Aug. 24, 1965 J. F. MORSE 3,202,125

STEERING ASSEMBLY FOR OUTDRIVE MARINE PROPULSION UNITS

Filed April 2, 1964 5 Sheets-Sheet 1

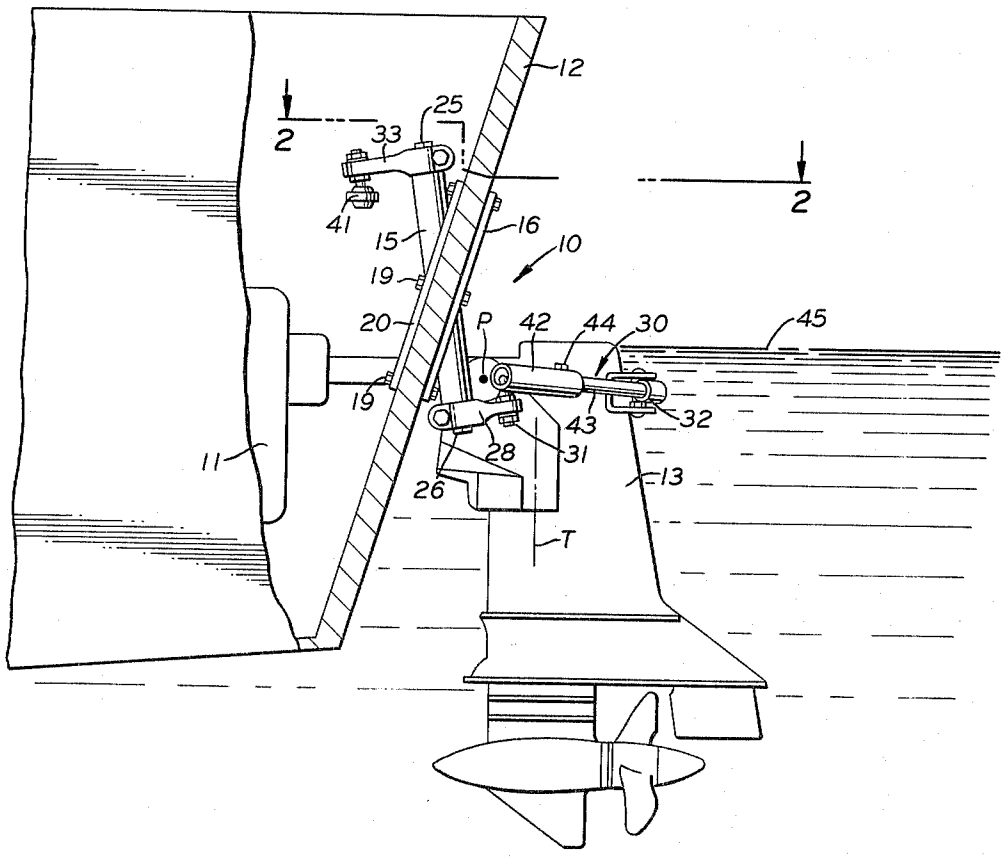


FIG. 1

INVENTOR.
JOHN F. MORSE
BY Hamilton & Cook
ATTORNEYS.

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STEERING ASSEMBLY FOR OUTDRIVE MARINE PROPULSION UNITS

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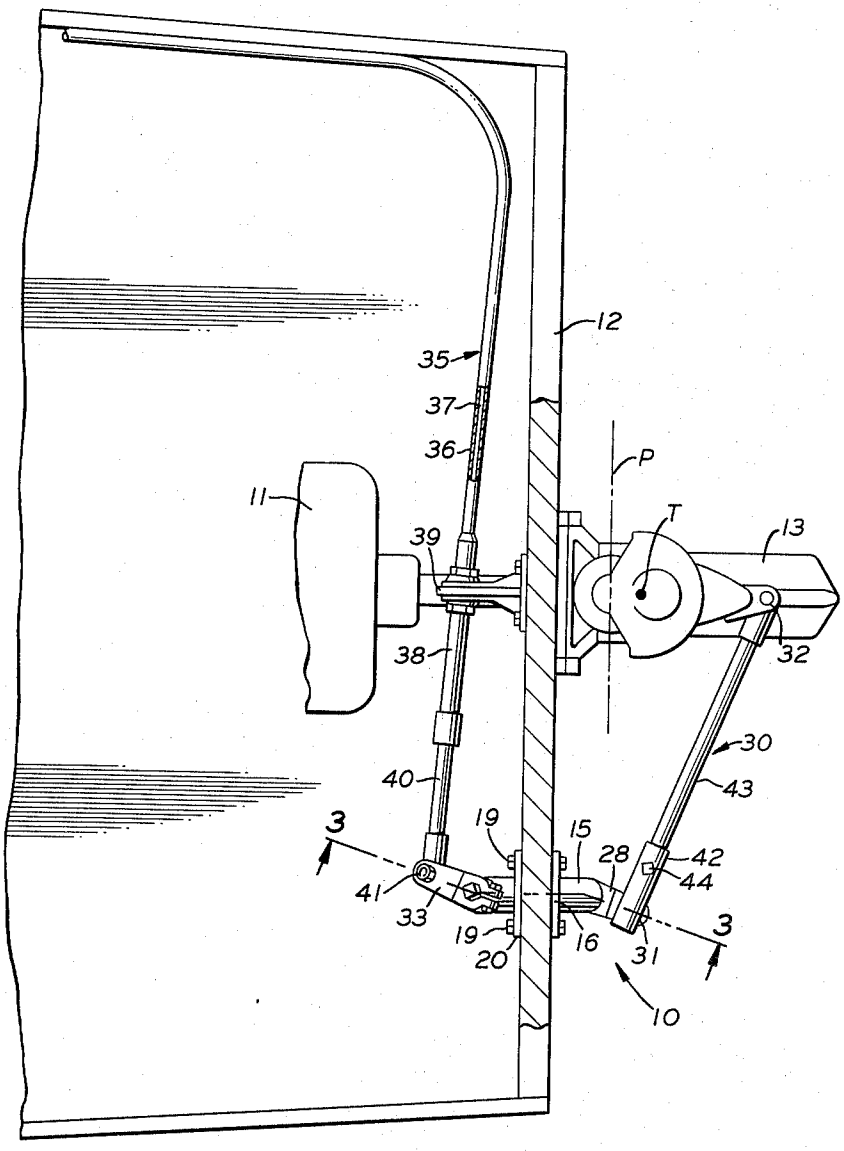


FIG. 2

INVENTOR.
JOHN F. MORSE
BY Hamilton & Cook
ATTORNEYS.

Aug. 24, 1965 J. F. MORSE 3,202,125

STEERING ASSEMBLY FOR OUTDRIVE MARINE PROPULSION UNITS

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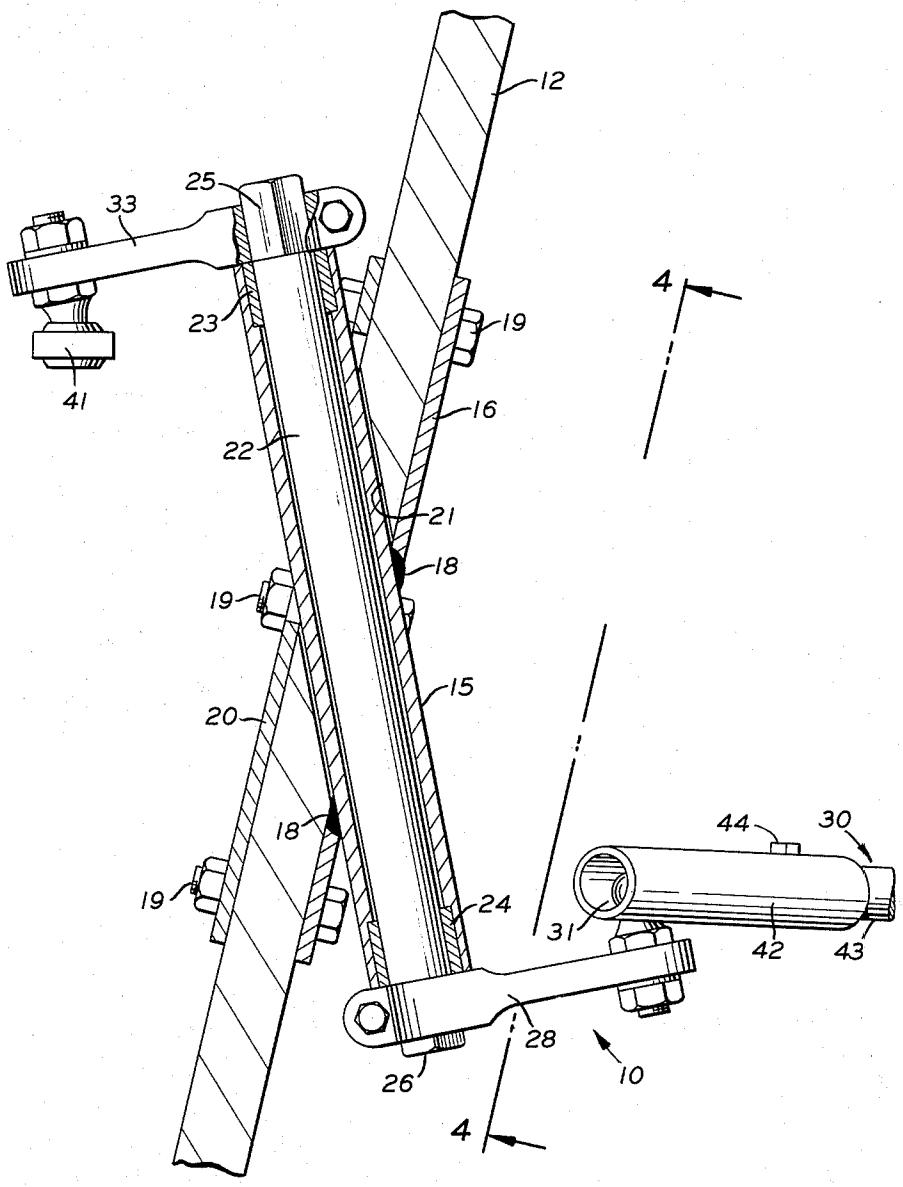


FIG. 3

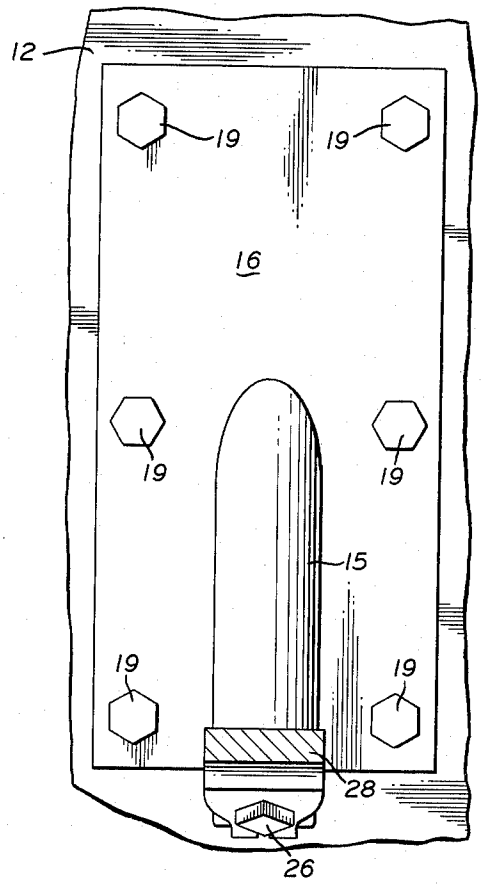
INVENTOR.
JOHN F. MORSE
BY Hamilton & Cook
ATTORNEYS.

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STEERING ASSEMBLY FOR OUTDRIVE MARINE PROPULSION UNITS

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FIG. 4



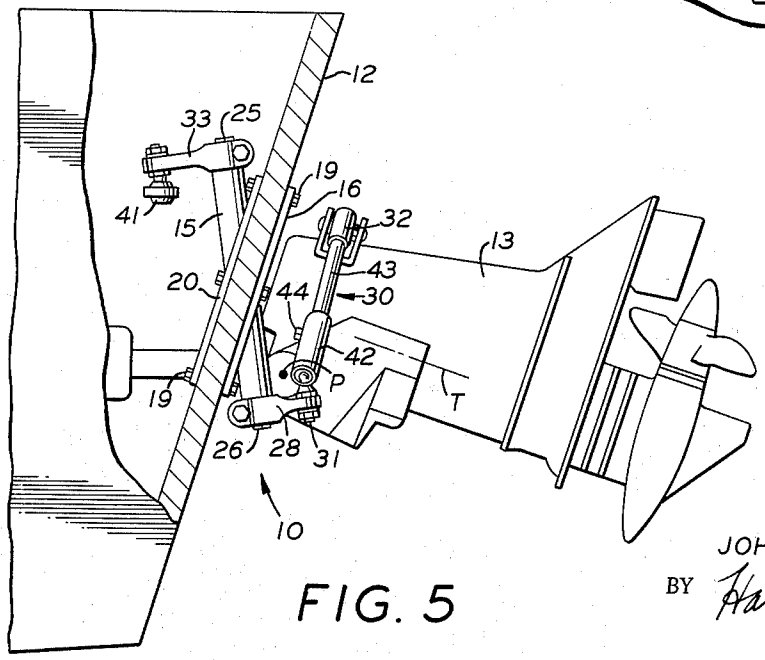


FIG. 5

INVENTOR.
JOHN F. MORSE
BY Hamilton & Cook
ATTORNEYS.

Aug. 24, 1965 J. F. MORSE 3,202,125

STEERING ASSEMBLY FOR OUTDRIVE MARINE PROPULSION UNITS

Filed April 2, 1964 5 Sheets-Sheet 5

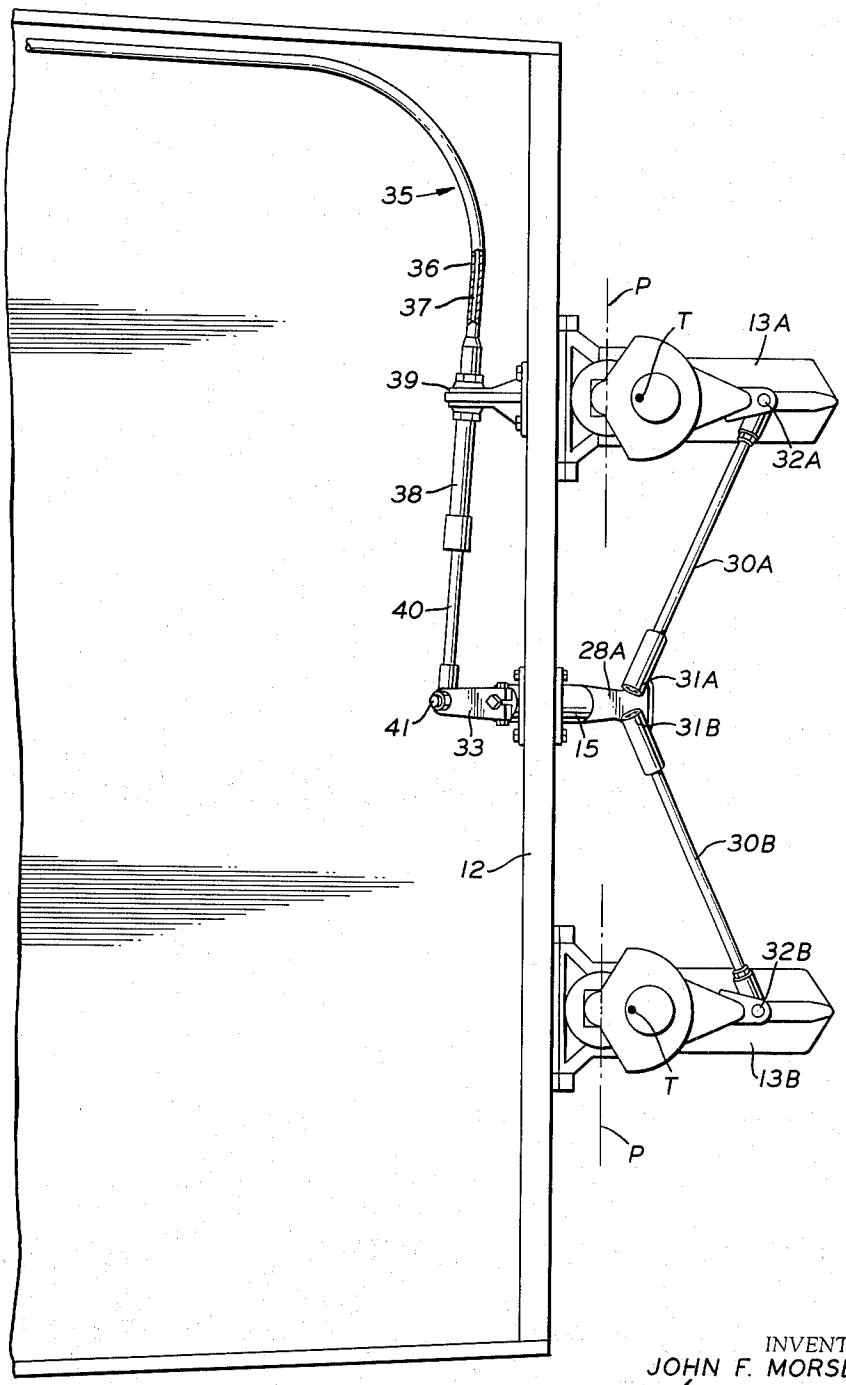


FIG. 6

INVENTOR.
JOHN F. MORSE
BY Hamilton & Cook
ATTORNEYS.

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3,202,125

STEERING ASSEMBLY FOR OUTDRIVE MARINE PROPULSION UNITS

John F. Morse, 21 Clinton St., Hudson, Ohio

Filed Apr. 2, 1964, Ser. No. 356,766
7 Claims. (Cl. 115—35)

The present invention relates generally to steering assemblies. More particularly, the present invention relates to an apparatus and system for steering a marine propulsion unit. Specifically, the present invention relates to an apparatus and system for steering the drive assembly of an inboard-outboard propulsion system.

Marine propulsion units utilizing an inboard engine which transmits its power through the transom of the boat to a drive assembly mounted exteriorly of the transom are generally referred to as "Outdrive" marine propulsion units.

Outdrive marine propulsion units are highly favored because they incorporate the advantageous features of both the inboard and outboard propulsion systems. Specifically, the Outdrive unit utilizes the inboard engine which may be larger and heavier and produce higher horsepower. At the same time the steering can be accomplished by controllably directing the thrust of the propeller, thus eliminating the need for a rudder, as used with inboard units. Moreover, the dependingly mounted drive assembly of the Outdrive unit tilts up when it strikes an underwater obstruction, thus incorporating one of the best features of the outboard and eliminating the rigidity of the rudder and propeller assembly used with inboard units. However, even with all these advantages there are problems, and the main problem of the Outdrive unit is the steering. The drive assembly of the larger Outdrive units is swingable approximately 90° about a vertical turning axis—i.e., 45° on each side of dead center—and is rockable from its vertical driving position to a nearly horizontal position about a horizontal tiltup axis. To date, several different steering arrangements have been employed which allow for the various turning and tilting actions of the drive assembly.

One arrangement mounts a straight tiller arm longitudinally through the transom directly above the drive assembly on a ball and socket. The rearward end of the tiller arm is connected to the top of the drive assembly and comprises either telescopic sections or a linkage arrangement to accommodate tilting of the drive assembly. The fore end of such a tiller arm, which extends forwardly of the transom, is connected to an appropriate steering power transmission means by which the tiller can be horizontally swung to turn the drive assembly. Another arrangement offsets the tiller arm so that it does not lie vertically above the drive assembly and then connects the rearward end of the tiller arm to the drive assembly by a connecting rod which extends generally transversely the longitudinal axis of the boat.

Because the drive assembly of Outdrive units is almost completely beneath the water line, the tiller arm pierces the transom in the vicinity of the water line. To seal the boat at this point one end of a flexible boot is attached to the tiller arm rearwardly of the transom. The boot extends forwardly and the other end is attached to the transom so as to surround the pivotal arrangement where the tiller passes through the transom. This construction works quite satisfactorily until natural wear and deterioration result in a leak in the boot. The boat will then take on water, sometimes in sufficient quantities to sink the boat.

It is therefore the primary object of the present invention to provide an improved mechanical steering connection between the drive assembly of an Outdrive unit and a steering force transmission means.

It is another object to provide a steering assembly, as above, which will not ship water.

It is still another object of the present invention to provide a steering assembly, as above, which, while it does pierce the transom, requires no complicated packings or seals to prevent shipping of water.

It is a further object of the present invention to provide a steering assembly, as above, which will permit enclosure of the push-pull cable, or other steering force transmission means, completely within the hull of the boat where it can best be protected from mechanical damage and corrosive action.

It is a still further object of the present invention to provide a steering assembly, as above, which does not physically interfere with either the inboard engine or the exteriorly mounted drive assembly of an Outdrive unit through the full turning and tiltup ranges of the drive assembly, and which, irrespective of the degree at which the drive assembly is turned, will not impart any undesired rotation to the steering wheel, as a result of the drive assembly being tilted by unexpected contact with underwater obstructions.

It is a further object of the present invention to provide a steering assembly, as above, which will be as readily applicable to provide steering of twin Outdrive units by a single steering force transmission means as to provide steering of single Outdrive units.

It is a still further object of the present invention to provide a steering assembly, as above, which is economical both to manufacture and maintain and which is constructed of uncomplicated parts to provide long life and freedom from breakdown.

These and other objects which will become apparent from the following specification are accomplished by means hereinafter described and claimed.

One preferred and one alternative embodiment are shown by way of examples in the accompanying drawings and hereinafter described in detail without attempting to show all of the various forms and modifications in which the invention might be embodied; the invention being measured by the appended claims and not by the details of the specification.

In the drawings:

FIG. 1 is a longitudinal section through a boat showing an Outdrive unit and the steering assembly of the subject invention in elevation;

FIG. 2 is a section taken substantially on line 2—2 of FIG. 1 showing the steering assembly in top plan;

FIG. 3 is a section taken substantially on line 3—3 of FIG. 2;

FIG. 4 is a section taken substantially on line 4—4 of FIG. 3 showing the mounting of the steering assembly to the boat transom in elevation;

FIG. 5 is a view similar to FIG. 1 showing the Outdrive in tiltup position; and

FIG. 6 is a top plan view showing the steering assembly of the subject invention operatively connected to a twin Outdrive assembly.

In general, a steering assembly according to the concept of the present invention has a generally vertically oriented quill which pierces, and is affixed to, the transom of the boat on which it is mounted. A steering shaft is housed in the quill for relative rotation with respect thereto. A crank is nonrotatably attached to the lower end of the steering shaft rearwardly and exteriorly of the transom and is pivotally connected to one end of a link bar, the other end of which is pivotally attached to the drive assembly of the Outdrive unit. For best results the con-

nections of each end of the link bar are on substantially the same horizontal level as the tiltup axis of the drive assembly, and the connection of the link rod to the crank arm is in close proximity to a horizontal extension of the tiltup axis.

An upper crank is nonrotatably attached to the upper end of the steering shaft forwardly of the transom interiorly of the boat hull and is attached to the steering force transmission means.

Referring more particularly to the drawings, a steering assembly constructed in accordance with the concept of the present invention is indicated generally by the numeral 10 and is shown attached to an Outdrive unit comprising, an inboard engine 11 which transmits its power through the transom 12 to a dependingly supported drive assembly 13 on the outer, rear side of the transom 12.

The drive assembly has a turning axis, indicated by the letter T and a tiltup axis, indicated by the letter P. The dependingly supported drive assembly and its attachment to the transom 12 are conventional and form no part of the present invention.

The steering assembly 10, which controls the drive assembly 13 through its entire turning range, has a quill 15 which is angularly secured to at least one outer mounting plate 16 in a watertight fashion, as by welding 18. The mounting plate 16 is firmly attached to the wooden transom 12 depicted by a plurality of bolts 19 so that the quill 15 pierces the transom 12 in a generally vertical orientation. In some situations it has been found desirable to apply an inner mounting plate 20 to assure that the outer mounting plate can be secured sufficiently tightly to the transom 12 to prevent the passage of water therepast through the bore 21 by which the quill 15 pierces the transom 12. Of course, an auxiliary sealing material, or gasket, may be utilized behind the mounting plate 16, at the installer's discretion.

It should be apparent that while the quill 15 is disclosed as being a distinct element passing through an existing transom 12, the transom could be molded, or otherwise formed, integrally to incorporate the hollow quill. Furthermore, should the transom be metal, the plate could be welded thereto.

The quill 15, as shown best in FIG. 2, is mounted on the transom 12 in spaced lateral relation with respect to the drive assembly 13 and houses a steering shaft 22. The steering shaft 22 is journaled in the quill 15, as by an upper and lower bearing 23 and 24, respectively. The shaft 22 has an upper end 25 and a lower end 26, both of which extend axially beyond the respective ends of the quill 15.

On the lower end 26 of steering shaft 22 a lower crank arm 28 is nonrotatably mounted. The crank arm 28 extends rearwardly of transom 12 and has one end of the link bar 30 pivotally attached thereto, as by a ball and socket joint 31. The other end of the link bar 30 is pivotally attached to the drive assembly 13 rearwardly of the turning axis T, as by a ball and socket joint 32. As shown, the connection of the link bar 30 to the lower crank arm 28 and the connection of the link bar 30 to the drive assembly 13 are both located substantially in the same horizontal plane as the tiltup axis P. Furthermore, the connection 31 of the link bar 30 with the lower crank arm 28 is preferably located in the vicinity of an extension of the tiltup axis P.

By this particular geometric relationship the pivotal connections 31 and 32 permit the steering assembly to remain dynamically stable through the complete tiltup range of the drive assembly 13 at any given point in the turning range.

Hence, if the drive assembly 13 is unintentionally tilted, as when striking an underwater obstruction, the steering wheel will not be rotated against the helmsman's hands regardless of the position of the drive assembly 13 about the turning axis T.

On the upper end 25 of the steering shaft 22 an upper crank arm 33 is nonrotatably mounted. The upper crank arm 33 should be oriented so as not to interfere with the transom 12 while it is swung to turn the steering shaft 22 and yet be readily accessible for attachment of the steering force transmission means.

As shown, the upper crank arm 33 may be extended forwardly from the transom 12 within the hull of the boat and be pivotally attached, at its outer end to the steering force transmission means. The subject steering assembly 10 is adaptable to be used with any of the known steering force transmission means. For example, one could utilize a tiller rope system—often referred to as the opposed, or balanced, rope transmission system since all movements are effected by application of tensile force. The particular force transmission means disclosed herein comprises a push-pull cable 35 having a casing 36 and a core 37 slidably received therein. The casing 36 is attached to an extension sleeve 38 which is in turn attached to the boat. For example, the extension sleeve 38 may be affixed to the interior side of the transom 12 by a ball and socket joint 39 which prevents longitudinal movement of the sleeve 38 with respect to itself, but permits limited pivoting to retain alignment of the extension sleeve 35 with the outer end of the upper crank arm 33 as the latter is swung.

Extending axially outwardly from the extension sleeve 38 and operatively secured to the core 37 is a rigid ram member 40. The ram 40 is pivotally attached to the outer end of crank arm 33, as at 41, and provides the transmission of the steering force imparted to the cable core 37 by the helmsman, at a remote station, to the crank 33. The reciprocable lineal movement transmitted by the core 37 is converted to rotational movement in the steering shaft 22 by crank 33 and is again reconverted to lineal movement through the lower crank 28 into the link bar 30 which swings the drive assembly 13 controllably about its turning axis T.

It may be found desirable to construct the link bar 30 from an outer sleeve member 42 and a rod member 43 adjustably slidable therein and capable of being locked in selected relative position by a set screw 44. This permits adjusting the steering assembly 10 to the drive assembly 13 for any given boat.

The present invention is as equally adapted to the steering of dual Outdrive units as it is for steering the single Outdrive unit described above.

Referring particularly to FIG. 6, it can be observed that this is accomplished by merely replacing the lower crank arm 28 with a crank arm 28A having an outer end accommodating double balls and sockets, 31A and 31B, to which one end of each of the dual link bars 30A and 30B can be attached. The opposite ends of the link bars 30A and 30B are then pivotally attached to dual drive assemblies 13A and 13B, as at 32A and 32B respectively, rearwardly of the turning axes T. For such an arrangement, of course, the best results are obtained by locating the quill 15 through the transom 12 as closely to a point centrally of the dual drive assemblies 13A and 13B as possible, and by locating the connections of the link bars 30A and 30B in substantially the same horizontal plane as the tiltup axis P with the connection 31B being preferably located in the vicinity of an extension of the tiltup axis P.

Irrespective of whether the subject steering assembly is used in conjunction with a single or a dual Outdrive arrangement, the drive assembly 13, even with the boat at rest, lies almost, if not completely, beneath the surface of the water. In FIG. 1 the surface of the water is designated by the numeral 45, and it is readily apparent that the lower end of the quill 15 remains submerged. However, because of the generally vertically orientation of the quill 15, water will not be shipped therethrough, at least so long as the level of the upper end thereof is not

positioned below the surface of the water. The upper end of the quill should accordingly always be located a spaced distance above the water's surface, the exact dimension being determinable by the installer for any given boat.

By utilizing a steering assembly embodying the concept of the subject invention not only are no packings and other seals required in the quill to prevent shipping water therethrough, but also the Outdrive unit can be effectively and safely steered so that the present invention accomplishes the objects thereof.

What is claimed is:

1. A steering assembly for one or more Outdrive marine propulsion units utilizing at least one drive assembly attached to the transom of a boat and having a turning and tilting axis comprising, a generally vertically oriented quill piercing the transom and fixed thereto, a steering shaft rotatably mounted in said quill with an upper and lower end extending axially outwardly of said quill, a lower crank arm nonrotatably secured to the lower end of said shaft, a link bar for each drive assembly, one end of each said link bar pivotally attached to said lower crank arm, the other end of each said link bar pivotally attached to a drive assembly, an upper crank arm nonrotatably secured to the upper end of said steering shaft, said upper crank arm attached to a steering force transmission means.

2. A steering assembly for one or more Outdrive marine propulsion units utilizing at least one drive assembly attached to the transom of a boat and having a turning and tilting axis comprising, a generally vertically oriented quill piercing the transom and fixed thereto, a steering shaft rotatably mounted in said quill with an upper and lower end extending axially outwardly of said quill, a lower crank arm nonrotatably secured to the lower end of said shaft, a link bar for each drive assembly, one end of each said link bar pivotally attached to said lower crank arm, the other end of each said link bar pivotally attached to a drive assembly rearwardly of said turning axis, the pivotal connection at each end of said link bar lying in substantially the same horizontal plane as the tiltup axis of the drive assembly, an upper crank arm nonrotatably secured to the upper end of said steering shaft, said upper crank arm attached to a steering force transmission means.

3. A steering assembly for one or more Outdrive marine propulsion units utilizing at least one drive assembly attached to the transom of a boat and having a turning and tilting axis comprising, a generally vertically oriented quill piercing the transom and fixed thereto in laterally spaced relation with respect to said drive assembly, a steering shaft rotatably mounted in said quill with an upper and lower end extending axially outwardly of said quill, a lower crank arm nonrotatably secured to the lower end of said shaft and extending rearwardly therefrom, a link bar for each drive assembly, one end of each said link bar pivotally attached to said lower crank arm, the other end of each said link bar pivotally attached to a drive assembly, an upper crank arm nonrotatably secured to the upper end of said steering shaft, said upper crank arm attached to a steering force transmission means.

4. A steering assembly for one or more Outdrive marine propulsion units utilizing at least one drive assembly attached to the transom of a boat and having a turning and tilting axis comprising, a generally vertically oriented quill piercing the transom and fixed thereto in laterally spaced relation with respect to said drive assembly, a steering shaft rotatably mounted in said quill with an upper and lower end extending axially outwardly of said quill, a lower crank arm nonrotatably secured to the lower end of said shaft and extending rearwardly therefrom, a link bar for each drive assembly, one end of each said link bar pivotally attached to said

lower crank arm, the other end of each said link bar pivotally attached to a drive assembly rearwardly of said turning axis, the pivotal connection at each end of said link bar lying in substantially the same horizontal plane as the tiltup axis of the drive assembly, an upper crank arm nonrotatably secured to the upper end of said steering shaft, said upper crank arm attached to a steering force transmission means.

5. A steering assembly for an Outdrive marine propulsion unit utilizing a drive assembly attached to the transom of a boat and having a turning and tilting axis comprising, a quill, a mounting plate attached medially of said quill and in angular relation with respect thereto, said mounting plate adapted to be mounted on the transom of a boat with the quill piercing the transom generally vertically and in lateral spaced relation with respect to said drive assembly, a steering shaft journaled in said quill having upper and lower ends extending axially outwardly of said quill, said upper end lying forwardly of said transom and said lower end lying rearwardly of said transom, a lower crank arm nonrotatably attached to the lower end of said steering shaft and extending rearwardly therefrom, a link bar, one end of said link bar pivotally attached to said crank arm on substantially the same horizontal plane as the tiltup axis of said drive assembly, the other end of said link bar pivotally attached to said drive assembly rearwardly of the turning axis of said drive assembly and on substantially the same plane as the tiltup axis of said drive assembly, an upper crank arm nonrotatably attached to the upper end of said steering shaft, said upper crank arm attached to a steering force transmission means.

6. A steering assembly for an Outdrive marine propulsion unit utilizing a drive assembly attached to the transom of a boat and having a turning and tilting axis comprising, a quill, a mounting plate attached medially of said quill and in angular relation with respect thereto, said mounting plate adapted to be mounted on the transom of a boat with the quill piercing the transom generally vertically and in lateral spaced relation with respect to said drive assembly, a steering shaft journaled in said quill having upper and lower ends extending axially outwardly of said quill, said upper end lying forwardly of said transom and said lower end lying rearwardly of said transom, a lower crank arm nonrotatably attached to the lower end of said steering shaft and extending rearwardly therefrom, a link bar, one end of said link bar pivotally attached to said crank arm on substantially the same horizontal plane as the tiltup axis of said drive assembly, the other end of said link bar pivotally attached to said drive assembly rearwardly of the turning axis of said drive assembly and on substantially the same plane as the tiltup axis of said drive assembly, an upper crank arm nonrotatably attached to the upper end of said steering shaft, a push-pull cable for transmitting steering forces, said push-pull cable having a casing and a core reciprocable therein, a connector asembly, said connector assembly having a guiding member and a rigid ram member, said guiding member attached to said casing and mounted on the boat, said rigid ram member telescopically reciprocable in said guiding member, one end of said ram member attached to said core to be operably reciprocable thereby, the other end of said ram member pivotally attached to said upper crank arm.

7. A steering assembly for dual Outdrive marine propulsion units, each of which utilizes a drive assembly attached to the transom of a boat in laterally spaced apart relation and each of which has a turning and tilting axis, said tilting axes being generally aligned, comprising, a generally vertical by oriented quill piercing the transom medially the dual drive assemblies and attached to the transom, a steering shaft rotatably journaled in said quill and having upper and lower ends extending axially outwardly of said quill, a lower crank arm nonrotatably attached to the lower end of said steering shaft and ex-

tending rearwardly therefrom, a pair of link bars, one end of each link bar pivotally attached to said lower crank arm on substantially the same horizontal plane as the tiltup axes of said drive assemblies, the other end of each said link bar being attached to its respective drive assembly rearwardly of its turning axis and in substantially the same horizontal plane as the tiltup axes of said drive assemblies, an upper crank arm nonrotatably attached to the upper end of said steering shaft, a steering force transmission means operatively attached to said upper crank arm.

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MILTON BUCHLER, *Primary Examiner.*

FERGUS S. MIDDLETON, *Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,202,125 August 24, 1965

John F. Morse

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 70, for "vertical by" read -- vertically --.

Signed and sealed this 31st day of May 1966.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents