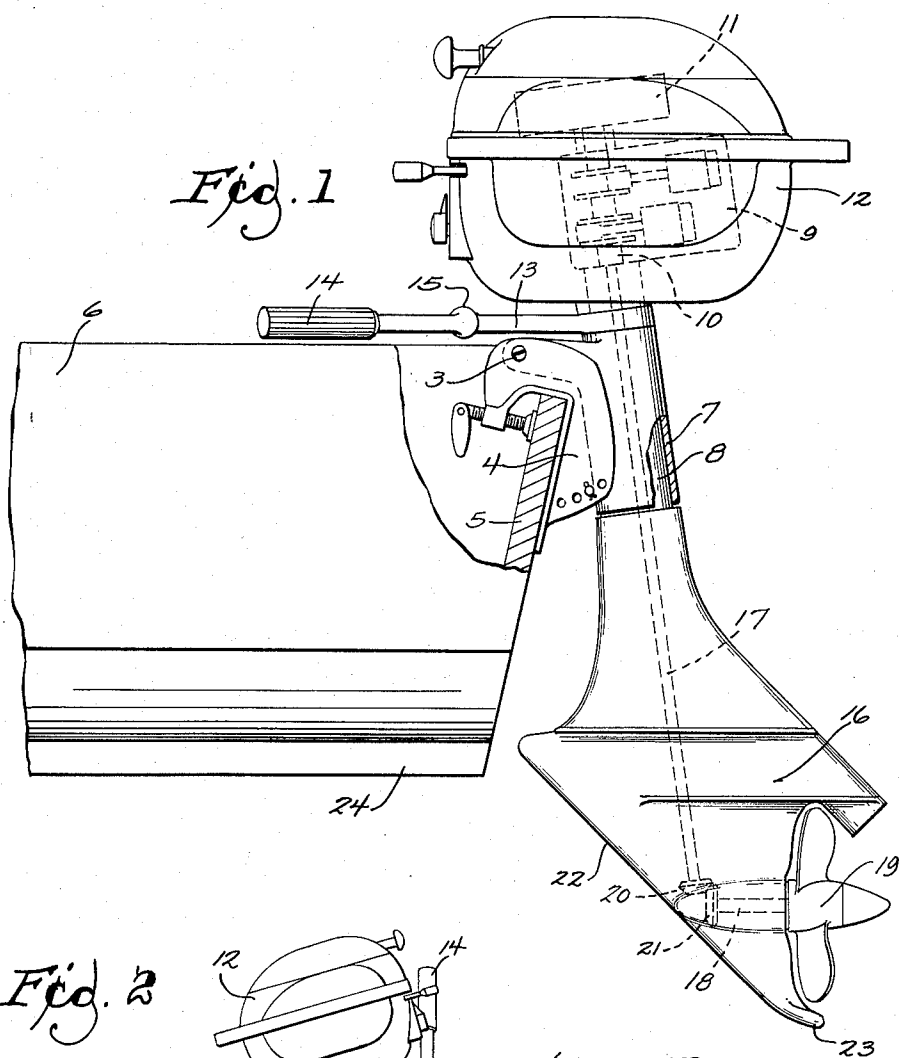
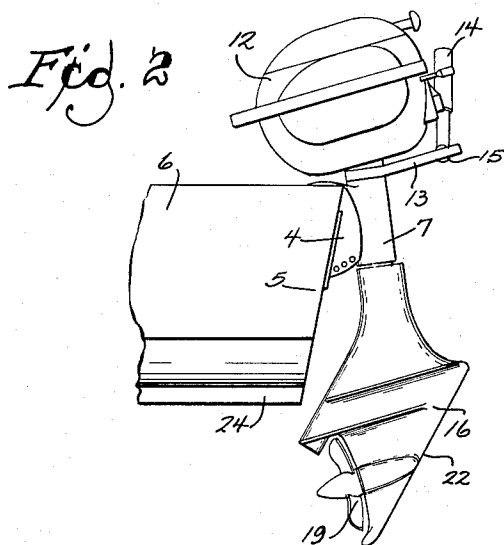
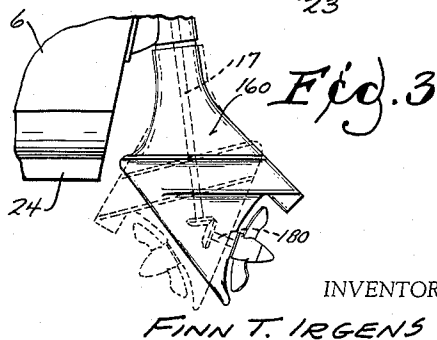


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OUTBOARD MOTOR ROTATABLE ON AN INCLINED AXIS FOR
REVERSAL AND HAVING AN OBLIQUE PROPELLER SHAFT
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OUTBOARD MOTOR ROTATABLE ON AN INCLINED AXIS FOR REVERSAL AND HAVING AN OBLIQUE PROPELLER SHAFT

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1 Claim. (Cl. 115—18)

This invention relates to an outboard motor having an inclined drive shaft and having a propeller shaft at an oblique angle thereto. Desirably the outboard motor is rotatable for steering and reverse upon an inclined axis which will usually coincide with that of the drive shaft. As a result of the oblique relationship between the propeller shaft and such axis, the propeller slip stream will be directed sharply downwardly in the reverse position, as compared with its horizontal or nearly horizontal direction of thrust in forward propulsion.

So-called "angle drives" as shown in Patent No. 2,096,457, have been used to minimize weed trouble by locating close to the waterline the driving gears between the drive shaft and propeller shaft, while extending the propeller shaft downwardly to a depth sufficient to operate the propeller well below the surface.

The advantages of the inclined drive shaft are several. In the first place, the weight of the power head is desirably brought into closer proximity to the transom of the boat, thus moving the whole center of gravity of the outboard motor closer to the boat.

In the second place, the motor with inclined steering axis will tilt more readily than a motor with a vertical axis in the event that shoals or other submerged obstacles are encountered.

In the third place, while the propeller shaft may be either horizontal or somewhat inclined to the horizontal during normal forward propulsion, the present arrangement makes it possible to obtain the advantages of an oblique relationship between the drive shaft and propeller shaft in engines of relatively high power, wherein it might not be desirable to direct the slip stream downwardly. For purposes of the present invention, the propeller shaft may, if desired, be entirely horizontal so that the thrust will be directly forward, with no upward component.

In the fourth place, while the invention is by no means limited in its application to outboard motors which rotate bodily for reversal, there is an important advantage in such motors in having an inclined drive shaft. A gear housing of the form here shown could not be used with a motor bodily rotatable about an upright axis without re-designing the bracket to locate that axis at a very substantially increased distance from the boat so that the housing would not strike the boat when rotated to reverse position. By reason of the fact that the swivel bearing axis is inclined, the power head is located closer to the transom and the gear housing is moved outwardly, leaving ample clearance within which to rotate to reverse propulsion position.

In the fifth place, whatever the position of the propeller shaft during normal forward propulsion, the oblique relationship between it and the inclined drive shaft causes a large part of the thrust to be exerted downwardly when the propulsion unit is rotated to a reverse driving position. This throws the propeller slip stream under the boat and tends to lift the entire stern of the boat to prevent water from being thrown into the boat dur-

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ing reverse operation. It also reduces boat speed in a rearward direction, even if the engine is erroneously operated at top speed. The improvement is, therefore, important from a safety standpoint.

In the drawings:

Fig. 1 is a view in side elevation of a mounted outboard motor embodying the present invention, a portion of its swivel bearing and portions of the boat being broken away.

Fig. 2 is a view on a reduced scale showing the same motor rotated to a reverse propulsion position.

Fig. 3 is a fragmentary view in side elevation showing the lower unit of a modified embodiment of the invention, its forward propulsion position being shown in full lines and its rearward propulsion position being shown in dotted lines.

Any conventional bracket 4 may be used to mount on the stern 5 of boat 6 a propulsion unit comprising a power head, gear case and connecting strut. Pivoted to the bracket by a pintle 3 to accommodate bodily tilting of the propulsion unit is a swivel bearing 7 in which the strut portion 8 of the propulsion unit is rotatable. In accordance with this invention, the strut and its bearing axis are forwardly inclined from the vertical as clearly shown in Fig. 1. The power head carried at the upper end of the propulsion unit includes an engine 9 having a crank shaft 10 and flywheel 11. The housing or shroud 12 may be so mounted as to appear horizontal despite the inclination of the steering axis in bearing 7.

The tiller comprises a portion at 13 which is fixed to strut 8 at an oblique angle to project approximately horizontally over the transom of the boat. The grip portion 14 of the tiller is pivoted at 15 to the portion 13 of the tiller to be capable of folding upwardly for use as a crank to assist in rotating the entire outboard motor from the position of Fig. 1 to the reverse propulsion position of Fig. 2.

As is usual in such motors, the strut 8 provides a rigid connection between the power head at its upper end and the gear housing 16 at its lower end. Extending through the strut into the gear housing is a drive shaft 17 aligned with crank shaft 10. Mounted in the gear housing is the propeller shaft 18 which carries the usual propeller 19. A gear 20 carried by the drive shaft 17 meshes with a gear 21 carried by the forward end of the propeller shaft to transmit motion from the engine to the propeller. An elongated inclined surface 22 at the forward margin of the gear housing extends from a point near water level and above the keel 24 of the boat to the skeg 23 so that it sheds weeds and prevents them from encumbering the gear housing. It also slides readily over shoals. The bodily tilting of the propulsion unit and its bearing 7 on pintle 3 is facilitated by the initial inclination of the strut and the fact that the power head is relatively far forward and over the pintle.

As above noted, the precise relationship of the propeller shaft to the horizontal is immaterial to the present invention. While it is shown horizontal in Fig. 1, it may be inclined as shown in Fig. 3, where the housing 160 has its propeller shaft 180 downwardly inclined to increase the obtuse angle between it and the drive shaft 17, with the result that the thrust will be directed even more sharply downwardly when the unit is turned to its reverse propulsion position as indicated in dotted lines in Fig. 3.

In any event, the rotation of the entire outboard motor for 180° as shown in Fig. 2 will result in directing the propeller thrust more or less downwardly, the exact extent of its downward direction being dependent on whether it was initially entirely horizontal or had,

during forward propulsion, a slight downward inclination.

With most outboard motors, it is dangerous to operate the engine at top speed during reverse. Not only does the movement of the boat, stern foremost, establish a wave at the stern, but the propeller slip-stream is directed toward the stern of the boat where it augments the height of the wave of water displaced by boat movement and tends to throw the water into the boat, sometimes swamping the boat and imperiling its occupants. With the present device, the lifting of the stern of the boat by the downward component of thrust of the propeller in reverse minimizes the wave and, in effect, increases the height of the transom above normal water level. In addition, boat speed in reverse is minimized because so large a component of propeller thrust is exerted downwardly rather than forwardly. In the third place, the propeller slip stream is now directed well below the boat and in a downward direction where it tends to draw water from the stern wave, instead of augmenting the height thereof. Finally, the moment exerted by the weight of the motor about the center of buoyancy of the boat is reduced by the fact that the weight of the power head is moved closer to the boat transom. In consequence of all of these advantages, the operation in reverse is much safer when this invention is used. At the same time, forward operation is unimpaired.

While some of the foregoing advantages involve the bodily movement of the entire motor in moving its swivel bracket for reversal, it will be observed that this is not true of others. The invention is principally intended for that type of motor but is not limited thereto and may be employed with outboard motors using other types of reversing mechanisms, and with outboard motors which have no reverse at all. The advantages of the invention from the standpoint of easy tilting and

the adaptability to engines of high power have nothing to do with reversal.

I claim:

In an outboard motor, the combination with a bracket support provided with a swivel bearing having a forwardly inclined axis, of a propulsion unit comprising a supporting strut and a gear casing connected therewith, the strut extending through the swivel bearing and having bearing surfaces rotatably mounted therein and fully rotatable through at least 180° of oscillation on said axis between forward and rearward propulsion positions, a drive shaft extending through the strut and having driving means, a driving gear disposed in the gear casing and connected with the drive shaft, a propeller shaft having a propeller at its rear end and mounted in the gear casing at an oblique angle to the drive shaft and provided with a driven gear at its forward end meshing with the driving gear, the propeller shaft having its propeller end no higher than its gear carrying end in positions of forward propulsion and having its propeller end very materially lower than its gear carrying end in positions of rearward propulsion, said propeller shaft being rearwardly inclined downwardly in the forward propulsion position of said unit and is more sharply inclined downwardly in the rearward propulsion positions of said unit.

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