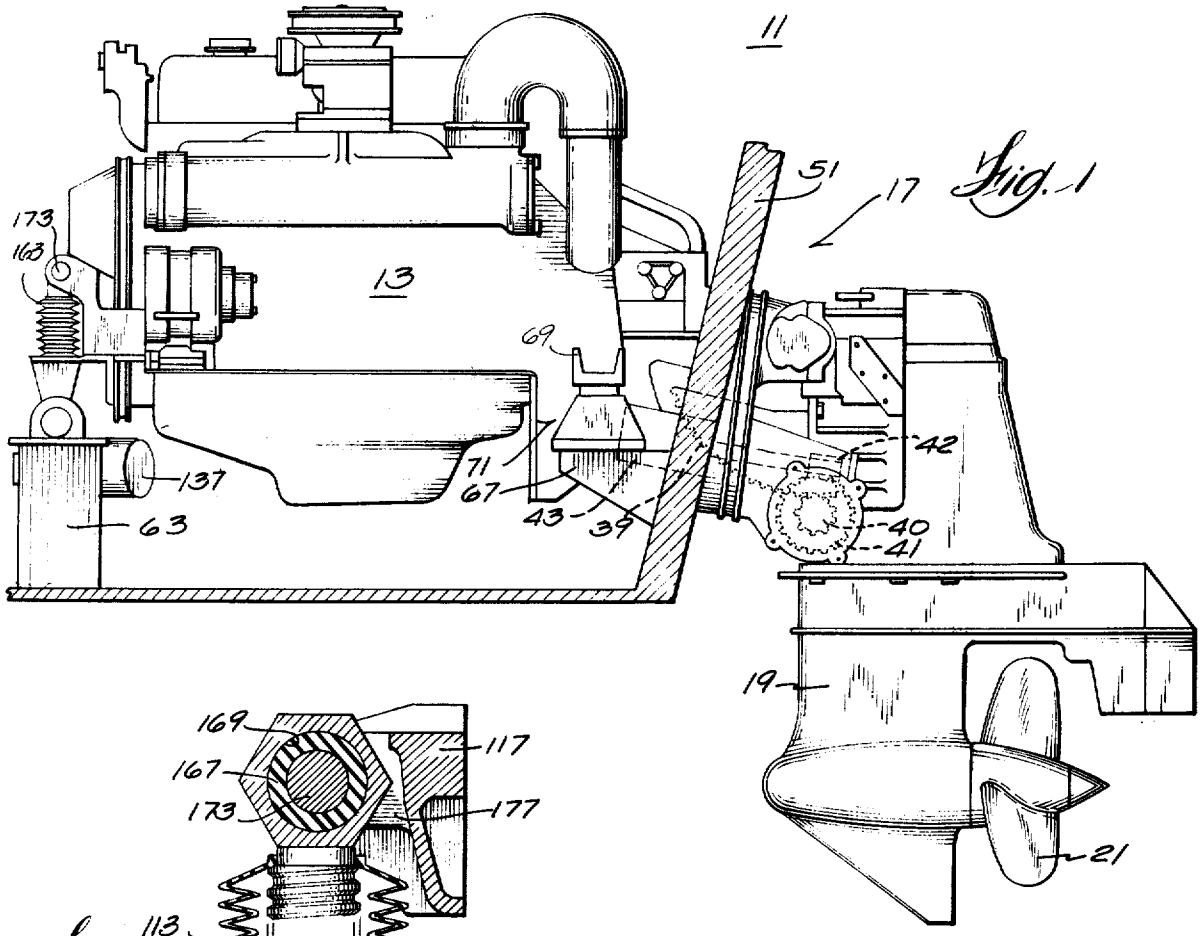


Fig. 1

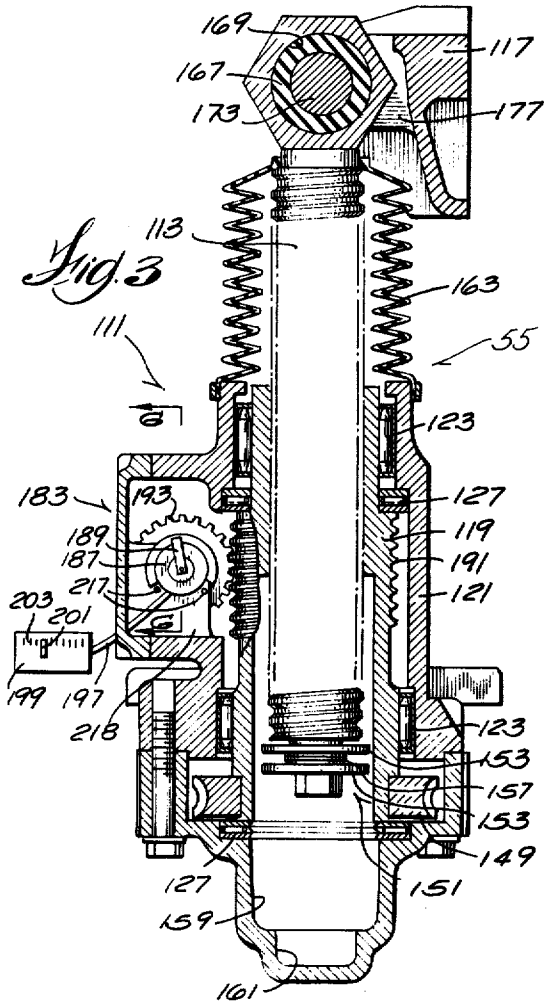


Fig. 3

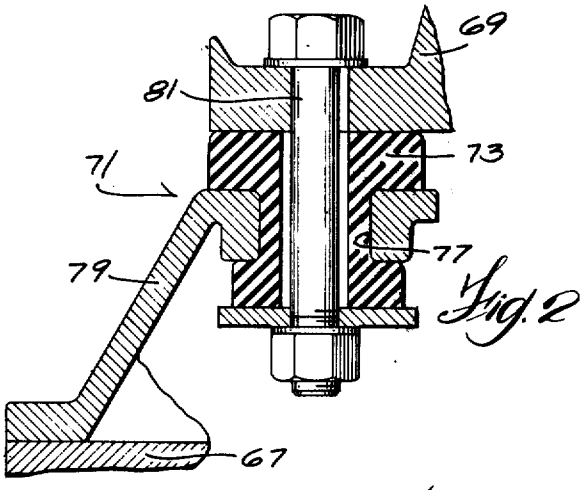


Fig. 2

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Fig. 4

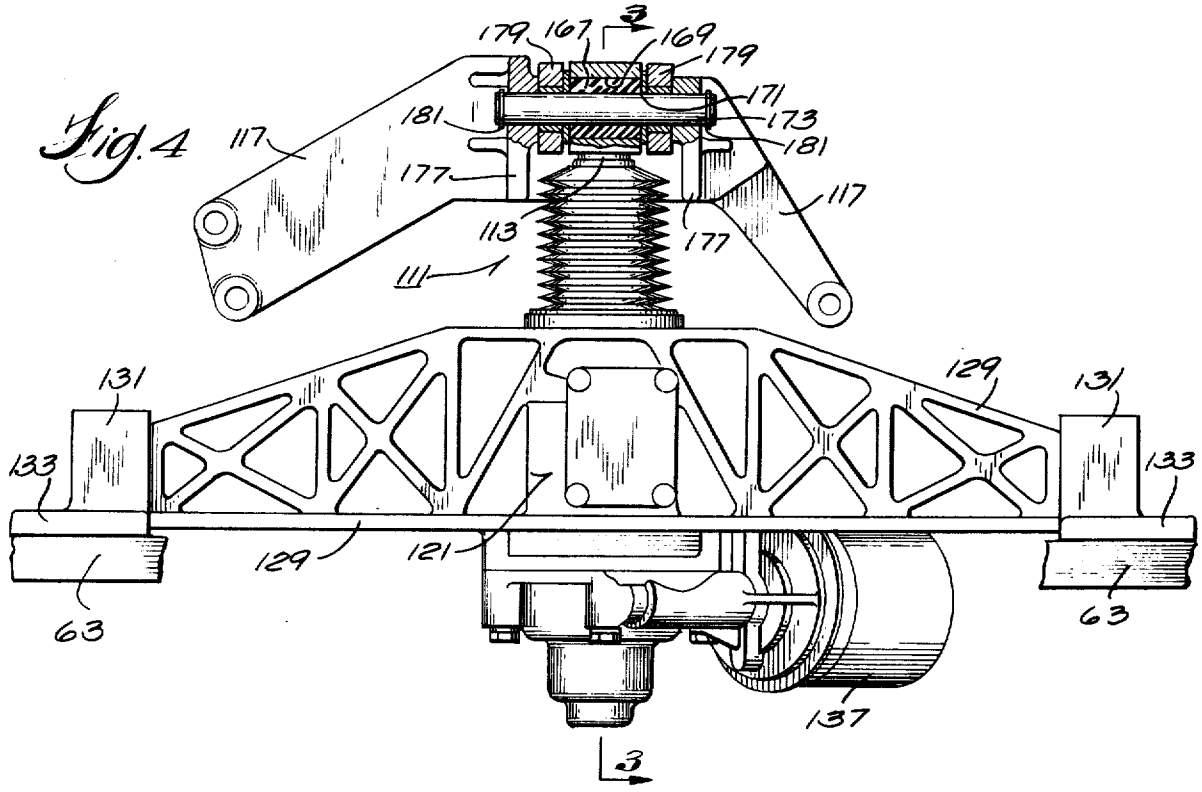


Fig. 5

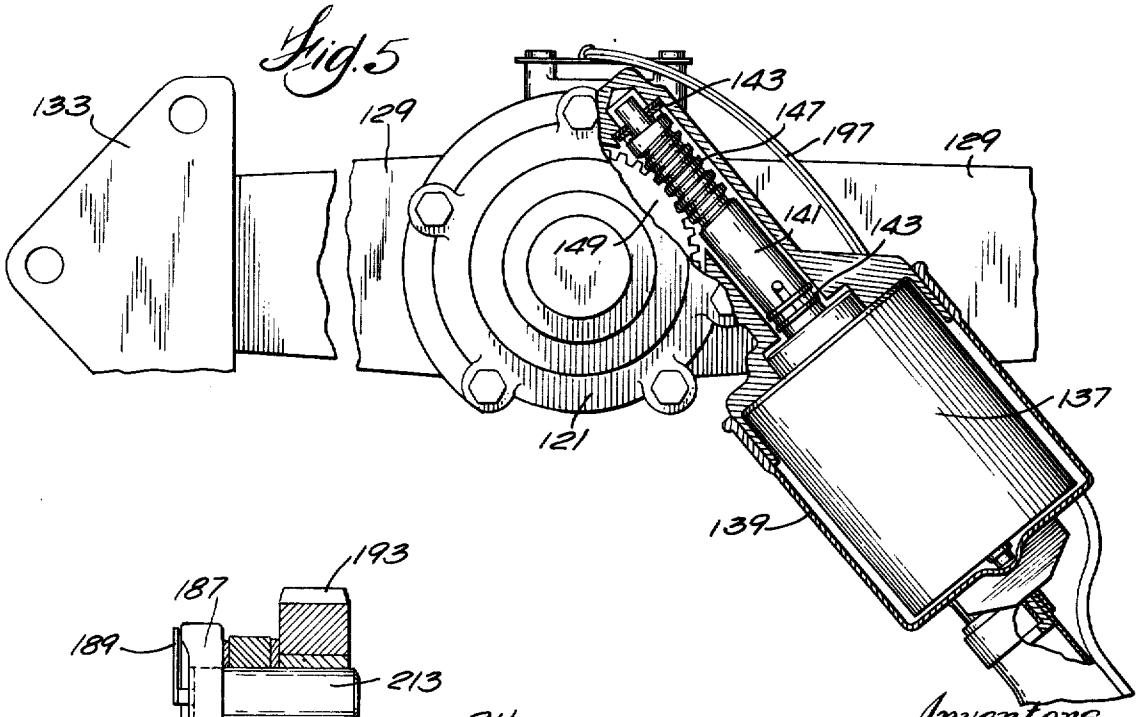


Fig. 6

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STERN DRIVE UNIT PROPELLER TRIMMING ARRANGEMENT

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

BACKGROUND OF THE INVENTION

The invention relates generally to marine propulsion stern drive units including an engine which is mounted on a boat hull and which supports a vertically tiltable and horizontally swingable lower unit part supporting a propeller. Such lower units are desirably trimmed relative to the boat hull and thereby to the water to obtain maximum speed and safety conditions. Such trimming effects both the relation of the boat to the water and the angle at which the propeller generates propulsive thrust. Other factors are involved in the "trim" of a boat as, for instance, passenger loading and sea conditions. Thus, one particular relationship of a propulsion unit to a boat can give good results under one set of conditions and less satisfactory results under another set of conditions. Furthermore, conditions can change when under way, as for instance, if the weather or sea condition change, or if the distribution of passenger weight changes. Accordingly, it is desirable to be able to adjust the trim under way.

It should also be noted that proper trim between a lower unit and a boat is an important safety factor when under way. In this regard, for instance, a "bow-down" condition can cause violent uncontrollable action in swells.

In addition to trim, another factor of significance with respect to vertically tiltable lower units is capability to absorb shock incident to rearward and upward swinging occurring in response to the striking of an underwater obstacle and the capacity for power tilting of the propulsion unit upwardly and downwardly relative to the trimmed running position. For example, propeller removal is facilitated by tilting the lower unit to its fully raised position and shallow water operation at reduced speeds is facilitated by tilting the lower unit to a partially raised position. Power tilting in the down or return direction to the trimmed position also affords return of the lower unit after the striking of an underwater obstacle and after power tilting upwardly to partially and fully raised positions.

Various arrangements have been provided in the past for frictionally and hydraulically absorbing shock or dissipating energy in response to the striking of an underwater obstacle. In addition, various arrangements have been employed to afford power tilting of a marine propulsion lower unit between a running position and a partially or fully raised or elevated position. In addition, various hydraulic arrangements have been provided for adjusting the trim of an outboard motor relative to a boat even when under way and to afford energy absorption in response to striking of an underwater obstacle. However, all the known prior stern drive arrangements were incapable, without trim setting by the operator, of affording propulsion unit return to the same trim position after power tilting or after tilting in response to the striking of an underwater obstacle. Attention is directed to the following U.S. patents:

Ziegler Pat. No. 3,250,240 issued May 10, 1966;
Kiekhaefer Pat. No. 2,953,335 issued Sept. 20, 1960;
North Pat. No. 3,295,221 issued Nov. 15, 1966;
North Pat. No. 3,434,449 issued Mar. 25, 1969;
Woodfill Pat. No. 3,434,448 issued Mar. 25, 1969;
McCormick Pat. No. 3,434,450 issued Mar. 25, 1969.

Attention is also directed to the commonly assigned Carpenter Application Ser. No. 118,134 filed Feb. 23, 1971, and entitled "Hydraulic Power Trim and Power Tilt System for a Marine Propulsion Device".

Attention is also directed to the Shimanckas U.S. Pat. No. 3,183,880 issued May 18, 1965, and entitled "Marine Propulsion Device."

SUMMARY OF THE INVENTION

The invention provides a stern drive unit in which a stern leg is fixedly attached to an engine and in which the stern drive unit is adapted to be mounted in a boat hull in such manner as to selectively raise and lower the forward end of the engine relative to the boat hull about a rearward transverse axis to afford selective propeller trim adjustment. Also in accordance with the invention, there is provided a stern drive unit including an arrangement for selectively raising and lowering the forward end of the engine to adjust the trim of the propeller. In the preferred construction, a screw jack arrangement is employed.

Still further in accordance with the invention, a vibration isolation mount is provided between the forward end of the engine and the boat hull. In the preferred construction, such mount is located between the screw jack and the forward end of the engine. Provision is also made for affording pivotal movement between the screw jack and the engine and between the screw jack and the boat hull to accommodate trimming of the engine relative to the boat hull.

Still further in accordance with the invention, vibration isolation mounts are provided, rearwardly of the front of the engine, between the stern drive unit and the boat hull, which mounts affording vertical trimming of the engine about a transverse axis rearwardly of the front of the engine in response to vertical trimming of the stern drive unit, i.e., raising and lowering of the front of the engine.

Also in accordance with the invention, there is provided means for sensing the vertical position of the forward end of the engine and for displaying to the operator such position or the equivalent trim position of the propeller.

Also in accordance with the invention, there is provided a boat having therein a stern drive unit including an engine mounted for selective tilting movement relative to the boat hull to provide propeller trim capability.

One of the principal objects of the invention is the provision of an arrangement for trimming a stern drive unit while independently retaining power tilting capability and whereby lowering of the stern drive unit to its fully lowered power tilt position will automatically return the stern drive unit to the previously adjusted trim condition.

Still another of the principal objects of the invention is the provision of a stern drive unit in accordance with the preceding paragraph including elastomeric vibration isolation mounting means between the stern drive unit and the boat hull for reducing vibration and noise transmission from the stern drive unit to the boat hull.

Still another of the objects of the invention is the provision of a stern drive unit including a motorized rack screw arrangement for tilting the stern drive unit relative to the boat hull to selectively obtain a desired propeller trim condition.

Still another of the principal objects of the invention is the provision of a stern drive trimming arrangement which includes provision for sensing the trim condition of the stern drive unit and displaying such trim condition information to the operator or user.

Still another object of the invention is the provision of a stern drive unit which advantageously provides selective propeller trim adjustment independently of power tilting capability and which is relatively economical to manufacture and install and which will provide reliable service over a long and useful life.

Other objects and advantages of the invention will become known by reference to the following description and accompanying drawings.

DRAWINGS

FIG. **1** is a side elevational view of a stern drive unit mounted in a boat hull in accordance with the invention.

FIG. **2** is an enlarged fragmentary sectional view of a vibration insulation mount employed in the stern drive unit shown in FIG. **1**.

FIG. **3** is a fragmentary sectional view taken generally along line **3—3** of FIG. **4** and including a schematic illustration of a propeller trim condition indicating means.

FIG. **4** is a front elevational view, partially broken away and in section, of a portion of the stern drive unit shown in FIG. **1**.

FIG. **5** is a fragmentary top view, partially broken away and in section, of the components shown in FIG.

FIG. **6** is an enlarged fragmentary and partially schematic sectional view taken along line **6—6** of FIG. **3**.

Before explaining the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or [terminoloty] *terminology* employed herein is for the purpose of description and not of limitation.

DETAILED DESCRIPTION

Shown in the drawings is a marine propulsion stern drive unit **11** including an engine **13** and a propulsion leg **17** fixedly connected to the engine **13** and including a lower unit **19** which rotatably supports a propeller **21** and which is tiltable vertically, as well as horizontally swingable relative to the engine **13.** Various propulsion leg constructions can be employed. Preferably, the propulsion or stern drive leg **17** includes a power tilting device permitting raising of the lower unit **19** either partially or fully out of the water. In the disclosed construction, the propulsion or stern drive leg **17** is constructed in general accordance with disclosures of the U.S. Shimanckas U.S. Pat. No. 1,183,880 issued May 3, 1965, and entitled "Marine Propulsion Device", which patent is incorporated herein by reference.

As used herein, the terms "propulsion leg" or "stern drive leg" encompass the Shimanckas intermediate unit "A", the Shimanckas swivel bearing support "C", and the Shimanckas propulsion unit "D" which are disclosed in the Shimanckas U.S. Pat. No. 3,183,880, Column 2, lines 69 through 72. It is noted that the stern drive leg disclosed by Shimanckas includes provision for power tilting including a segmented rack **39** which meshes with a pinion **40.** In turn, the pinion **40** is connected to a worm gear **41** driven by a worm **42** on the armature shaft of a reversible motor **43** (The numerals **39** through **43** applied herein to the drawings, correspond to the numerals applied to the Shimanckas, U.S. Pat. No. 3,183,880). Also included in the disclosed construction is the Shimanckas slip clutch (numbered 45 in the Shimanckas patent), which clutch affords upward movement of the lower unit **19** in response to striking of an underwater obstacle.

As disclosed in the Shimanckas U.S. Pat. No. 3,183,880, the Shimanckas propulsion unit "D" is carried on, and for steerable movement relative to, the Shimanckas swivel bearing support "C" which, in turn, is carried by, and for relative vertical movement relative to, No. Shimanckas intermediate unit "A". In the disclosure of the Shimanckas U.S. Pat. No. 3,183,880, the intermediate unit "A" in turn was fixedly for from the boat hull through elastomeric cushions or mounts (numerals **21** and **25** in the Shimanckas patent) and the Shimanckas engine "B" was fixed to, and supported from, the Shimanckas intermediate unit "A". Thus, except for the vertical swinging movement of the assembly of the Shimanckas swivel bearing support "C" and propulsion unit "D" and except for the steering movement of the Shimanckas propulsion unit "D", the stern drive unit disclosed by Shimanckas was fixedly assembled and was mounted to the boat hull from the Shimanckas intermediate unit "A". Further, and except as noted, as disclosed in the Shimanckas U.S. Pat. [No. 3,183,800] *No. 3,183,880* the stern drive unit was not movable relative to the boat hull.

In accordance with the invention disclosed herein, there is provided means for mounting the stern drive unit **11** on a boat hull **51** with the stern drive leg **17** extending through an opening (not shown) in the boat hull transom. The stern drive leg **17** can be connected to the transom to prevent entry of water in various ways including use of an inflatable member such as disclosed in the Shimanckas Application Ser. No. 55,665 filed July 17, 1970, and assigned to the assignee of this application.

In accordance with the invention, the stern drive mounting means also includes means **55** for selectively vertically displacing or tilting the forward end of the engine **13** about a rearward transverse axis and relative to the boat hull **51** and thereby to tilt the entire stern drive unit **11** relative to the boat hull **51** so as to obtain desired propeller trim conditions. Preferably, the stern drive unit mounting means includes forward and rearward vibration isolating elastomeric mounts between the stern drive unit **11** and the boat hull **51** so as to isolate the boat hull **51** from engine and other vibrations. It is preferable to arrange the rearward elastomeric mounts so as to permit tilting about the rearward mounts through a limited range affording the desired trim capability. The rearward vibration isolating mounts could be connected to either the stern leg **17** or to the engine **13.** In the disclosed construction, the rearward mounts comprise transversely spaced elastomeric cushions connected between a rearwardly located engine frame member and the boat hull.

More particularly, the boat hull **51** includes fore and aft fixed stringers or pads **63** and **67**, respectively, to which the engine **13** is mounted. Still more specifically in this regard, the engine **13** includes, at its rear, a supporting frame member **69** to which are connected transversely aligned elastomeric mounts **71** which, in turn, are also connected to the boat hull stringer **67**. In the illustrated and preferred construction, each of the isolation mounts **71** includes, as shown best in FIG. **2**, a rubber mounting cushion or element **73** which can be as generally described in the Brown U.S. Pat. No. 3,532,319 issued Oct. 9, 1970. Specifically, the cushions **73** each include, intermediate their ends, a generally annular recess **77** receiving a mounting bracket **79** fixed to the boat hull stringer **67**. In addition, the cushion **73** is connected to a bolt **81** which extends from an engine frame member **69** perpendicularly of the position of the bracket **79** connected to the cushion **73**. As already noted, this construction affords pivoting of the engine **13** and other stern drive components about a rearwardly located transverse axis to accommodate trimming of the propeller relative to the boat hull **51** as may be desired.

As already noted, the engine mounting means includes means for selectively vertically displacing or tilting the forward end of the engine **13** relative to the boat hull **51** so as to thereby trim the propeller. Various arrangements can be employed to selectively raise and lower the forward end of the engine **13**. For instance, a hydraulic ram could be employed. In the preferred and illustrated construction, there is employed a motorized jack screw **111** coupled with a vibration isolation mounting between the jack screw **111** and the engine **13**.

More specifically, the jack screw **111** includes (See FIGS. **3**, **4**, and **5**) an element in the form of an externally threaded screw **113** which is connected to an engine frame portion **117** to permit relative pivotal movement about a transverse or lateral axis and to prevent axial rotation of the screw **[117] *111***. In turn, the screw **[117] *111*** is threadedly received in an internal bore of a member **119** which is rotatably carried in a housing by axially spaced radial bearings **123** and axially spaced thrust bearings **127**.

In order to permit tilting of the housing **121** and jack screw **111** relative to the boat hull **51**, the housing **121** includes (See FIG. **4**) a pair of transversely extending arms **129** having bearing portions **131** received in transversely spaced pillow blocks or mounting brackets **133** fixed to the forward boat hull stringer **63**, thereby affording pivotal movement about a transverse axis of the rotatable jack screw member **119** relative to the boat hull **51**.

Means are provided for rotating the member **119** to raise and lower the forward end of the engine **13**. While various arrangements can be employed, in the illustrated and preferred construction, rotation of the member **119** is provided (See FIG. **5**) by a reversable electric motor **137** which is suitably mounted on the housing **121** and enclosed in a watertight boot **139** and which is drivingly connected to a stub shaft **141** carried in the housing **121** by axially spaced thrust bearings **143** and which includes a worm portion **147** in mesh with a worm wheel **149** fixed to the rotatable member **119** (See FIG. **3**).

Means are provided for cushioning overtravel of the screw **113** relative to the rotatable member **119**. While various arrangements can be employed, in the disclosed construction, a bumper stop **151** is provided by equipping the screw **113**, at the end thereof received in the housing **121**, with a pair of axially spaced stop washers **153** separated by a series of dished spring washers **157**. The upper stop washer **153** is of such dimension as to be adapted, when the screw **113** is fully extended from the housing **121**, to abut the margins of the opening in the housing **121** through which the screw **113** extends. At the lower end of the housing **121**, there is provided a blind bore **159** which is adapted to receive the lower end of the screw **113** when the screw **113** is fully retracted into the housing **121**. Extending from the blind bore **159** is a blind counterbore **161** which has a circumferential margin engageable by the lower stop washer **151** upon full retraction of the screw **113** into the housing **121**. The spring washers **157** cushion and then stop the axial movement of the screw **113** upon engagement of the stop washers **151** with the housing **121**.

In order to insure reliable operation over a long and useful life, a watertight bellows-type boot **163** is arranged in encircling relation about the portion of the screw **113** extending from the housing **121**. The boot **163** is connected, at its upper end, to the screw **113** above the screw thread and, at its lower end, to the margin of the housing **121** around the opening through which the screw **113** extends.

Means are provided for vibrationally isolating the forward end of the engine **13** from the boat hull **51**. While various other arrangements can be employed, in the preferred and illustrated construction as already indicated, there is provided (See FIGS. **3** and **4**) and elastomeric cushion or mount **167** between the screw **113** and the engine frame portion **117**.

More specifically, the upper end of the screw **113** includes a cylindrical eye or bore **169** which has a transverse axis and which has bonded or otherwise received therein the cylindrical rubber cushion or mount **167**. The rubber mount **167** includes an axial bore **171** to which is bonded or otherwise received therein a shaft or pintle **173** which also extends through aligned bores in laterally spaced supporting arms **177** of the frame portion **117** which supports the engine **13**. Suitable spacers **179** are provided between the arms **177** and the assembly of the screw **113** and the rubber mount or cushion **167**. Axial displacement of the shaft **173** is prevented by snap retainers **181** engaged on the shaft **173** adjacent each of the ends thereof and exteriorly of the support arms **177**.

Also in accordance with the invention, there is provided means **183** for sensing the vertical position of the forward end of the engine **13** and thereby the trim condition of the propeller **21**, and for displaying such engine position information and therefor the propeller trim condition to the operator or user. While various arrangements can be employed in the preferred and illustrated construction, the engine position sensing and displaying means **183** comprises a potentiometer **187** mounted on the housing **121** and including a rotatable wiper **189** which is mechanically connected to the rotatable member **119** so as to reflect the position of the screw **113**. More specifically, the rotatable member **119** also includes an externally threaded portion **191** which is in mesh with a gear **193** connected to the potentiometer wiper **189** so as to cause rotation of the wiper **189** in response to rotation of the rotatable member **119**. Thus, rotation of the rotatable member **119** causes related movement of the potentiometer wiper

[119] *189* to vary the voltage output of the potentiometer **187** in accordance with the position of the forward end of the engine **13**.

While various other arrangements could be employed, in the illustrated and preferred construction, the potentiometer **187** is electrically connected by electrical leads **197** to an indicating device **199** which can be located at the dashboard and in the vicinity of the steering wheel and which comprises a needle or indicator **201** positioned relative to a scale **203** in response to the voltage applied to the device from the potentiometer **187**.

In accordance with the invention, means are also provided for self-calibrating the sensing and display means. While various other arrangements can be employed, in the disclosed construction shown in FIGS. **3** and **6**, means are provided for limiting movements of the wiper **189** to an angular range corresponding to the full travel of the screw **113** as determined by the meshed engagement of the gear **193** with the threaded portion **191** of the rotatable member **119**. In addition, selectively operably lost motion means is provided between the member **119** and the wiper **189**. In the specifically illustrated construction, such means comprises a slip clutch **211** (See FIG. **6**) between the gear **193** and the potentiometer **187**. More specifically in this regard, a shaft **213** connects the potentiometer wiper **189** to the gear **193** for common movement and the slip clutch **211** comprises a bushing [255] *215* which is interposed between the shaft **213** and the gear **193** and which will normally transmit rotary movement from the gear **193** to the shaft. However, the bushing [213] *215* will slip relative to either or both of the gear **193** and the wiper **189** in the event the wiper **189** is restrained from pivotal movement.

The wiper movement restraining or limiting means comprises two spaced insulated pins or studs or posts **217** which are suitably mounted on a supporting bracket **218** and in spaced locations to limit or prevent angular movement of the wiper **189** beyond the full range associated with full travel of the screw **113**. Accordingly, when the electric motor **137** is initially engaged to drive the screw **113** to one of its fully extended or fully retracted positions, the potentiometer wiper **189** will be rotated in the direction toward one of the posts **217**. If the wiper **189** engages the post **217** toward which the wiper **189** is traveling before complete movement of the screw **113** to the end of its travel, the clutch **211** will slip so that when the screw **113** eventually reaches the end of its travel, the potentiometer wiper **189** is in the position at the end of its angular range of movement and in proper position reflecting the location of the screw **113**. Thereafter, movement of the potentiometer wiper **189** away from the engaged post **217** will occur in response to movement of the screw **113** from its position at the end of its travel so as thereby to self-calibrate the sensing and display means.

In operation, energization of the reversable electric motor **137** causes selective vertical movement of the forward end of the engine **13** about a transverse axis provided by the rearward elastomeric cushion mounts **71**. Such vertical tilting movement of the engine **13** causes accompanying movement of the lower unit **19** and trimming of the propeller **21** relative to the boat hull **51**. At the same time, the lower unit **19** is capable of steering and tilting movement independently of the trim adjustment, thereby permitting the lower unit **19** to be raised and then fully lowered to the same adjusted trim position.

In addition to affording downward tilting return of the lower unit **19** to the same previously adjusted trim position, the disclosed construction also advantageously affords trim adjustment under way. Still further, the display means **198** is adapted to inform the operator at all times of the engine position or propeller trim condition.

Various of the features of the invention are set forth in the following claims.

What is claimed is:

[1. A stern drive unit comprising an engine, a stern drive leg fixed to said engine and including a part which is tiltable vertically and swingable horizontally independently of said engine, and means adapted for mounting said stern drive unit on a boat hull including means for selectively vertically tilting the forward end of said engine relative to the boat hull.]

2. A stern drive unit [in accordance with claim 1 wherein said means adapted for mounting said stern drive unit on the boat hull includes] *comprising an engine, a stern drive leg fixed to said engine and including a part which is tiltable vertically and swingable horizontally relative to said engine, and means adapted for mounting said stern drive unit on a boat hull including* elastomeric mounting means connected to said stern drive unit rearwardly of the front of said engine, said elastomeric mounting means providing a pivotal axis relative to which the forward end of said engine is movable, *and means connected to the front of said engine for selectively vertically tilting the forward end of said engine relative to the boat hull independently of vertical tilting of said part of said stern drive leg relative to said engine*.

3. A stern drive unit in accordance with claim [1] *2* wherein said means for selectively tilting the forward end of said engine includes an element connected to said engine and a member adapted to be connected to the boat hull, and means selectively extensibly connecting said element and said member.

4. A stern drive unit in accordance with claim **3** wherein said means for selectively tilting said engine includes a mounting arm adapted to be connected to the boat hull and wherein said element is connected to said engine so as to permit pivotal movement of said element relative to said engine about a lateral axis transverse of said engine and to prevent rotation of said element about an axis transverse to said lateral axis, and said element comprises a screw, and wherein said member is rotatably mounted from said mounting arm and includes a thread engaged with said screw.

5. A stern drive unit in accordance with claim **4** and further including a pair of pillow blocks adapted to be fixed to the boat hull, and a pivotal connection between said arm and said pillow blocks.

6. A stern drive unit in accordance with claim **4** wherein said member includes an axial bore and said thread is arranged internally of said bore, and said element extends into said bore and said screw is formed externally on said element.

7. A stern drive unit in accordance with claim **4** wherein said means for selectively tilting the forward end of said engine further includes a reversible drive motor mounted on said arm, and gearing connecting said member and said drive motor to afford rotation of said member in response to drive motor operation.

8. A stern drive unit in accordance with claim 7 wherein said arm has connected thereto a housing rotatably supporting said member and including an opening through which said element extends and an expansible boot connected to said housing around said opening and to the upper part of said element and encircling the portion of said element below said upper part and between said upper part and said housing.

9. A stern drive unit in accordance with claim 3 including an elastomeric connection between said element and said engine.

10. A stern drive unit in accordance with claim 4 including a pair of mounting brackets adapted to be fixed to the boat hull and a pivotal connection between said mounting brackets and said arm.

11. A stern drive unit [in accordance with claim 1 and further including] *comprising an engine, a stern drive leg fixed to said engine and including a part which is tiltable vertically and swingable horizontally independently of said engine, means adapted for mounting said stern drive unit on a boat hull including means connected to the front of said engine for selectively vertically tilting the forward end of said engine relative to the boat hull, and* means for sensing the position of the forward end of said engine, and means connected to said engine position sensing means *and located remotely from said engine* for displaying the position of said engine to the operator of the boat.

12. A stern drive unit in accordance with claim 11 wherein said means for selectively tilting the forward end of said engine includes an element connected to said engine so as to permit pivotal movement between said engine and said element about a lateral axis and to prevent rotation of said element about an axis perpendicular to said lateral axis, and a member adapted to be pivotally and rotatably mounted relative to the boat hull, and a threaded connection between said element and said member.

13. A stern drive unit in accordance with claim 12 wherein said means for sensing the position of said engine includes a potentiometer having a displaceable wiper and means for mechanically connecting said wiper to said member for positioning said wiper in response to rotation of said member.

14. A stern drive unit in accordance with claim 13 wherein said wiper is rotatably mounted, and wherein said means mechanically connecting said wiper and said member comprises a gear connected to said wiper, and an external thread on said member in mesh with said gear.

15. A stern drive unit in accordance with claim 14 wherein said display means includes an indicating device movably responsive to applied voltage and electrical connections between said indicating device and said potentiometer so as to vary the voltage applied to said indicating device in response to the position of said wiper.

[16. A boat comprising a boat hull, an engine, a stern drive leg fixed to said engine and including a part which is tiltable vertically and swingable horizontally independently of said engine, and means mounting said stern drive unit on said boat hull including means for selectively vertically displacing the forward end of said engine relative to the rear of said engine.]

17. A boat [in accordance with claim 16 wherein said means mounting said stern drive unit on said boat hull includes] *comprising a boat hull, an engine, a stern drive leg fixed to said engine and including a part which is tiltable vertically and swingable horizontally relative to said engine, and means mounting said stern drive unit on said boat hull including* elastomeric mounting means connected to said stern drive unit rearwardly of the front of said engine and to said boat hull, said elastomeric mounting means providing a pivotal axis relative to which the forward end of said engine is movable, *and means connected to the front of said engine for selectively vertically displacing the forward end of said engine relative to the rear of said engine independently of vertical tilting of said part of said stern drive leg relative to said engine.*

18. A boat in accordance with claim 17 wherein said elastomeric mounting means is connected between the rear of said engine and said boat hull.

19. A boat in accordance with claim 17 wherein said means for selectively displacing the forward end of said engine includes an element connected to said engine and a member connected to said boat hull, and means selectively extensibly connecting said element and said member.

20. A boat in accordance with claim 19 wherein said element is connected to said engine so as to permit pivotal movement of said element relative to said engine about a lateral axis transverse of said engine and to prevent rotation of said element about an axis transverse to said lateral axis, wherein said element comprises a screw, and wherein said member is rotatably mounted and includes a thread engaged with said screw.

21. A boat in accordance with claim 20 wherein said member includes an axial bore and said thread is arranged internally of said bore, and said element extends into said bore and said screw is formed externally on said element.

22. A boat in accordance with claim 20 wherein said means for selectively displacing the forward end of said engine further includes a reversible drive motor and gearing connecting said member and said drive motor to afford rotation of said member in response to drive motor operation.

23. A boat in accordance with claim 22 including a housing rotatably supporting said member and including an opening through which said element extends and an expansible boot connected to said housing around said opening and to the upper part of said element and encircling the portion of said element below said upper part and between said upper part and said housing.

24. A boat in accordance with claim 19 including an elastomeric connection between said element and said engine.

25. A boat in accordance with claim 19 including a pivotal connection between said boat hull and said member.

26. A boat [in accordance with claim 16 and further including] *comprising a boat hull, an engine, a stern drive leg fixed to said engine and including a part which is tiltable vertically and swingable horizontally independently of said engine, means mounting said stern drive unit on said boat hull including means connected to the front of said engine for selectively vertically displacing the forward end of said engine relative to the rear of said engine, and* means for sensing and for *remotely* displaying the position of said engine to the operator of the boat.

27. A boat in accordance with claim 26 wherein said means for selectively displacing the forward end of said engine includes an element connected to said engine so

is to permit pivotal movement between said engine and said element about a lateral axis and to prevent rotation of said element about an axis perpendicular to said lateral axis, a member pivotally and rotatably mounted relative to said boat hull, and a threaded connection between said element and said member.

28. A boat in accordance with claim **27** wherein said means for sensing the position of said engine includes a potentiometer having a displaceable wiper, and means for mechanically connecting said wiper to said member for positioning said wiper in response to rotation of said member.

29. A boat in accordance with claim **28** wherein said wiper is rotatably mounted, and wherein said means mechanically connecting said wiper and said member [comprising] *comprises* a gear connected to said wiper, and an external thread on said member in mesh with said gear.

30. A boat in accordance with claim **29** wherein said displaying means includes an indicator device movably responsive to a voltage applied thereto and electrical connections between said indicator device and said potentiometer so as to vary the voltage applied to said indicator device in response to the position of said wiper.

31. A boat in accordance with claim **26** including means for self-calibrating said means for sensing and displaying the engine position.

32. A boat in accordance with claim **31** wherein said means for selectively displacing the forward end of said engine includes an element connected to said engine so as to permit pivotal movement between said engine and said element about a lateral axis and to prevent rotation of said element about an axis perpendicular to said lateral axis, a member pivotally and rotatably mounted relative to said boat hull, and a threaded connection between said element and said member to afford movement of said element in response to member rotation between spaced positions at the respective ends of the travel of said element, wherein said means for sensing the position of said engine includes a potentiometer having a displaceable wiper, and means for mechanically connecting said wiper to said member for positioning said wiper in response to rotation of said member, and wherein said self-calibrating means includes means engageable by said wiper for limiting the range of movement of said wiper and means for providing lost motion between said wiper and said member in the event that said wiper movement limiting means is engaged by said wiper and said element is spaced from both of said spaced positions.

33. A marine propulsion device including a first part adapted to be fixedly mounted on a hull of a boat, a second part connected to said first part for angular movement relative to said first part in a vertical path and including a member rotatably movable relative to said first part in accordance with the angular movement of said second part relative to said first part, said member including thereon an external thread, and means connected to said second part and operable in response to movement of said second part along said path for remotely indicating the angular location of said second part relative to said first part, said means for remotely indicating the angular location of said second part relative to said first part including a potentiometer having a rotatably mounted wiper, a gear connected to said wiper for common rotation and in mesh with said external thread on said member for positioning said wiper in response to rotation of said member, and means connected to said potentiometer for displaying the position of said second part relative to said first part to the operator of the boat.

34. A marine propulsion device in accordance with claim 33 wherein said means for displaying includes an indicating device movable responsive to applied voltage and electrical connections between said indicating device and said potentiometer so as to vary the voltage supply to said indicating device in response to the position of said wiper.

35. A marine propulsion device in accordance with claim 33 and including means for self-calibrating said means for remotely indicating the position of said second part relative to said first part.

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