April 17, 1951 E. C. KIEKHAEFER 2,549,481

REVERSIBLE OUTBOARD MOTOR

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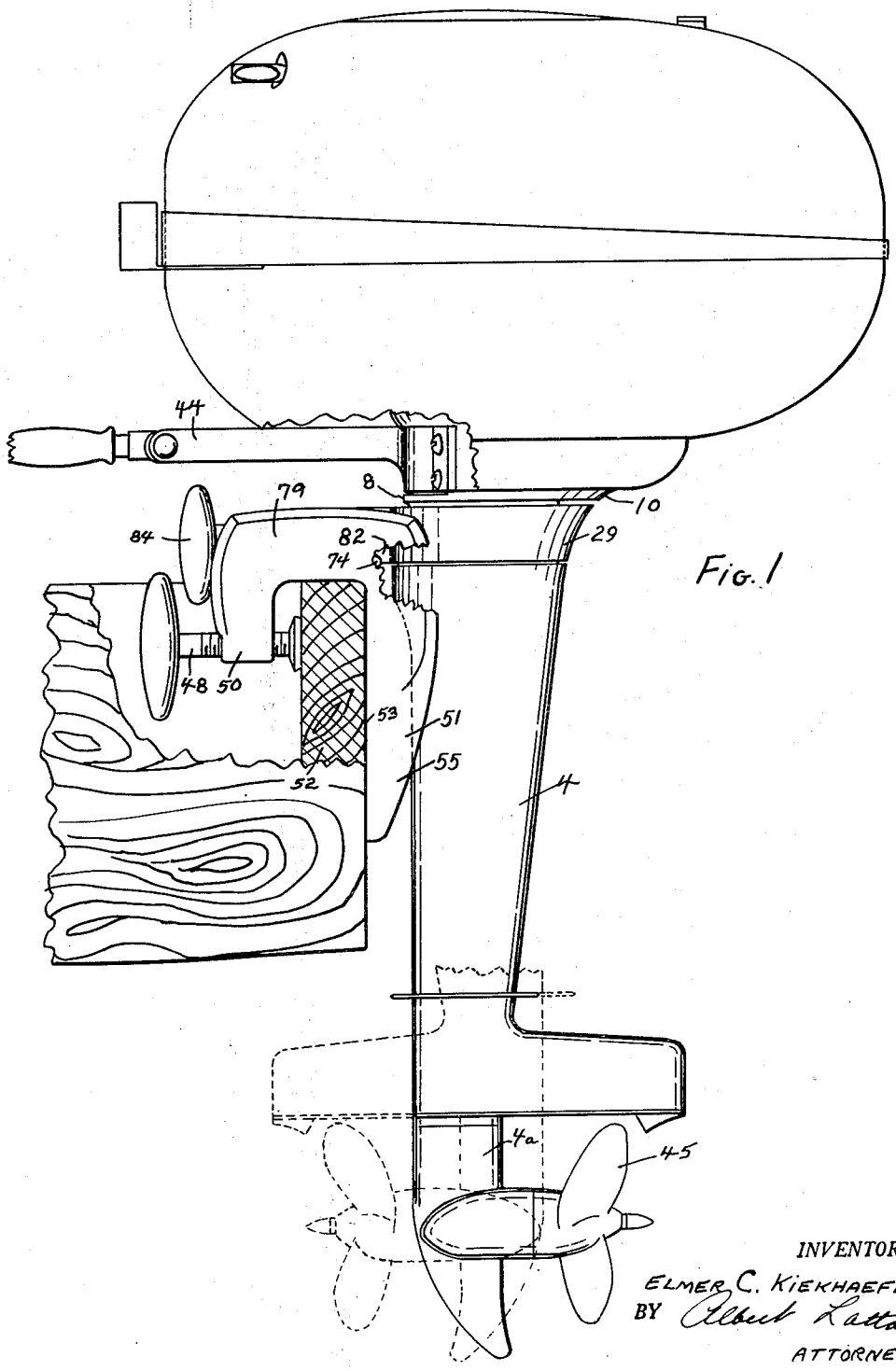


Fig. 1

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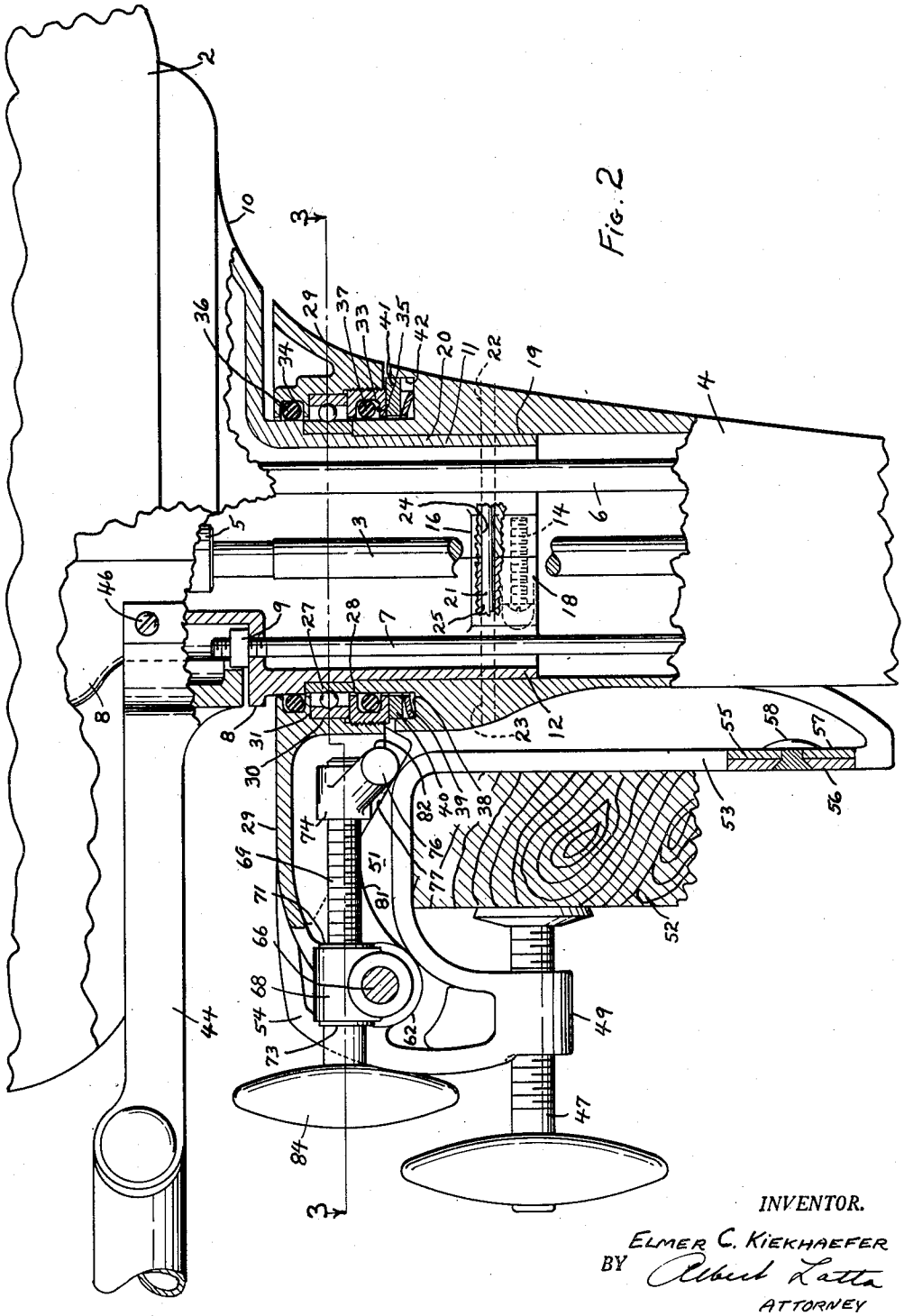


Fig. 2

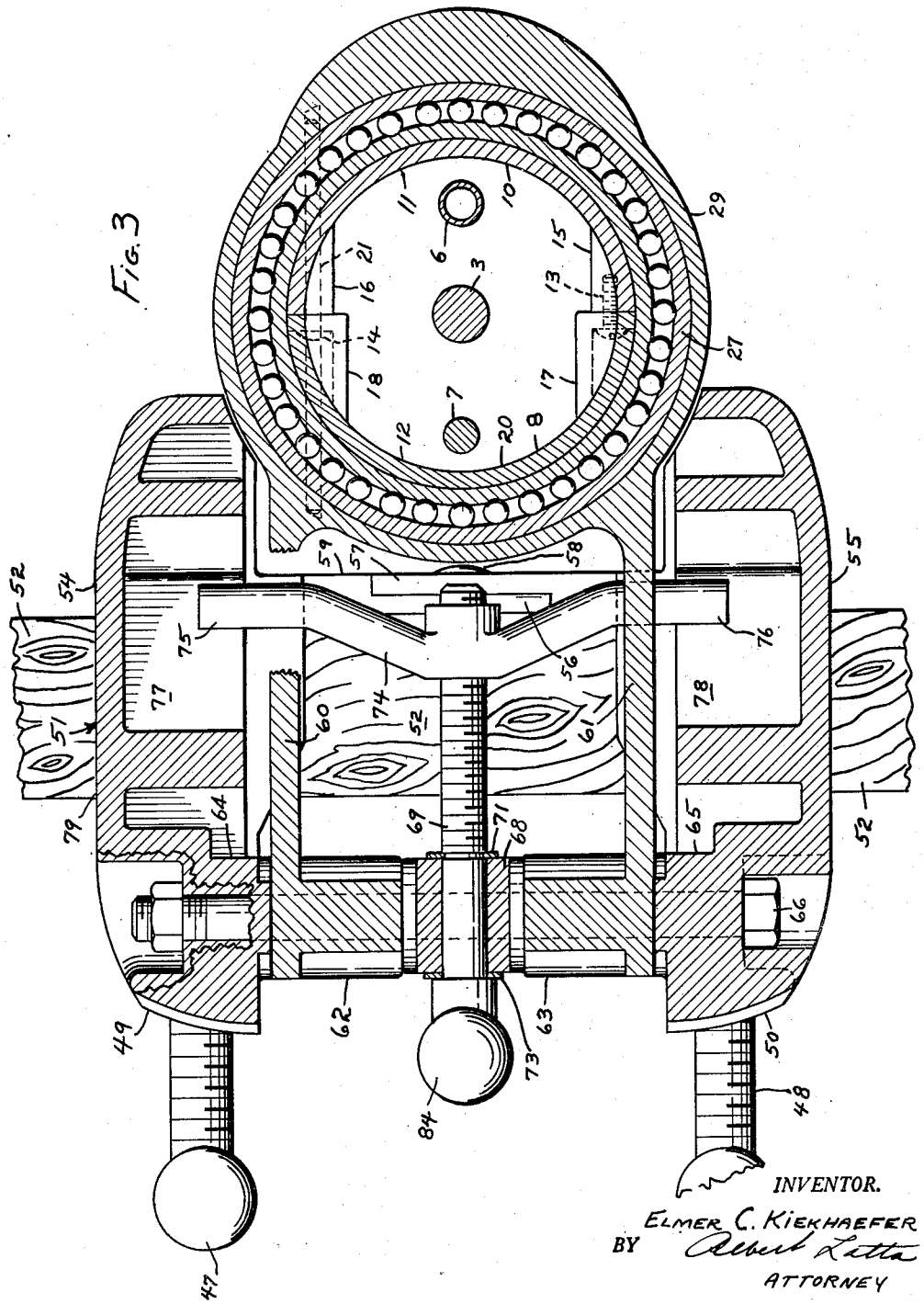
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Fig. 3



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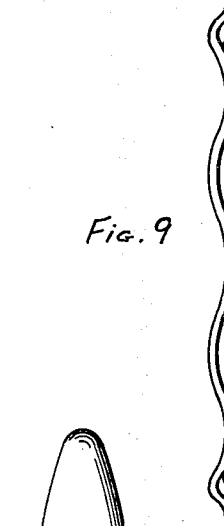


Fig. 9

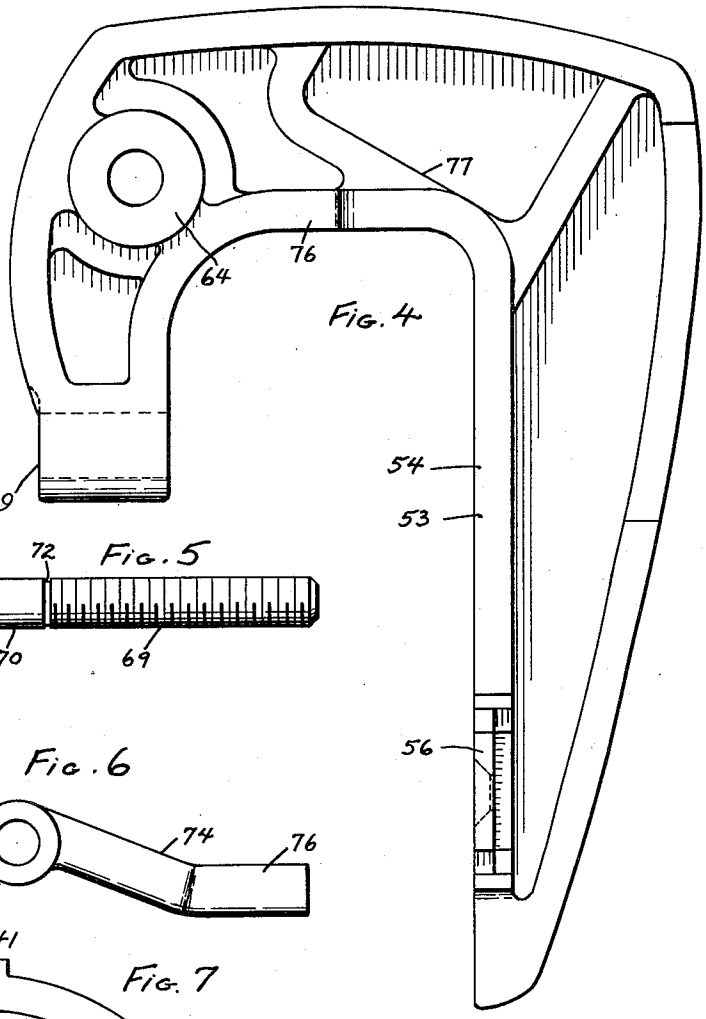


Fig. 4

Fig. 5

Fig. 6

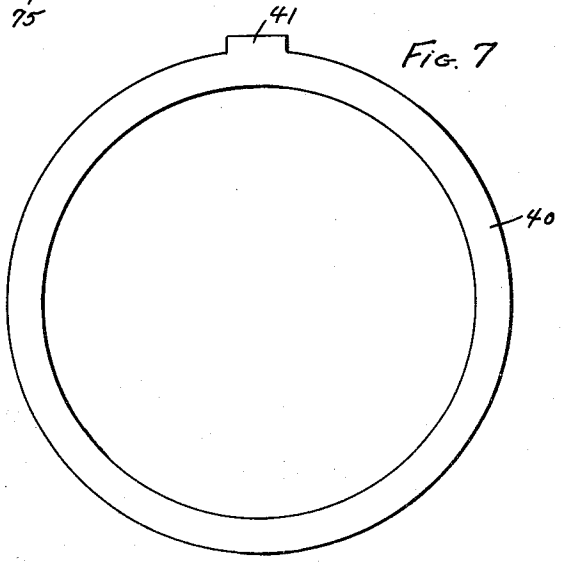
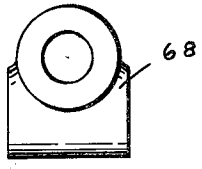


Fig. 7

Fig. 8



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Patented Apr. 17, 1951 2,549,481

UNITED STATES PATENT OFFICE

2,549,481

REVERSIBLE OUTBOARD MOTOR

Elmer C. Kiekhaefer, Cedarburg, Wis.

Application September 5, 1947, Serial No. 772,346

11 Claims. (Cl. 115—18)

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This invention relates to outboard motors and is directed largely to the reduction of manufacturing costs. A primary object of my invention is to provide an outboard motor with a steering and reversing mechanism and with a co-pilot device, all of which are relatively inexpensive to manufacture.

Another object of my invention is to provide a novel reversing steering mechanism.

A further object of my invention is to provide an outboard motor with a novel device, known in the trade as a co-pilot device, for steering the boat in a predetermined course when the tiller handle is manually released.

Other objects and advantages of my invention will become apparent upon reading the following specification and upon examination of the drawings in which:

Fig. 1 is a side elevational view of an outboard motor employing my invention;

Fig. 2 is a side elevational view of the outboard motor showing a portion of the power head and a portion of the drive shaft housing with the mid-section broken in section to disclose my invention;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a detail view of one of the halves which when mated with a corresponding half unite to form a boat clamping bracket;

Fig. 5 is a detail view of the adjusting screw for the tilting and locking mechanism;

Fig. 6 is a detail view of the yoke which is a part of the tilting and locking mechanism;

Fig. 7 is a detail view of the friction ring which is a part of the co-pilot device;

Fig. 8 is a detail view of the swivel piece which is a part of the tilting and locking mechanism; and

Fig. 9 is a detail view of the spring washer which is a part of the co-pilot device.

In general, I have provided an outboard motor comprised of a power head 2, a drive shaft 3 and a drive shaft housing 4. The drive shaft 3 is driven by the engine shaft 5 and extends through the interior of the drive shaft housing 4 to the gear casing 4a to transmit rotation to the propeller 45. A water pipe 6 carries water up into the power head 2 for engine cooling purposes. A tie-rod 7 is secured at one end to the gear casing 4a and is secured at its other end to the crankcase casting 8 by means of a nut 9.

The power head 2 includes an engine block 10 and a crankcase casting 8 which are secured

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together by suitable bolts and nuts to form a unitary structure for housing the power unit. The engine block 10 has a downwardly depending neck portion 11 which is of a semi-cylindrical shape. The crankcase casting 8 is also provided with a downwardly depending neck portion 12 which is also of a semi-cylindrical shape and which mates with the neck portion 11 of the engine block to form a cylindrical sleeve 20.

The lower end of the neck portions 11 and 12 may be secured together by means of suitable bolts or screws 13 and 14, said neck portions 11 and 12 being provided with bosses 15, 16, 17 and 18 into which the screws 13 and 14 are threaded.

The drive shaft housing 4 has an internal bore 19 which is machined to receive the cylindrical sleeve 20 formed by the neck portions 11 and 12. When said cylindrical sleeve is inserted into the bore 19, then a pin 21 is inserted into drilled holes 22 and 23 in the drive shaft housing 4 which holes register with the drilled holes 24 and 25 in bosses 16 and 18.

The pin 21 thus secures the drive shaft housing 4 to the sleeve 20 to prevent axial and rotating movement between said parts, the reason for which will be hereinafter described.

Sleeve 20 is provided at its upper end with an external annular shoulder 26 which serves as a bearing seat for the inner race of a ball bearing 27. The upper facial extremity 28 of drive shaft housing 4 serves to clamp the inner race of bearing 27 against the annular shoulder 26.

A bracket 29 is provided with an internal bore so that bracket 29 completely embraces the sleeve 20 and the upper end of drive shaft housing 4. Said bracket 29 has an internal bore 30 forming an annular shoulder 31 which serves as a bearing seat for the outer race of ball bearing 27. A ring nut 33 is threaded into the bracket 29 and clamps the outer race of bearing 27 against the annular shoulder 31. The annular groove 34 in bracket 29 and the annular groove 35 in ring 33 serve to retain a pair of elastic seal rings 36 and 37 which prevent dirt and water from getting into the bearing 27.

The upper end of the drive shaft housing 4 has an annular groove 38 into which a wavy spring washer 39 and a friction ring 40 are received. It will be noted that the friction ring 40 is provided with a tab 41 which projects into slot 42 to prevent rotation of said ring relative to drive shaft housing 4.

It will be noted that the power head 2 and drive shaft housing 4 are free to rotate relative to supporting bracket 29 through the medium

of bearing 27. It will be also noted that the bearing 27 supports the entire weight of the power head 2 and drive shaft housing, consequently, said bearing is subjected to a heavy axial load. Therefore bearing 27 is a husky bearing capable of absorbing considerable axial thrust with a limited amount of deflection of radial alignment of the inner and outer races. It will be noted that radial deflection of the bearing races is of little significance since the rotative function of the bearing is confined to manual rotation of the power unit and drive shaft housing relative to supporting bracket 29 for steering purposes and for reversing the direction of travel of the boat.

With respect to reversing the direction of travel of the boat, this is accomplished by grasping the tiller 44 and rotating the power head and drive shaft housing 180° about the axis of the bore in supporting bracket 29, the propeller 45 thus assuming the position as shown in dotted lines in Fig. 1, thereby propelling the boat in reverse direction. It can be seen that the power head and drive shaft housing can be swiveled 360° about the axis of sleeve 20.

The assembly of the steering mechanism and co-pilot device is accomplished as follows. The bearing 27 is first inserted into the bore 30 of support bracket 29 with a light press fit. Then the lock ring 33 is threaded into bracket 29 and tightened against the outer race of bearing 27. The seal rings 36 and 37 are then inserted in the annular grooves 34 and 35. This entire subassembly is then inserted onto sleeve 20 until the inner race of bearing 27 abuts the annular shoulder 26. Then the spring washer 39 is inserted into the annular groove 38 of drive shaft housing 4 and friction ring 40 is positioned in the same groove with tab 41 located in slot 42. The upper end of the drive shaft housing is then slipped onto sleeve 20 and pressure is applied until the upper end 28 of the drive shaft housing abuts against the inner race of bearing 27. The pressure is applied for the purpose of subjecting the spring washer 39 to a predetermined amount of deflection wherein a predetermined amount of pressure is exerted by the spring washer against the friction ring 41. The pin 21 is then inserted into the hole 22 through holes 24 and 25 and then into hole 23 thereby securing the drive shaft housing 4 relative to sleeve 20. It will be noted that it is important to locate the drilled holes 22 and 23 in proper relation to the drilled holes 24 and 25 in the sleeve 20 whereby when said holes are in register the desired deflection of spring washer 39 is obtained.

I may desire to use shims between the upper end 28 of drive shaft housing 4 and the inner race of bearing 27 whereby machining tolerances which determine the distances between annular shoulder 26, housing face 28 and the base of annular groove 38 may not have to be held too closely.

When spring washer 39 is permanently deflected to the desired predetermined amount by the insertion of pin 21 into the drive shaft housing and sleeve 20, then the pressure exerted by said washer against the friction ring (which is stationary with the drive shaft housing as a result of tab 41 in slot 42), causes said friction ring to rub against the underneath face of lock ring 33 thereby impeding the rotation of the power head and drive shaft housing relative to support bracket 29. The amount of impedition, however, is only sufficient to maintain the power head and drive shaft housing in a fixed position relative to support bracket 29, when the tiller 44 is manually released. Thus the steering course of the boat at the time the tiller 44 is released remains fixed until the tiller is again manually moved to change the steering course. This "fixing" of the steering course is accomplished by the so-called co-pilot mechanism described immediately above.

It is to be understood, of course, that the impedition of rotation of the power head and drive shaft housing relative to support bracket 29 is not so great as to impair free steering of the boat by manual manipulation of the tiller 44 and no laborious effort is involved in the manual manipulation of said tiller. It can be seen that the tiller 44 is secured directly to the crankcase casting 8 by means of screws or bolts 46 whereby manual swinging of the tiller causes rotation of the power head and drive shaft housing relative to support bracket 29.

The complete outboard motor assembly is removably secured to the transom 52 of a boat by means of clamp screws 47 and 48 which are threaded into the downwardly depending arms 49 and 50 of clamp bracket 51, said transom being clamped between the clamp screws and the opposing legs 53 of clamp bracket 51. The clamp bracket 51 may be comprised of two castings 54 and 55 of corresponding shape and construction having inter-fitting lugs 56 and 57 secured together by rivet 58 thus forming a web portion 59 between the two castings 54 and 55 to form the unitary clamp bracket 51. The support or swivel bracket 29 has an outwardly projected tongue formed of spaced arms 60 and 61 having inwardly directed hubs 62 and 63. The clamp bracket 51 also has hub portions 64 and 65 which are aligned with hubs 62 and 63 when the swivel bolt 66 is inserted through the internal bores in each of the hubs. The bracket 29 is free to swivel on bolt 66 within a limited range hereinafter described and the swiveling of bracket 29 on bolt 66 causes the entire assemblage of said bracket 29 and the power head and lower end unit to tilt up and down about the axis of bolt 66.

In outboard motor construction it is desirable to mount the power head and lower end unit relative to the boat clamping bracket in such a manner as to permit the lower end unit to swing upwardly automatically whenever the lower end unit engages an under water obstruction such as a log or rock, thereby preventing serious damage to the outboard motor. At the same time it is desirable to be able to adjust the normal tilted angle of the outboard motor relative to the boat and to maintain said motor in said selected angle of adjustment during operation thereof so as to obtain maximum performance from the propeller.

It is to be understood that when the propeller is turning, its propelling action is continuously urging the lower end unit of the outboard motor toward the boat which in turn causes the boat to move forward. Thus the action of the propeller continuously maintains the outboard motor in a selected angle of tilt relative to the boat until an obstruction is encountered by the lower end unit. Then the propelling action of the propeller is overcome and the lower end unit swings backwardly and upwardly in a pivotal movement so as to "ride over" the obstruction. It will be noted that the outboard motor is free to swing upwardly about the axis of bolt 66 until the tiller handle 44 engages some part of the clamp bracket 51. The downward pivotal movement of the outboard

motor relative to clamp bracket 51, however, is limited by an adjustable mechanism described hereinafter and described and claimed in my copending application Serial No. 43,982, filed August 13, 1948, which has since become abandoned.

A swivel nut 68 is free to swivel on bolt 66 within the outer faces of hubs 62 and 63 of swivel bracket 29. Adjustment screw 69 has a smooth cylindrical surface region 70 which swivels within nut 68. A retaining ring 71 which is received in annular groove 72 of screw 69, however, prevents axial movement of the screw 69 relative to nut 68. A washer 73 may be used at the end of the swivel nut opposite the end where the retaining ring is located. A yoke 74 is threaded onto the adjustment screw 69 and has outwardly extending arms 75 and 76 which ride on the inclined ways 77 and 78 which are preferably formed integrally with and interiorly of the upper walls 79 and 80 of each of the castings 54 and 55 of clamp bracket 51. The yoke arms 75 and 76 also support the weight of support bracket 29 and the power head and lower end unit which are carried by the support bracket 29, since the underneath surfaces 81 of arms 60 and 61 of support bracket 29 rest directly on the upper surfaces of the yoke arms 75 and 76. The gravity load, therefore, of support bracket 29 and the power head and lower end unit is transmitted to yoke arms 75 and 76 and from the yoke arms to the ways 77 and 78 of clamp bracket 51 and from the clamp bracket 51 to the boat transom 52. It will be noted that the underneath surfaces 81 of arms 60 and 61 have a downwardly depending arcuate shoulder stop 82 which limits the travel of the yoke 74 in a direction away from the handle 84 of the adjustment screw 69. Said stop shoulder 82 thereby limits the downward tilting adjustment of the power head and lower end unit relative to clamp bracket 51.

When it is desired to either raise or lower the tilt angle of the power head and lower end unit relative to clamp bracket 51, this is accomplished by grasping handle 84 of adjustment screw 69 and turning it either clockwise or counter-clockwise. When the handle 84 is turned in clockwise direction, the yoke 74 is retracted along the threaded portion of screw 69 toward handle 84, thereby causing yoke arms 75 and 76 to travel up the inclined ways 77 and 78. The upper surfaces of yoke arms 75 and 76 being in contact with the underneath surfaces of swivel bracket arms 60 and 61 thereby cause the swivel bracket 29 to swivel upwardly about the axis of swivel bolt 66 effecting an upward tilting of the power head and lower end unit to any desired position. When the desired position of tilt is reached, such position remains fixed until the tilt position is again changed by turning handle 84 of adjustment screw 69.

Turning the handle 84 counter-clockwise, of course, causes yoke arms 75 and 76 to travel down the ways 77 and 78 and gravity causes swivel bracket 29 and the power head and lower end unit to follow the yoke arms, on which they are supported, thus lowering the tilt position of the power head and lower end unit relative to clamp bracket 51.

Having thus described my invention what I claim is:

1. In an outboard motor, an engine block with a downwardly depending sleeve portion, an annular shoulder formed in the exterior surface of said sleeve portion, a drive shaft housing with an internal bore at its upper end, said sleeve portion extending into the bore of the drive shaft housing, an anti-friction bearing having its inner race clamped between the annular shoulder on the sleeve portion and the upper end of the drive shaft housing, a bracket having a bore therein and encircling the sleeve portion and the upper end of the drive shaft housing, an annular shoulder within said bore, the outer race of the anti-friction bearing abutting said shoulder, a ring nut threaded into the bore of the bracket to clamp the outer race of the bearing against the annular shoulder in said bore, the engine block and drive shaft housing being rotatable relative to the bracket and being supported by said bracket through the medium of the anti-friction bearing.

2. In an outboard motor, an engine block with a downwardly depending sleeve portion, an annular shoulder formed in the exterior surface of said sleeve portion, a drive shaft housing with an internal bore at its upper end, said sleeve portion extending into the bore of the drive shaft housing, an anti-friction bearing having its inner race clamped between the annular shoulder on the sleeve portion and the upper end of the drive shaft housing, a bracket having a bore therein and encircling the sleeve portion and the upper end of the drive shaft housing, an annular shoulder within said bore, the outer race of the anti-friction bearing abutting said shoulder, means for clamping the outer race of the bearing against the annular shoulder in said bore, the engine block and drive shaft housing being rotatable relative to the bracket and being supported by said bracket through the medium of the anti-friction bearing, means disposed between the drive shaft housing and the bracket for providing frictional resistance to the rotation of the engine block and drive shaft housing relative to the bracket.

3. An outboard motor as set forth in claim 2 wherein the means for providing frictional resistance comprises a cup-like washer disposed between the drive shaft housing and the bracket.

4. An outboard motor comprising a power unit, a housing depending downwardly therefrom, a supporting member associated with the power unit and housing for rotatively supporting same relative thereto, means normally urging the supporting member in an axial direction relative to the housing, whereby rotative movement of the housing and power unit relative to the supporting member is somewhat resisted.

5. An outboard motor comprising a power unit, a housing depending downwardly therefrom, a supporting member associated with the power unit and housing for rotatively supporting same relative thereto, a resilient washer interposed between the housing and the supporting member and normally urging the supporting member in an axial direction relative to the housing whereby rotative movement of the power unit and housing relative to the supporting member is impeded.

6. An outboard motor comprising a power unit, a drive shaft housing depending downwardly therefrom, a supporting member associated with the power unit and drive shaft housing, an anti-friction bearing mounted in the support member for rotatively supporting the power unit and drive shaft housing relative thereto, means for securing the bearing within the support member, resilient means normally urging the outer race of the bearing and the support member in

an axial direction relative to the power unit and drive shaft housing, whereby to impede rotative movement of the power unit and drive shaft housing relative to the support member.

7. An outboard motor comprising a power unit, a drive shaft housing secured thereto, a support member rotatively supporting the power unit and drive shaft housing, a groove in the upper facial extremity of the drive shaft housing, a washer stationarily mounted in the groove, a second resilient washer in the groove beneath the first washer urging same into frictional contact with a face of the support member whereby to impede rotative movement of the power unit and drive shaft housing relative to the support member.

8. A steering mechanism for an outboard motor including; a power unit, a drive shaft housing and a support member rotatively supporting the power unit and drive shaft housing for steering purposes; a pair of washers mounted in face to face relation to each other, one of said washers being urged into frictional contact with a face of the support member whereby to impede rotative movement of the power unit and drive shaft housing relative to the support member.

9. A steering mechanism for an outboard motor including; a power unit, a drive shaft housing, a support member and an anti-friction bearing mounted in the support member for rotatively supporting the power unit and drive shaft housing for steering purposes; a retaining member securing the bearing within the support member, a pair of washers mounted in face to face relation to each other, one of said washers being urged into frictional face to face contact with a face of the retaining member, whereby to impede rotative movement of the power unit and drive shaft housing relative to the support member.

10. A steering mechanism for an outboard motor including; a power unit, a drive shaft housing and a support member; an anti-friction bearing interposed between the support member and the power unit and drive shaft housing, said bearing rotatively supporting the power unit and drive shaft housing relative to the support member and said bearing supporting the power unit and drive shaft housing against axial displacement relative to the support member.

11. A steering mechanism for an outboard motor including; a power unit, a drive shaft housing and a support member; an anti-friction bearing interposed between the support member and the power unit and drive shaft housing for rotatively and axially supporting the power unit and drive shaft housing relative to the support member, means interposed between the drive shaft housing and support member for resisting rotative movement of the power unit and drive shaft housing relative to the support member.

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