Oct. 19, 1937. F. T. IRGENS 2,096,457

OUTBOARD MOTOR

Filed Feb. 12, 1934

Fig. 1.

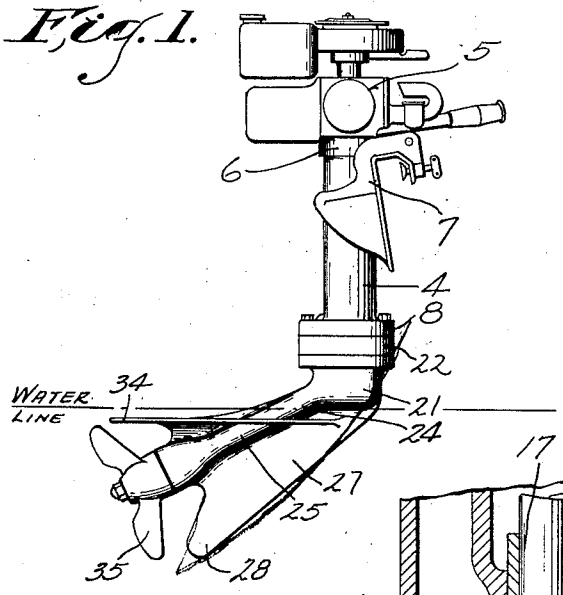


Fig. 2.

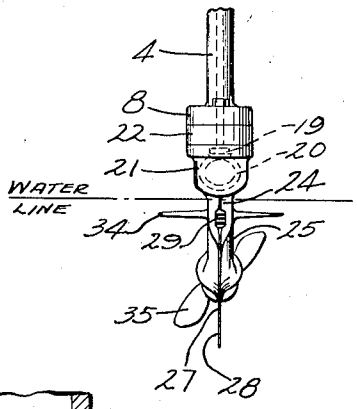
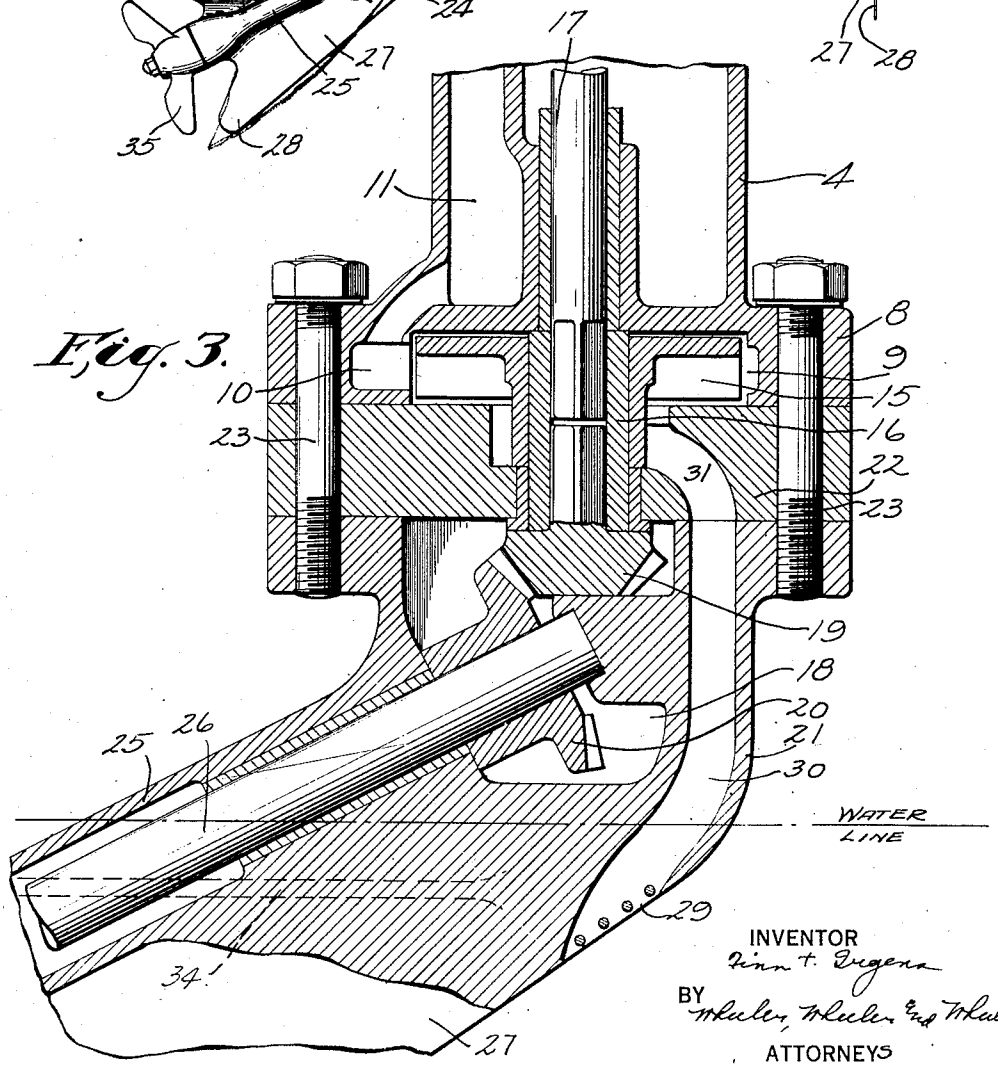


Fig. 3.



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OUTBOARD MOTOR

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10 Claims. (Cl. 115—18)

This invention relates to improvements in outboard motors, with particular reference to lower units thereof.

For the purposes of the present specification the term "outboard motor" is used generally to designate marine propulsion devices having outboard drives, irrespective of the location of the power head, it being well understood in the art that my improved lower unit for marine propulsion is susceptible of use to advantage with any source of power, whether located within or outside of the boat.

The conventional outboard motor has a substantially vertical drive shaft and a substantially horizontal propeller shaft, the driving connection between said shafts being completed by gearing encased in a streamlined submersible lower unit, below the water level. It is the primary object of the present invention to greatly reduce the resistance of the lower unit, to eliminate the need for streamlining thereof, to increase the speed and effectiveness, and to decrease the cost of outboard motor lower units by providing a construction in which the propeller shaft enters the water at an angle, and the gearing connecting it with the vertical drive shaft is disposed above, or near, normal water level.

Another object of the invention is to provide an improved lower unit which may be associated with conventional engine and shaft housing structures by a mere substitution without other change.

It is a further extremely important object of the invention to provide an outboard motor lower unit of a type closely associated with the steering transom of the boat in the ordinary manner but nevertheless substantially completely weedless in operation, and having improved steering action due to an increased radius of fin surface with respect to the axis upon which the device turns for steering.

In the drawing:

Figure 1 is a side elevation of an outboard motor embodying the present invention.

Figure 2 is a front elevation of the lower unit thereof.

Figure 3 is an enlarged detail in cross section in a vertical plane including the axes of the drive shaft and propeller shaft.

Like parts are identified by the same reference characters throughout the several views.

As above indicated, the outboard motor organization in general may be of a conventional type in which the shaft housing 4 and power head 5 is bodily rotatable in the bearing 6 of transom bracket 7 for steering. The shaft housing terminates at its lower end in a flange 8 internally recessed at 9 to provide a pump chamber having a peripheral outlet 10 to the passage 11 which leads upwardly to deliver cooling water to the engine comprising a part of the power head 5.

The centrifugal pump runner 15 may be mounted on the coupling sleeve 16 which is internally squared to receive the lower end of the drive shaft 17 from the engine of the power head. Thus far the device corresponds with a well known outboard motor.

In accordance with the present invention the gear chamber 18 of the lower unit has been moved from a submersed position to a position preferably above the water line which is indicated in the drawing. In the preferred construction herein disclosed the gear chamber is completely above the normal water level so that the enlargement necessary for the accommodation of the gears 19 and 20 will not impede the progress of the device through the water. The gear casing portion 21 of the lower unit is closed by a cover plate 22 which is interposed between the flange 8 and the gear casing and serves not only to close the gear chamber 18, but also to close the lower side of the pump chamber 9. Bolts at 23 pass through flange 8 and closure section 22 into threaded engagement with the gear casing portion 21 of the lower unit to maintain the parts in assembled relation.

Below the gear casing portion 21 of the lower unit the width or transverse thickness of the lower unit is sharply restricted as shown at 24 in Fig. 2, so that its maximum dimension is that of the tubular portion 25 of the lower unit through which the inclined propeller shaft 26 passes. The leading edge of this portion of the lower unit is preferably sharp at the water line as shown in Fig. 2, and continues sharp therebeneath along the fin plate 27 to the skeg 28 except for a minor enlargement at 29 which provides space for an inlet port communicating by means of duct 30 in the lower unit and duct 31 in the closure plate 22 with the intake of pump chamber 9.

Just below the water level an anti-cavitation plate 34 may, if desired, be cast integrally on the inclined propeller shaft housing portion 25 of the lower unit to lie in an approximately horizontal position above the propeller 35 which is carried by the lower end of the inclined propeller shaft 26.

Since the gearing is located above normal water level it is no longer necessary to economize on

the size of the gears. The submerged parts of the device need only be sufficiently wide to accommodate the propeller shaft, rather than the gearing, and consequently are greatly reduced as compared with any previous outboard motor having a vertical drive shaft. The resistance offered to the water is accordingly greatly reduced as compared with previous practice and the speed correspondingly increased. Since the fin surface 27 extends to a considerable distance behind the bearing 6 in which the device turns unitarily for steering, the steering effect is materially enhanced.

One of the greatest advantages of the device, however, consists in its adaptability for use in shallow and weedy waters. There is nothing below water level to which a weed can cling. From a point near or above normal water level the lower surface of the fin 27 is continuously inclined sharply to the rear and any weed encountering this surface will slide easily beneath the lower unit without catching thereon. The angle of the lower surface of the fin 27 to the horizontal should not exceed about 40 degrees. The water intake 29 has been so located that any weeds tending to obstruct the intake port will be brushed therefrom by the flow of water with respect to the lower unit, and by contact with other weeds.

The same sharp inclination of the lower margin of fin surface 27 to the rear makes the motor remarkably free from damage in rocky waters. The entire motor is preferably pivotally connected with bracket 7 in the conventional manner and, due to the long incline of the lower margin of the submerged unit, it tilts easily in passing over shoals or submerged obstacles.

It will be appreciated by those skilled in the art that the weedproof advantages of the construction herein disclosed are not dependent upon the location of the gear casing above the water level, but are inherently present due to the long inclination of the lower margin of fin 27 irrespective of the gear casing position with reference to the water line.

The downward inclination of the propeller shaft and the consequent slightly inclined direction of propeller thrust has an advantage in a motor which is made fast to the transom in that it tends to keep the boat on an even keel. An outboard motor propeller tends to withdraw water from beneath the stern of the boat, thereby allowing the stern to settle slightly. Since the operator of the boat is normally seated in the stern his weight, coupled with that of the motor, likewise contributes to the tendency of the boat to ride with the stern depressed and the bow elevated. In the present device the thrust of the motor is so directed and transmitted to the boat as to tend to counteract this tendency and to maintain the boat on an even keel, thereby greatly reducing the resistance of the boat to the water.

I claim:

1. In an outboard motor, the combination with a power head and a downwardly extending shaft provided with a pinion, of a propeller shaft provided with a gear meshing with said pinion, and housing means providing enclosures for said shafts, pinions, and gears, and a propeller on said propeller shaft, the lower and forward margin of said housing means providing a substantially continuous unbroken surface inclined downwardly and at a sharp angle rearwardly from a point adjacent the water line to a point adjacent the propeller, together with a cooling system for said power head including water circulating means having an inlet in said housing means below normal water level in a downwardly and rearwardly inclined weed-shedding portion of said housing from which the rearward slope of said margin is continuous to the said point adjacent the propeller.

2. A lower unit for the purposes described, comprising a gear casing portion, a propeller shaft housing connected with said gear casing portion and extending downwardly and rearwardly therefrom, and an internal water passage in said lower unit leading past said gear casing portion in an upward direction from a point therebeneath, said lower unit having a substantially unbroken line along its forward and lower edge from a point adjacent the normal water level to the stern of the unit, said water passage having an intake port adjacent said line, whereby to tend to discharge downwardly and rearwardly materials which might otherwise stop said port.

3. The combination with a lower unit for the purposes described, having a downwardly and rearwardly extending propeller shaft housing, of a gear case connected with said housing, a propeller shaft in said housing having a propeller at the stern thereof, propeller shaft gearing in said gear case, and a water pump provided with a chamber above said gear case, said lower unit providing an internal inlet passage for said pump leading past said gearing to a point directly forwardly of said downwardly and rearwardly inclined propeller shaft and beneath said gearing.

4. The combination with a downwardly extending drive shaft and a housing therefor providing a pump chamber, of a pump on said shaft, a closure for the lower side of said pump chamber, a downwardly and rearwardly extending propeller shaft casing including a gear chamber secured below said closure and having a lower forward surface inclined downwardly and sharply to the rear, a propeller shaft in said casing provided with a propeller at its stern end, gearing in said gear case operatively connecting said drive shaft and propeller shaft, and a water conduit leading from the intake of said pump casing to a point below normal water level in said downwardly and rearwardly inclined surface of said casing said surface being substantially unobstructed rearwardly from said point for the free discharge of material which might otherwise stop said conduit.

5. A lower unit for an outboard motor having a vertical drive shaft assembly and a power head mounted thereon adapted to be readily connected to and disconnected from the transom of a boat, comprising a driven shaft extending downwardly and rearwardly from the drive shaft of said assembly, gearing connecting said shafts, a propeller on the lower end of said driven shaft, a casing for said driven shaft having bearings therefor and rigidly secured to said assembly and co-operating therewith to enclose said gears, said casing being provided with a generally horizontally arranged anti-cavitation plate and a weed deflecting fin projecting downwardly from the lower side of said casing and extending from a point above the level of said anti-cavitation plate to the propeller whereby weeds will be deflected away from the propeller.

6. An outboard motor comprising a power head, an upper substantially vertically disposed housing unit, a power shaft connected to said power head and journaled in said housing, a lower housing unit rigidly supported below the lower

end of the first mentioned housing unit, a propeller shaft journaled in said lower unit and disposed in driven relation to said power shaft, a propeller on the rear end of said propeller shaft, an anti-cavitation plate on said lower housing unit above the level of said propeller, and a weed shedding skeg associated with said lower housing unit having its lower edge extending on a downwardly and rearwardly inclined line from a point substantially at the level of said anti-cavitation plate, to a point at least as low as the lowest point in the path of said propeller.

7. In an outboard motor having a propeller and driving means therefor, a housing construction for the propeller driving means, comprising a substantially vertically disposed upper unit terminating at its lower end in an enlarged portion, a rearwardly and downwardly inclined lower unit terminating at its upper end in an enlarged portion, means connecting said enlarged portions, an anti-cavitation plate on the lower unit extending in a plane above the propeller, and a weed shedding skeg on the under surface of said lower unit extending from said enlarged portion downwardly and rearwardly on a continuous, unbroken, inclined line to a point adjacent said propeller, whereby to protect said propeller and shed weeds therefrom.

8. A lower unit for an outboard motor having a vertical drive assembly and a power head mounted thereon adapted to be readily connected to and disconnected from the transom of a boat, comprising a driven shaft extending downwardly and rearwardly from the drive shaft of said assembly, gearing connecting said shafts, a propeller on the lower end of said driven shaft, a casing for said driven shaft having bearings therefor and rigidly connected with said assembly and having an enlargement at its upper end cooperating with said assembly to enclose said gears, said casing being provided with a weed deflecting fin projecting downwardly from the lower side of said casing and having its lower margin extending substantially rectilinearly from a point at the lower and forward end of said enlargement to the propeller at an angle such that weeds will slide rearwardly and downwardly along such margin in the operation of the motor, whereby weeds will be deflected away from the propeller.

9. An outboard motor comprising a power head, casing means depending from the power head and providing a vertically disposed upper portion and a downwardly inclined, rearwardly projecting lower portion, a vertical drive shaft connected to the power head and journaled in the upper portion, a downwardly and rearwardly inclined propeller shaft journaled in the lower portion at the rear upper side thereof, a propeller on the end of said propeller shaft, motion transmitting means connecting said shafts, said lower portion of the casing means comprising a skeg having its forward lower edge disposed on a continuous unbroken and approximately rectilinear line inclined downwardly and rearwardly at a weed shedding angle, said angle being a greater angle to the horizontal than the angle of inclination of the propeller shaft, said edge extending from the forward end of said lower portion, beginning at a level above the path of the propeller, to a point adjacent the lower tip of the propeller, thereby to shed weeds encountered by the casing skeg to a point below the propeller.

10. An outboard motor comprising the combination with a dirigible housing and a transom bracket provided with means for the support of said housing, of a drive shaft extending in a generally upright position downwardly through said housing, a downwardly and rearwardly inclined shaft housing rigidly connected adjacent its forward end with said dirigible housing, a propeller shaft in said last mentioned housing, motion transmitting means connecting the propeller shaft with the drive shaft, a propeller on the propeller shaft having a definite path of rotation, and means for shedding weeds comprising a skeg applied beneath said propeller shaft housing and having its lower margin extending rearwardly and downwardly at a weed shedding angle continuously along a substantially unbroken and approximately straight line from a forward point ahead of said drive shaft above the level of the highest point in the path of rotation of the propeller to a rearward point disposed immediately adjacent the lowest portion of the propeller.

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