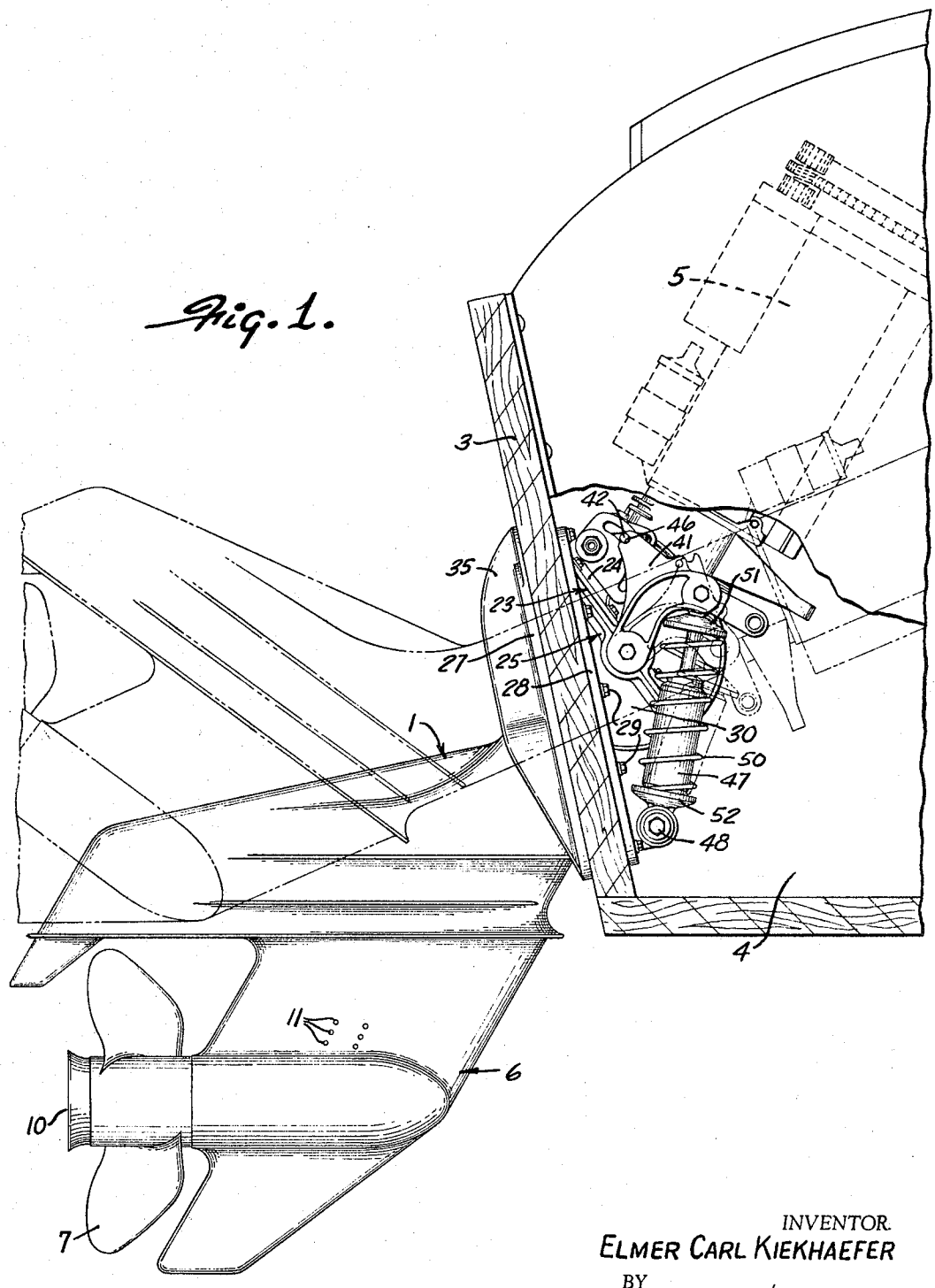
May 14, 1968 E. C. KIEKHAEFER 3,382,839

THROUGH TRANSOM MOUNTED DRIVE UNIT FOR WATERCRAFT

Filed Feb. 16, 1965 5 Sheets-Sheet 1

Fig. 1.



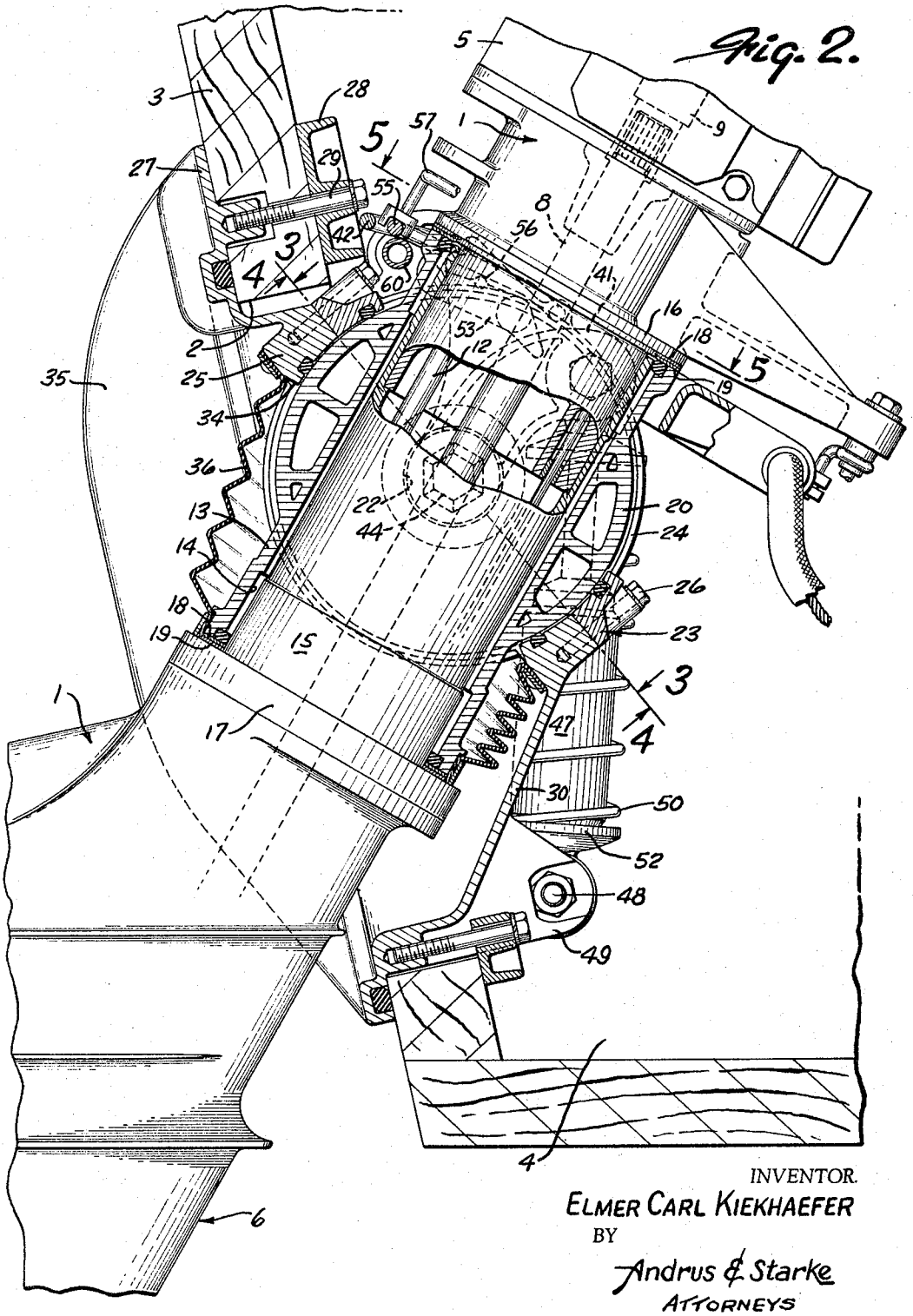
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THROUGH TRANSOM MOUNTED DRIVE UNIT FOR WATERCRAFT

Filed Feb. 16, 1965 5 Sheets-Sheet 2

Fig. 2.



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THROUGH TRANSOM MOUNTED DRIVE UNIT FOR WATERCRAFT

Filed Feb. 16, 1965 5 Sheets-Sheet 3

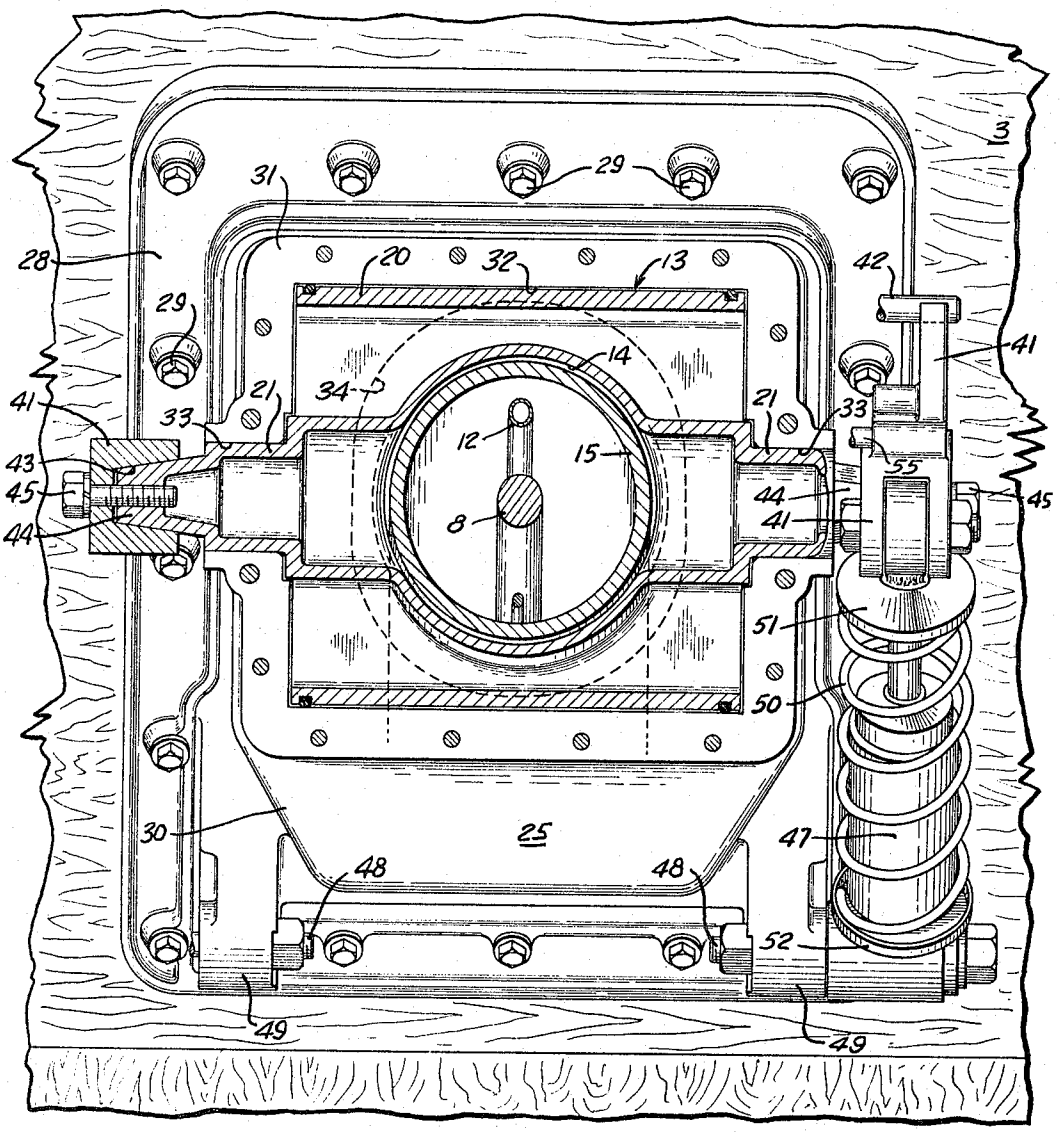


Fig. 3.

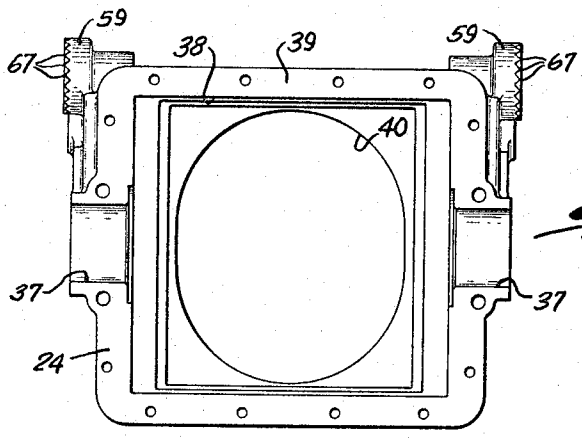


Fig. 4.

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THROUGH TRANSOM MOUNTED DRIVE UNIT FOR WATERCRAFT

Filed Feb. 16, 1965 5 Sheets-Sheet 4

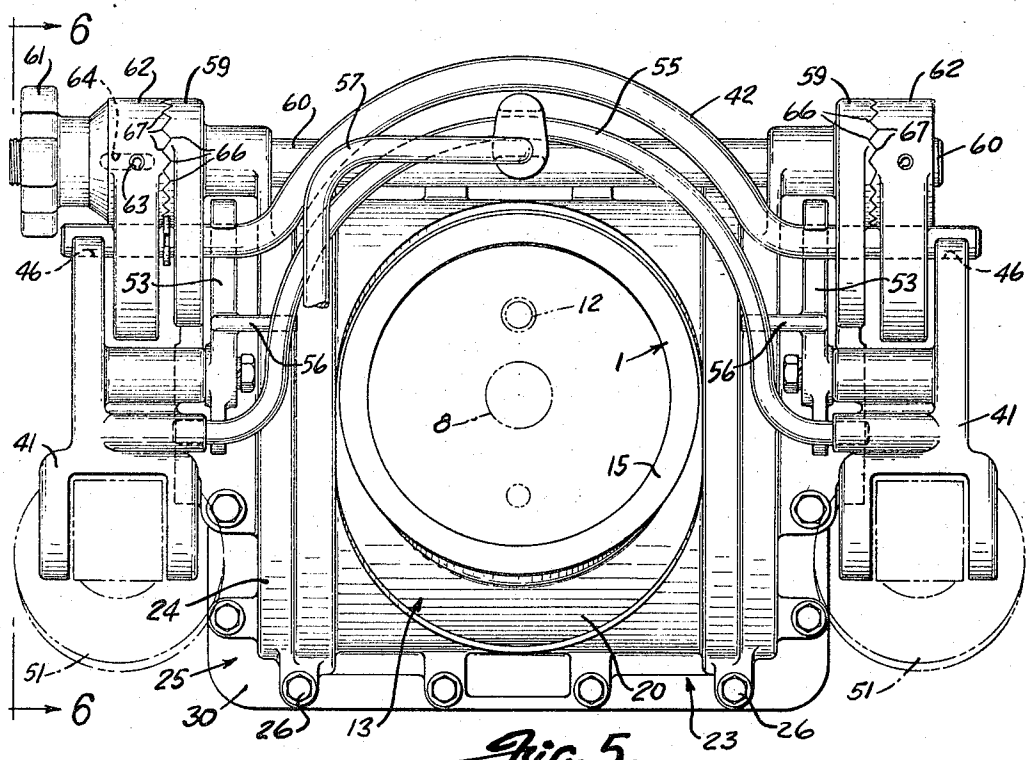


Fig. 5.

Fig. 6.

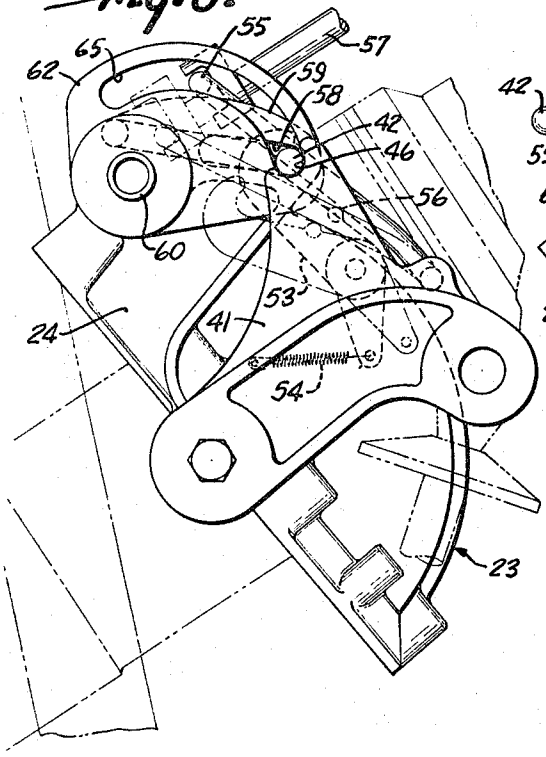
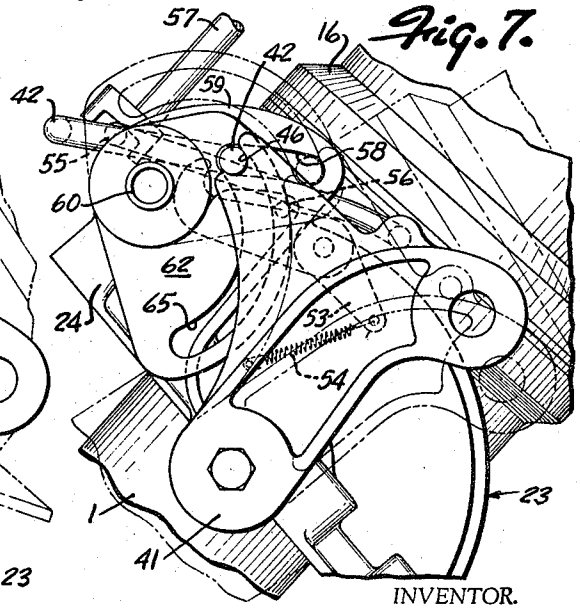


Fig. 7.



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THROUGH TRANSOM MOUNTED DRIVE UNIT FOR WATERCRAFT

Filed Feb. 16, 1965 5 Sheets-Sheet 5

Fig. 9.

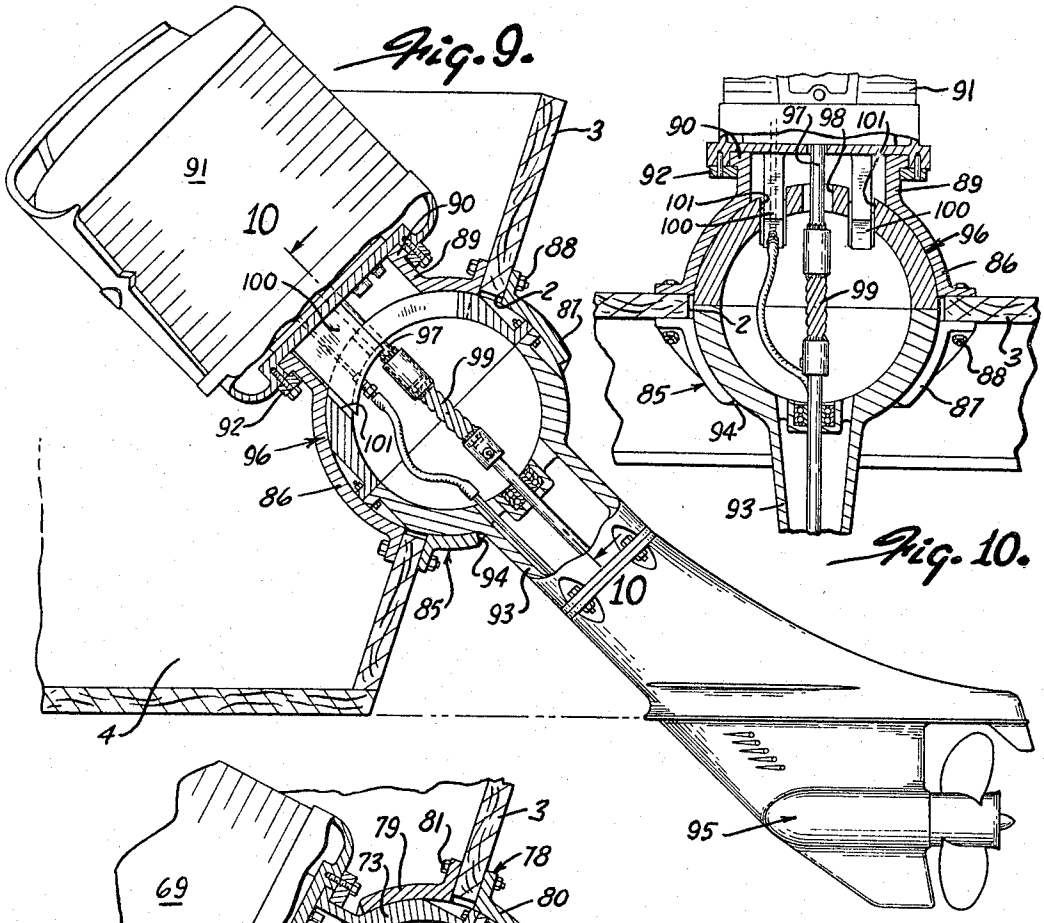
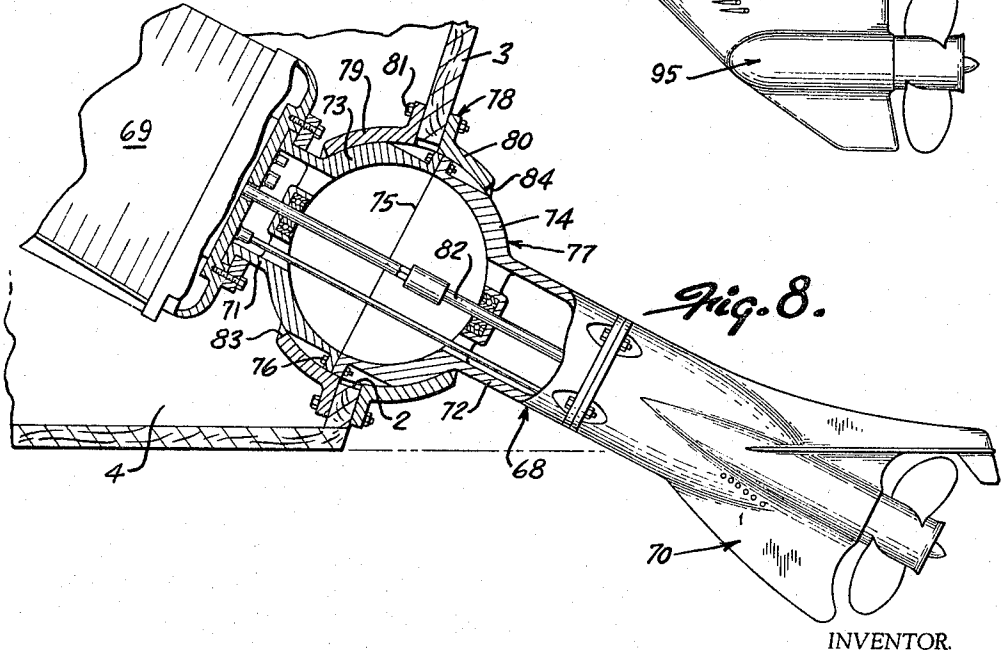


Fig. 10.

Fig. 8.



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United States Patent Office 3,382,839 Patented May 14, 1968

3,382,839

THROUGH TRANSOM MOUNTED DRIVE UNIT FOR WATERCRAFT

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Filed Feb. 16, 1965, Ser. No. 433,089
9 Claims. (Cl. 115—41)

ABSTRACT OF THE DISCLOSURE

A drive unit in which the engine is rigidly connected through an opening in the transom of a boat to the propeller unit. The drive unit is pivoted on horizontal trunnions for tilting movement and is rotatably supported by an intermediate member for steering. Adjustable abutment means between the drive unit and the transom establishes the trim of the boat.

This invention relates generally to marine propulsion drive means and more particularly to a through transom mounted drive unit.

It is generally an object of this invention to provide a through transom suspension for a drive unit providing for steering movement of the unit in a generally horizontal plane about a generally vertical axis and for tilt movement in a generally vertical plane about a generally transverse horizontal axis.

Briefly, the invention contemplates a drive unit which extends through an opening in the transom and has a power source disposed inboard of the watercraft and a propeller unit disposed outboard. The suspension providing for steering and tilt movement of the drive unit includes a universal bearing assembly interposed between the unit and the transom.

Generally, according to one aspect of the invention, the drive unit includes a cylindrical drive shaft housing which is rotatably mounted within a generally vertically disposed sleeve to provide for steering movement of the unit. The sleeve in turn is formed integrally with a trunnion structure including opposed trunnions extending normal to the sleeve. Transom support means aligned with an opening in the transom of the watercraft forms a transversely extending bearing assembly adapted to journally receive the opposed trunnions and provide for tilt movement of the drive unit. Adjustable abutment means are interposed between the drive unit and the transom to establish the operating trim of the unit.

The drawings furnished herewith illustrate the best mode for carrying out the invention as presently contemplated and set forth hereinafter.

In the drawings:

FIGURE 1 is an elevational view with the watercraft broken away and sectioned to show the drive unit mounting of this invention;

FIG. 2 is an enlarged partial elevational view partially in section of the drive unit mounting;

FIG. 3 is an enlarged perspective view taken generally on line 3—3 of FIG. 2 and with parts broken away and sectioned;

FIG. 4 is a view taken generally on line 4—4 of FIG. 2;

FIG. 5 is an enlarged view taken generally on line 5—5 of FIG. 2;

FIG. 6 is an enlarged view taken generally on line 6—6 of FIG. 5 showing the reverse latch hook in engagement with the tilt adjustment rod for reverse drive operation of the unit and in phantom lines showing the latch

hook disengaged from the tilt adjustment rod as for forward drive operation of the unit;

FIG. 7 is a view generally similar to FIG. 6 and shows the adjusting means for the tilt adjustment rod with the latter in one of its extreme positions and in phantom shows the rod in its other extreme position;

FIG. 8 is an elevational view with parts broken away and sectioned and shows another embodiment of the invention;

FIG. 9 is an elevational view with parts broken away and sectioned and shows still another embodiment of the invention; and

FIG. 10 is a sectional view taken generally on line 10—10 of FIG. 9.

Referring to the drawings, the through transom mounted drive unit includes a drive shaft housing 1 which extends through the opening 2 in the transom 3 of the partially shown watercraft 4. The drive shaft housing 1 carries a power source or engine 5 at the upper inboard end thereof and a propeller unit 6 at the lower outboard end thereof.

The propeller 7 is carried on a generally horizontal propeller shaft, not shown, which is selectively rotatable in opposed directions to rotate the propeller correspondingly and thereby provide for forward and reverse propulsion of the watercraft. Suitable gearing, not shown, drivingly connect the propeller shaft to the drive shaft 8 which extends through the drive shaft housing 1 and is in turn drivingly connected to the shaft 9 of engine 5.

The exhaust products from engine combustion are conducted in the usual manner from engine 5 through the generally hollow drive shaft housing 1 to the propeller unit 6 for discharge under water through the discharge opening 10 rearwardly of the propeller. The cooling water for engine 5 is picked up through the inlets 11 in the lower unit 6 and is conducted to the engine through conduit 12 extending generally vertically within the drive shaft housing.

The through transom drive unit is universally mounted within the transom opening 2 to provide for tilt movement of the unit in a generally vertical plane about a generally transverse horizontal axis and steering movement in a generally horizontal plane about a generally vertical axis.

The mounting or suspension for the drive unit includes the intermediate member 13 provided with a stepped generally vertically extending cylindrical bore 14 which constitutes a swivel bearing and is adapted to rotatably receive the cylindrical portion 15 of the drive shaft housing 1 to provide for steering movement of the drive unit within the intermediate member. The intermediate member 13 extends between the upper and lower radially extending annular flanges 16 and 17, respectively, on drive shaft housing 1 and a pair of thrust washers 18 and 19 are disposed between the respective flanges and the corresponding ends of the intermediate member.

The intermediate member 13 includes the transversely extending cylindrical portion 20 which extends generally equidistantly to either side of the drive shaft housing portion 15, and aligned trunnions 21 are provided on the ends thereof. The trunnions 21 are disposed in the transversely spaced and aligned bearings 22 on the tilt axis to rotatably support the drive unit and provide for tilt movement of the unit in a generally vertical plane.

The intermediate member 13 along with the drive unit are supported within a plate assembly 23 comprising complementary opposed upper and lower plate members 24 and 25 which are secured together by a plurality of bolts 26.

Lower plate member 25 of plate assembly 23 includes the peripheral flange portion 27 adapted to engage with

the outboard side of transom 3 adjacent to the opening 2. A transom plate member 28 having a configuration corresponding generally to that of flange portion 27 of plate member 25 is disposed inboard of the watercraft 4 adjacent to opening 2 and a plurality of bolts 29 secure the plate members 25 and 28 together to sandwich the transom 3 therebetween and rigidly mount the plate member 25 in place.

Intermediate the flange portion 27 the plate member 25 includes an inwardly projecting portion 30 which extends through the transom opening 2 and terminates with a generally rectangular parting surface 31 in a transverse plane disposed angularly relative to the generally vertical transom 3. From parting surface 31, a transversely extending semi-cylindrical cavity 32 is formed in portion 30 of plate member 25 and is adapted to receive the cylindrical portion 20 of the intermediate member 13. The trunnions 21 on member 13 are rotatably disposed in the transversely spaced and aligned semi-cylindrical cavities 33 provided in the transversely spaced walls of plate member portion 30 to form the lower portions of bearings 22. In assembled relation, the lower portion of the intermediate member 13 along with the drive unit extend outboard through the opening 34 of plate member portion 30 and between the spaced outboard strengthening ribs 35 extending rearwardly from plate member 25. The opening 34 is oval in shape being elongated in the vertical plane containing the drive shaft axis to permit trim adjustment of the drive unit and accommodate tilt movement of the unit. A generally annular flexible bellows member 36 may be secured to the outboard side of plate member portion 30 around opening 34 and extend downwardly therefrom for connection at the lower extreme end of intermediate member 13 to afford protection for the tilt and swivel bearings against water and and other foreign matter.

The upper cover plate member 24 of the plate assembly 23 includes the transversely spaced and aligned semi-cylindrical bearing cavities 37 and intermediate semi-cylindrical cavity 38 which respectively complement the cavities 33 and 32 of plate member 25 to rotatably confine the intermediate member 13 in the assembled relation of the plate members. The parting surface 39 on cover plate member 24 engages with the complementary surface 31 on plate member 25 to receive the bolts 26 for assembly. In assembled relation, the upper portion of the intermediate member 13 along with the drive unit extend inboard through the plate member oval-shaped opening 40 opposite from opening 34 in plate member 25 to provide for trim adjustment and tilt movements.

For a relatively common 12° transom angle relative to the vertical, the through transom mounting of necessity requires the drive unit to be inclined at a substantial forward rake which is desirable for its weedless characteristics and for ease of tilting upon striking submerged or floating objects. The trim or rake angle of the drive unit is established by engagement between the pair of transversely spaced arms 41 associated with the drive unit and the tilt adjustment rod or abutment means 42 associated with the transom 3 as will be further described hereinafter.

The arms 41 disposed on opposite sides of the drive unit are provided with inwardly facing transverse recess openings 43 at the lower ends thereof which complement and engage the tapered hexagonal transverse extensions 44 on the intermediate member trunnions 21 outwardly of bearings 22 to rotationally lock the arms relative to the drive unit. The arms 41 are further secured against axial displacement relative to the extensions 44 by the threaded members 45 which extend through the arms and thread into the corresponding trunnion extensions. Thus, the arms 41 at all times move correspondingly with the drive unit about the tilt axis.

During forward drive operation of the unit each arm 41 is biased rearwardly by the propeller thrust to normally maintain the notch 46 in the arm in abutting engagement with the tilt adjustment rod 42 to thereby establish the operating trim of the drive unit. However, upon striking a submerged or floating object, the drive unit is free to pivot rearwardly to clear the object from beneath the unit.

The momentum imparted to the drive unit upon striking an object is at least in part cushioned by contraction of the normally extended shock absorbers 47 having one end thereof pivotally secured to the corresponding movable arms 41 and the other end thereof pivotally secured to the rod 48 carried by the inwardly extending projections 49 on fixed plate member 25. The shock absorbers 47 may further serve to limit the angular tilt movement of the drive unit. The compression springs 50 surround the shock absorbers 47 and have their opposed ends disposed in the spaced cups 51 and 52 respectively carried by the relatively movable parts of the shock absorbers. The springs 50 serve to again extend the contracted shock absorbers 47 to thereby prevent a sticking of the drive unit in the fully tilted position and assure immediate return of the unit to the operating trim position.

During reverse drive operation of the drive unit, the arms 41 along with the drive unit are locked relative to the tilt adjustment rod 42 as generally shown in FIGS. 5 and 6 to prevent the reverse thrust of the propeller 7 from merely moving the unit angularly about its tilt axis and out of the water. The locking is effected by a reverse latch hook 53 pivotally mounted on arms 41 and adapted to engage on the opposite side of rod 42 from the abutting engagement of arms 41 to secure the rod therebetween. Hooks 53 are biased to the rod engaged position by the tension springs 54 disposed between the respective hooks and the corresponding arms 41.

During forward drive operation of the drive unit, the latch hooks 53 are moved to and maintained in a disengaged position from rod 42 against the bias of springs 54 by the actuating rod 55 which engages with inwardly extending projections 56 on the hooks and extends rearwardly around the drive unit and is pivotally supported by the spaced arms 41. A pivotable lever 57 mounted on the drive unit and operatively connected to the drive unit control means, not shown, is adapted to move the actuating rod 55 to the hook disengaged position and to maintain the rod in that position during forward drive operation of the drive unit. During reverse drive operation of the drive unit, lever 57 is pivoted to an inoperative position to allow springs 54 to effect and maintain engagement of the reverse hooks 53.

Provision is made for varying the operating trim or rake angle of the drive unit within a given range as provided by adjusting movements of the tilt adjustment rod 42. The rod 42 extends around the rearward portion of the drive unit and the opposed transversely extending end portions thereof extend through the transversely spaced and aligned arcuate cam slots 58 in the corresponding stationary cam brackets 59 provided on the upper cover plate 24. The slots 58 are struck on an arc from the tilt axis of the drive unit so that regardless of the position of the rod 42 within the slots, engagement of the rod by the notches 46 in the respective arms 41 is assured.

The transversely spaced stationary cam brackets 59 are provided with axially aligned openings in spaced relation from the slots 58 for support of an axially and pivotally movable through rod 60 one end of which is threaded to receive a tightening knob 61. Outwardly from the cam brackets 59, the through rod 60 carries corresponding adjusting cams 62. The adjusting cam 62 on the end of rod 60 oppositely from the knob 61 is fixedly secured to the rod while the adjusting cam adjacent to the knob is confined against pivotal movement relative to the rod but is movable axially thereon by virtue of the engage-

ment of the pin 63 in the cam with the slot 64 in the rod. Thus, the through rod 60 and the adjusting cams 62 rotate together as a unit.

The transversely spaced adjusting cams 62 are provided with aligned cam slots 65 is spaced relation from the through rod 60 and formed on an increasing radius from the axis of the through rod and in intersecting relation with the cam slots 58 in the adjacent cam brackets 59. The transverse end portions of the tilt adjustment rod 42 extend through the cam slots 65 and, outwardly of the adjusting cams 62, form the abutments for engagement by notches 46 on corresponding arms 41. For a given position of the tilt adjustment rod 42, the knob 61 is threaded tightly onto the rod 60 to draw the radial teeth 66 and 67 on the annular facing surfaces of the adjustment cams 62 and the corresponding cam brackets 59 respectively into meshing engagement to thereby secure the rod 42 in the given position as determined by the intersecting cam slots 58 and 65.

If it is desired to change the position of the tilt adjustment rod 42 to thereby alter the operating trim of the drive unit, the knob 61 is loosened upon the rod 60 permitting limited axial movement of rod 60 and adjusting cams 62 relative to the stationary cam brackets 59 to free the adjusting cams for pivotal movement relative to the cam brackets. After the adjusting cams 61 have been freed to rotate relative to the cam brackets 59, the tilt adjustment rod 42 is free to move to any desired position within the cam slots 58 of the cam brackets as determined by the intersecting cam slots 65 with corresponding rotation of the adjusting cams. With the tilt adjustment rod 42 relocated as desired in slots 58 of cam brackets 59, knob 61 is again tightened onto rod 60 to lock the adjusting cams 62 relative to the corresponding cam brackets to thereby secure rod 42 between the intersecting cam slots 65 and 58.

According to the embodiment of FIG. 8, the drive unit is universally mounted on the transom 3 of watercraft 4 by means of a spherical or ball assembly. The drive unit includes a drive shaft housing 68 which extends through an opening 2 in the transom 3 and carries a power source in the form of an engine enclosed within cowl 69 at the upper inboard end thereof and a propeller unit 70 at the lower outboard end thereof. The drive shaft housing 68 comprises upper and lower housing portions 71 and 72 respectively. The lower end of the upper housing portion 71 terminates with a semi-spherical enlargement 73 which complements the semi-spherical enlargement 74 on the upper end of the lower housing portion 72. The semi-spherical enlargements 73 and 74 of housing portions 71 and 72 respectively are joined on a transverse plane at 75 by means of recessed bolts 76 to provide the drive shaft housing 68 with a spherical or ball enlargement 77.

The spherical or ball enlargement 77 of the drive unit is rotataly mounted within a complementary spherical or ball transom housing assembly or socket 78 comprising inner and outer transom plates 79 and 80 respectively secured together by a plurality of bolts 81. The drive unit is rotatable about the axis of the drive shaft 82 for steering and is tiltable about a transom axis through the center of the spherical assembly in a generally vertical plane as provided for by opposed openings 83 and 84 in plates 79 and 80 respectively.

Referring to the embodiment of FIGS. 9 and 10, the drive unit is supported in the opening 2 of the transom 3 by means of the transom plate assembly 85 which defines a spherical or ball housing and comprises inner and outer transom plates 86 and 87 secured together by a plurality of bolts 88 or the like. Oppositely from transom 3 the inner transom plate 86 includes a hollow cylindrical portion 89 which terminates with the outwardly extending annular flange 90. An engine enclosed within cowl 91 is rotatably mounted on the end of cylindrical transom plate portion 89 and is confined against axial displacement by the annular clamp ring 92 secured to the engine cowl 91 and projecting beneath flange 90.

The drive shaft housing 93 extends downwardly through an opening 94 in the outer transom plate 87 and carries a propeller unit 95 at the lower end thereof and terminates with a ball housing portion 96 at the upper end thereof adapted to be rotatably supported within the spherical or ball housing of the transom plate assembly 85. The drive shaft housing 93 along with propeller unit 95 are adapted for tilt movement in a generally vertical plane relative to the transom plate assembly 85 and the cowl enclosed inboard engine as provided for in the transom plate opening 94.

To accommodate tilt movements of the outboard portion of the drive unit relative to the inboard engine, the drive shaft 97 extends downwardly from the engine through a longitudinally extending clearance slot 98 in the rotatable ball housing portion 96 of drive shaft housing 93 and a flexible link 99 is interposed in the drive shaft at the tilt axis within the housing portion 96 to provide for a bending in the drive shaft as occasioned by tilt movements of housing 93. The engine enclosed within cowl 91 is interlocked to the ball housing portion 96 of the drive shaft housing 93 by engagement of the keys 100 projecting downwardly from the base portion of the engine cowl 91 in transversely spaced relation and on either side of drive shaft 97 within the longitudinally extending keyways or slots 101 in housing portion 96. The interlock as provided by engagement of keys 100 within corresponding slots 101 provides for steering of the drive unit by rotation of the cowl enclosed inboard engine relative to the transom plate assembly 85 and is adapted to accommodate the tilt movements of the outboard portion of the drive unit relative to the engine.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. In combination with a watercraft having a transom and an opening in the transom, a drive unit disposed in the transom opening and including a drive shaft housing carrying a power source at the upper end thereof and a propeller unit at the lower end thereof, an outer transom plate member having a peripheral portion adapted to engage the outboard side of the transom and an intermediate portion aligned with and projecting inwardly through the transom opening, an inner transom plate member engageable with the inboard side of the transom and generally complementing the peripheral portion of the outer transom plate member, means securing the inner and outer transom plate members together to sandwich the transom therebetween, a complementary cover plate member secured to the intermediate portion of the outer transom plate member, said cover plate member and the intermediate portion of the outer transom plate member forming a transverse horizontal cylindrical bore therebetween and respectively having generally vertically aligned openings communicating with said bore, and an intermediate member comprising a pair of intersecting cylinders, one of said cylinders being disposed generally vertically and being adapted to rotatably carry a cylindrical portion of the drive unit drive shaft housing to provide for steering movement of the drive unit about a generally vertical axis, and the other of said cylinders being disposed transverse to the drive unit and rotatably within the bore formed between the cover plate member and the intermediate portion of the outer transom plate member with the drive unit extending through the generally vertically aligned openings communicating with the bore, said cover plate member and outer transom plate member supporting the drive unit for pivotal tilting movement about a transverse horizontal axis with the power source disposed inboard of the watercraft and the propeller unit disposed outboard.

2. In combination with a watercraft having a transom and an opening in the transom, a drive unit including a power source and propeller unit rigidly connected together through said transom opening, a plate member having a peripheral portion adapted for securement to the transom of the watercraft and an intermediate portion aligned with the transom opening, a cover plate member complementing the intermediate portion of said first named plate member and secured thereto to form a support assembly, and an intermediate member interposed between the support assembly and the drive unit and rotatably carried by said support assembly between the cover plate member and the intermediate portion of said first named plate member, said intermediate member supporting the drive unit for pivotal steering movement about a generally vertical axis and being supported by the support assembly for pivotal tilting movement about a transverse horizontal axis with the power source disposed inboard of the watercraft and the propeller unit disposed outboard.

3. In combination with a watercraft having a transom and an opening in the transom, a drive unit including a power source and propeller unit rigidly connected together through said transom opening, a lower plate member having a peripheral portion adapted to engage the outboard side of the transom and an intermediate portion aligned with and projecting inwardly through the transom opening, an upper and lower plate member engageable with the inboard side of the transom and generally complementing the peripheral portion of the lower plate member, means securing the upper and lower plate members together to sandwich the transom therebetween, a cover plate complementing the intermediate portion of the lower plate member and secured thereto to form a support assembly, and an intermediate member interposed between the support assembly and the drive unit and rotatably carried by said support assembly between the cover plate member and the intermediate portion of said first named plate member, said intermediate member supporting the drive unit for pivotal steering movement about a generally vertical axis and being supported by the support assembly for pivotal tilting movement about a transverse horizontal axis with the power source disposed inboard of the watercraft and the propeller unit disposed outboard.

4. In combination with a watercraft having a transom and an opening in the transom, a drive unit including a power source and a propeller unit rigidly connected together through said transom opening, support means rigidly secured to the transom of the watercraft and including a plate member extending peripherally of the transom opening, an intermediate member interposed between the support means and the drive unit, said intermediate member supporting the drive unit for pivotal steering movement about a generally vertical axis and being supported by the support means for pivotal tilting movement about a transverse horizontal axis with the power source disposed inboard of the watercraft and the propeller unit disposed outboard, abutment means associated with the transom and being selectively movable within a cam slot struck on an arc from the tilt axis of the drive unit, and arm means mounted on the intermediate member for rotation therewith about the tilt axis and being engageable with the abutment means to establish the operating trim of the drive unit.

5. In combination with a watercraft having a transom and an opening in the transom, a drive unit including a power source and a propeller unit and rigidly connected together through said transom opening, support means rigidly secured to the transom of the watercraft and including a plate member extending peripherally of the transom opening, an intermediate member interposed between the support means and the drive unit, said intermediate member supporting the drive unit for pivotal steering movement about a generally vertical axis and being supported by the support means for pivotal tilting movement about a transverse horizontal axis with the power source disposed inboard of the watercraft and the propeller unit disposed outboard, abutment means associated with the transom and being selectively movable within a fixed cam slot, means for moving the abutment means including means movable relative to the cam slot and adapted to carry the abutment means through a range of adjustment, and means associated with the drive unit and engageable with the abutment means to establish the operating trim of the unit.

6. The invention as set forth in claim 5 wherein the means for moving the abutment means includes a rotatable cam member having an arcuate cam slot at varying radius from the cam member axis, said cam slot being movable in intersecting relation relative to the fixed cam slot to carry the abutment means through its range of adjustment.

7. In combination with a watercraft having a transom and an opening in the transom, a drive unit disposed in the transom opening and including a power source rigidly connected through the transom opening to a propeller unit having a propeller selectively rotatable in opposed directions to provide for forward and reverse propulsion of the watercraft, support means rigidly secured to the transom of the watercraft, an intermediate member interposed between the support means and the drive unit, said intermediate member supporting the drive unit for pivotal steering movement about a generally vertical axis and being supported by the support means for pivotal tilting movement about a transverse horizontal axis with the power source disposed inboard of the watercraft and the propeller unit disposed outboard, abutment means associated with the transom, means associated with the drive unit and engageable with the abutment means to establish the operating trim of the unit, a latch hook on the drive unit and normally biased into engagement with the abutment means to lock the drive unit relative to the transom when the drive unit is operated to provide for reverse propulsion of the watercraft, and means engageable with the latch hook and adapted to move and maintain the latch hook out of engagement with the abutment means when the drive unit is operated to provide for forward propulsion of the watercraft.

8. The invention as set forth in claim 7 wherein the drive unit means engageable with the abutment means constitutes an arm carried by the intermediate member and the latch hook is carried by the arm, rod means carried by said arm and engageable with said latch hook, means normally biasing the latch hook and rod means to a position of latch hook engagement with the abutment means and thereby providing for securement of the drive unit relative to the transom when the unit is operated for reverse propulsion of the watercraft, and means movably mounted on the drive unit and engageable with said rod means to move and maintain the rod means together with the latch hook out of the engaged position with the abutment means when the drive unit is operated to provide for forward propulsion of the watercraft.

9. In marine propulsion drive means adapted for watercraft having a transom and an opening in the transom, a drive unit including a power source and a propeller unit rigidly connected together through the transom opening with the power source inboard of the watercraft and the propeller unit outboard, a plate member having a peripheral portion adapted for securement to the transom of the watercraft and an intermediate portion for alignment with the transom opening, a cover plate member complementing the intermediate portion of the first named plate member and secured thereto to form a support assembly, and an intermediate member interposed between the support assembly and the drive unit, said intermediate member supporting the drive unit for pivotal steering movement about a generally vertical axis and being supported

by the support assembly for pivotal tilting movement about a transverse horizontal axis.

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T. MAJOR, *Assistant Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,382,839 May 14, 1968

Elmer Carl Kiekhaefer

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 7, line 28, cancel "and lower"; line 68, cancel "and", second occurrence.

Signed and sealed this 4th day of November 1969.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents