March 27, 1956 E. C. KIEKHAEFER 2,739,561

OUTBOARD MOTOR UNIT WITH INCLINED STEERING AXIS

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Fig. 1

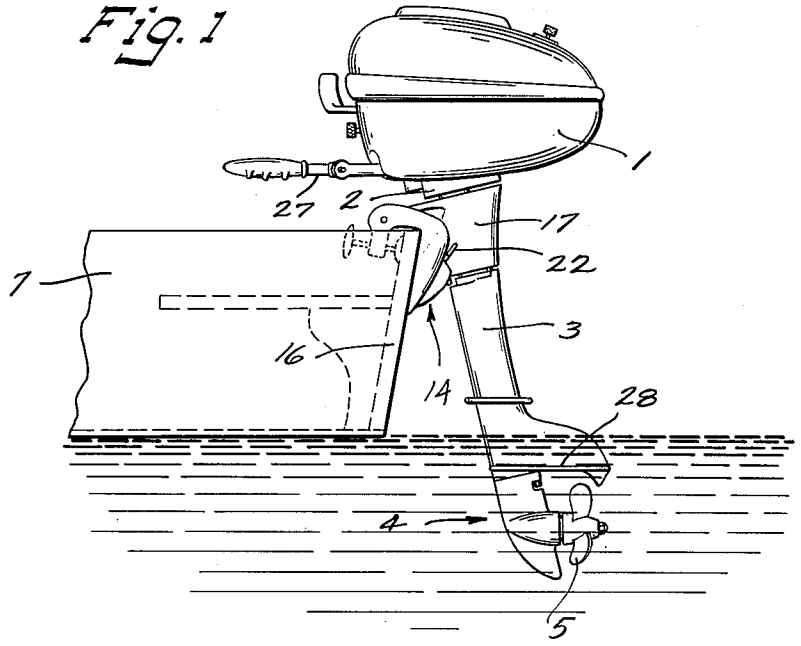


Fig. 2

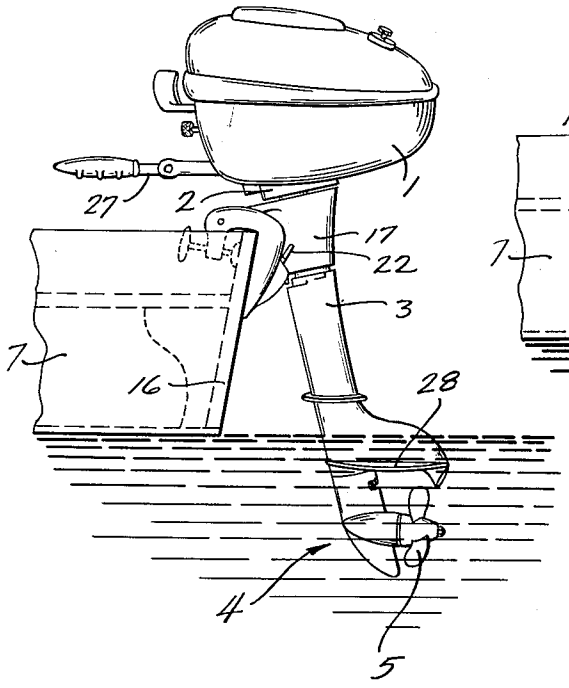
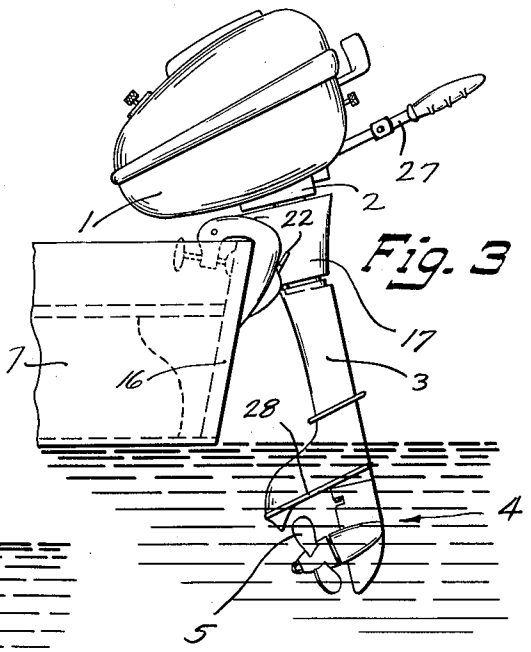


Fig. 3



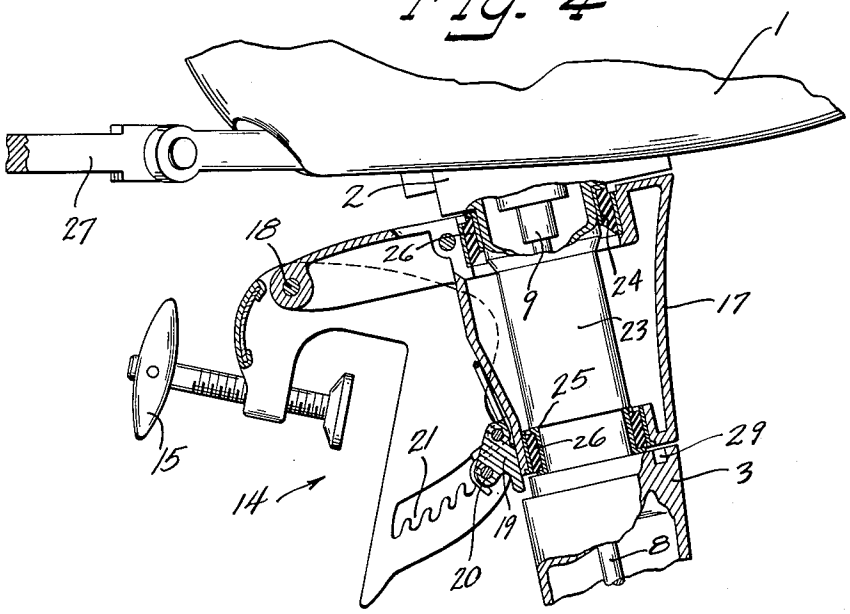
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Fig. 4



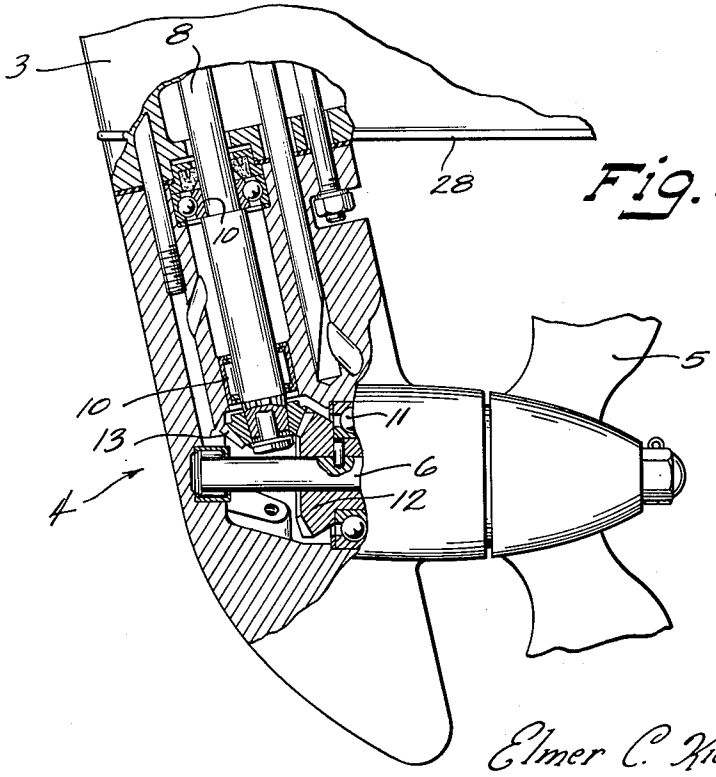


Fig. 5

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OUTBOARD MOTOR UNIT WITH INCLINED STEERING AXIS

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7 Claims. (Cl. 115—18)

This invention relates to outboard motor units for boats and particularly to steering of the boats by turning the motor units.

The invention provides improved motor operation wherein the propeller thrust which is directed forwardly in normal operation is directed angularly downwardly to a degree varying with turning of the motor unit in steering the boat to the right or left.

An object of the invention is to enhance the personal safety of the occupants of the boat and particularly to prevent swamping of the boat on turns and in reverse by a lifting of the stern of the boat effected by the motor in operation.

A more particular object is to direct the propeller angularly downwardly to a varying degree corresponding with the degree of turning movement of the motor unit to effect a corresponding degree of lifting of the stern of the boat in relation to the forward thrust of the propeller.

These and other objects and advantages will be more fully set forth in the following description of a preferred embodiment of the invention as illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a side elevation of the stern of a boat and the motor unit as attached thereto and driving the same forwardly;

Fig. 2 is a view similar to Figure 1 showing the motor unit turned to turn the boat to the left;

Fig. 3 is a view similar to Fig. 1 showing the motor unit turned to the full reverse position to drive the boat in the reverse;

Fig. 4 is a longitudinal vertical cross-section through the bracket of the motor unit by which the latter is removably secured to the transom of the boat as shown in Figs. 1 through 3; and

Fig. 5 is a longitudinal vertical cross-section of the underwater gear case of the motor unit.

The outboard motor unit shown in the drawings includes the cowl 1 which substantially encloses the engine 2 of the motor at the upper end of the unit. The housing 3 supporting engine 2 extends downwardly thereof and rigidly connects the engine 1 and the lower gear case 4 disposed under water. The propeller 5 is mounted on the shaft 6 supported by the gear case 4 and is driven by engine 1 and normally disposed underwater to propel the boat 7 forwardly and effect the steering of the boat as will be described.

The drive shaft 8 extending downwardly within housing 3 is connected at the upper end to the lower end 9 of the engine crankshaft. The lower portion of shaft 8 is journally supported by the bearings 10 in gear case 4. The bearings 11 in gear case 4 support shaft 6 normally horizontally to carry the propeller for operation in the water. The driven gear 12 is mounted on shaft 6 to mesh with the drive gear 13 which latter is fixed on the lower end of shaft 8.

The motor support bracket 14 includes the clamp

screws 15 by which the bracket is secured to the transom 16 of boat 7, and the swivel bracket member 17 which is pivotally assembled on the transverse horizontal pin 18 of bracket 14. In operation, the motor unit is supported by member 17 with the propeller 5 disposed under water rearwardly of the boat, and is adapted to be tilted on the axis of pin 18 to allow the propeller to be lifted to pass over submerged objects or to be withdrawn from the water.

The tilt lock latch 19 is carried by member 17 and includes the transverse pin 20 which is selectively disposed in any of the series of recesses 21 formed in bracket 14. The forward face of each recess 21 is formed to secure the motor against tilting in a direction which would lower the propeller and the opposite faces are pitched or inclined to lift pin 20 out of the recesses upon tilting of the motor in the opposite direction. The handle 22 secured to latch 19 provides for the adjustment of pin 20 in the selected recess and provides for the relative adjustment of the motor unit end bracket 14 to accommodate various boats having transoms of different rake or angularity.

The directional control of the boat, in each case, is effected by turning the motor unit on a substantially vertical axis to change the direction of propeller thrust. In the motor unit shown, housing 3 includes the cylindrical portion 23 which is journally mounted in the upper and lower bearings 24 and 25 carried by the sleeve of member 17. Bearings 24 and 25 include the rubber portions 26 which provide for the cushioned support of the motor unit. Steering of the boat is effected by manipulating the tiller handle 27 which turns the motor unit on the near-vertical axis of bearings 24 and 25 to direct the propeller thrust to the right or left.

According to the invention the axis of bearings 24 and 25 is inclined forwardly, or more specifically the axis lies in a vertical longitudinal plane respecting the boat and forms above a horizontal plane an acute angle therewith forwardly of the axis. In the motor unit shown, the axis of bearings 24 and 25 is inclined forwardly about 12° and defines an angle with the horizontal of about 78°. The drive shaft 8 is similarly inclined and extends within housing 3 on the axis of bearings 24 and 25 and the steering axis of the motor unit. Within the scope of the presently claimed invention the motor unit may be supported for steering movement on an inclined axis which is forwardly of the drive shaft and housing which latter may extend generally vertically or be otherwise inclined.

The angularity of the axis provides for tilting of the propeller downwardly as the motor unit is turned to the right or left as shown in Fig. 2. The degree to which the propeller is directed downwardly varies (not directly) with the degree of turning movement of the motor unit. In steering the boat, the propeller accordingly tends to lift the rear of the boat whenever a turning of the boat is effected and helps to prevent, particularly on sharp turns, upsetting or swamping of the boat.

The invention provides a factor of safety in making turns at high speeds while providing a horizontal thrust and maximum propeller efficiency in the forward direction. The plate 28 secured to gear case 4 is disposed normally horizontally above the propeller and operates to prevent cavitation and to assure the full efficiency of the propeller particularly as when operating near the surface of the water. In steering the boat by turning the motor unit, plate 28 is adjusted to correspond with the angular position of the propeller as described and functions at all times to maintain the propeller thrust.

The motor unit shown, being fully rotatable, can be turned 180° to propel the boat rearwardly. At such

times the water pushed back by the transom tends to pass over the transom and into the boat. The maximum angularity downwardly of propeller **5** provided by the invention is reached when the propeller is in the full reverse position referred to and provides at such times maximum protection against swamping of the boat.

When in the reverse position, the latch **19** is engaged within the slot **29** of housing **3** which latter secures latch **19** and pin **20** in the selected recesses **21** of bracket **14** to prevent raising of the propeller while operating in reverse.

Various embodiments of the invention may be employed within the scope of the following claims:

I claim:

1. In a dirigible outboard motor unit including a propeller disposed underwater to direct the thrust of the propeller normally horizontally and to drive the boat forwardly, a bracket adapted to be removably secured to the transom of a boat and including a pivotal connection supporting said motor unit for pivotal movement on a steering axis whereby the propeller can be adjusted for the directional control of the boat, said axis approximately intersecting the axis of said propeller and defining forwardly therewith an acute angle whereby the thrust of said propeller is directed angularly downwardly to lift the stern of the boat simultaneously with the directional control of the boat in either direction.

2. In a dirigible outboard motor unit including a propeller disposed underwater to direct the thrust of the propeller normally horizontally and to drive the boat forwardly, an anti-cavitation plate rigidly fixed to said unit immediately above said propeller, and a bracket adapted to be removably secured to the transom of a boat and including a pivotal connection supporting said motor unit for pivotal movement on a steering axis whereby the propeller can be adjusted for the directional control of the boat, said axis approximately intersecting the axis of said propeller and defining forwardly therewith an acute angle whereby said anti-cavitation plate and the thrust of said propeller are directed angularly downwardly to lift the stern of the boat simultaneously with the directional control of the boat in either direction.

3. In a dirigible outboard motor unit including a propeller and a shaft supporting said propeller underwater, said shaft and propeller being disposed to direct the thrust of the propeller normally horizontally and to drive the boat forwardly, a bracket adapted to be removably secured to the transom of a boat and including a pivotal connection supporting said motor unit for pivotal movement on a steering axis whereby the propeller can be reversed to drive the boat rearwardly, said axis approximately intersecting that of said propeller shaft and defining forwardly therewith an acute angle whereby the thrust of said propeller is directed angularly downwardly to lift the stern of the boat simultaneously with the reverse propulsion of the boat to avoid swells passing over the transom into the boat.

4. In a dirigible outboard motor unit including a propeller disposed underwater to direct the thrust of the propeller normally horizontally and to drive the boat forwardly, an anti-cavitation plate rigidly fixed to said unit immediately above said propeller, a clamp bracket adapted to be removably secured to the transom of a boat, a swivel bracket including a pivotal connection supporting said motor unit for pivotal movement on a steering axis whereby the propeller can be adjusted for the directional control and reverse propulsion of the boat, said axis approximately intersecting the axis of said propeller and defining forwardly therewith an acute angle whereby said anti-cavitation plate and the thrust of said propeller are directed angularly downwardly to lift the stern of the boat simultaneously with the directional control of the boat in either direction, said swivel bracket being supported by said clamp bracket for tilting of the motor unit to allow the propeller to be raised for passing over submerged obstructions, and interlock means connecting said brackets to prevent tilting of the motor unit when in the position effecting the reverse propulsion of the boat.

5. In an outboard motor unit comprising an engine, a propeller and a shaft for supporting said propeller underwater, a drive shaft and gear means connecting said engine and said propeller shaft to drive the propeller, said shaft and propeller being disposed to direct the thrust of the propeller normally horizontally and to drive the boat forwardly, and a housing for said drive shaft supporting said engine and said propeller shaft; a bracket adapted to be removably secured to the transom of a boat and including a pivotal connection supporting said motor unit for pivotal movement on a steering axis approximately intersecting that of said propeller shaft and defining forwardly therewith an acute angle whereby the thrust of said propeller is directed downwardly to lift the stern of the boat simultaneously with steering movement effecting the directional control of the boat in other than the forward direction.

6. In an outboard motor unit comprising an engine, a propeller and a shaft supporting said propeller underwater, a drive shaft and gear means connecting said engine and said propeller shaft to drive the propeller, said shaft and propeller being disposed to direct the thrust of the propeller normally horizontally and to drive the boat forwardly, a housing for said drive shaft supporting said engine and said propeller shaft, a horizontal anticavitation plate rigidly fixed to said housing immediately above said propeller, a bracket adapted to be removably secured to the transom of a boat and including a pivotal connection supporting said motor unit for pivotal movement on a steering axis approximately intersecting that of said propeller shaft and defining forwardly therewith an acute angle whereby said anti-cavitation plate and the thrust of said propeller are directed angularly downwardly with a corresponding steering movement effecting the directional control of the boat to lift the stern of the boat in other than the forward direction.

7. In an outboard motor, the combination with a bracket support having a swivel bearing with its axis forwardly inclined from the vertical, of a propulsion unit rotatably mounted on the swivel bearing and freely rotatable through at least 180° of movement between forward propulsion and reverse propulsion positions and comprising in substantially rigid connection a power head, a strut and a gear casing, the power head including an engine having a drive shaft extension through said strut and the gear casing being provided with a propeller shaft and propeller, the drive shaft and propeller shaft having meshed gears in said casing and being at an obtuse angle to each other such that the rotation of said unit on said bearing to a position for reverse propulsion will move the propeller shaft about said inclined axis to direct downwardly a substantial component of its thrust.

References Cited in the file of this patent

UNITED STATES PATENTS

1,467,641	Johnson	Sept. 11, 1923
1,693,590	Borgman	Dec. 4, 1928
2,096,457	Irgens	Oct. 19, 1937

FOREIGN PATENTS

505,852	Great Britain	May 17, 1939