

May 24, 1938.

O. C. LINTHWAITE
OUTBOARD MOTOR ASSEMBLY

Filed Jan. 16, 1935

2,118,209

2 Sheets-Sheet 1

FIG. 1

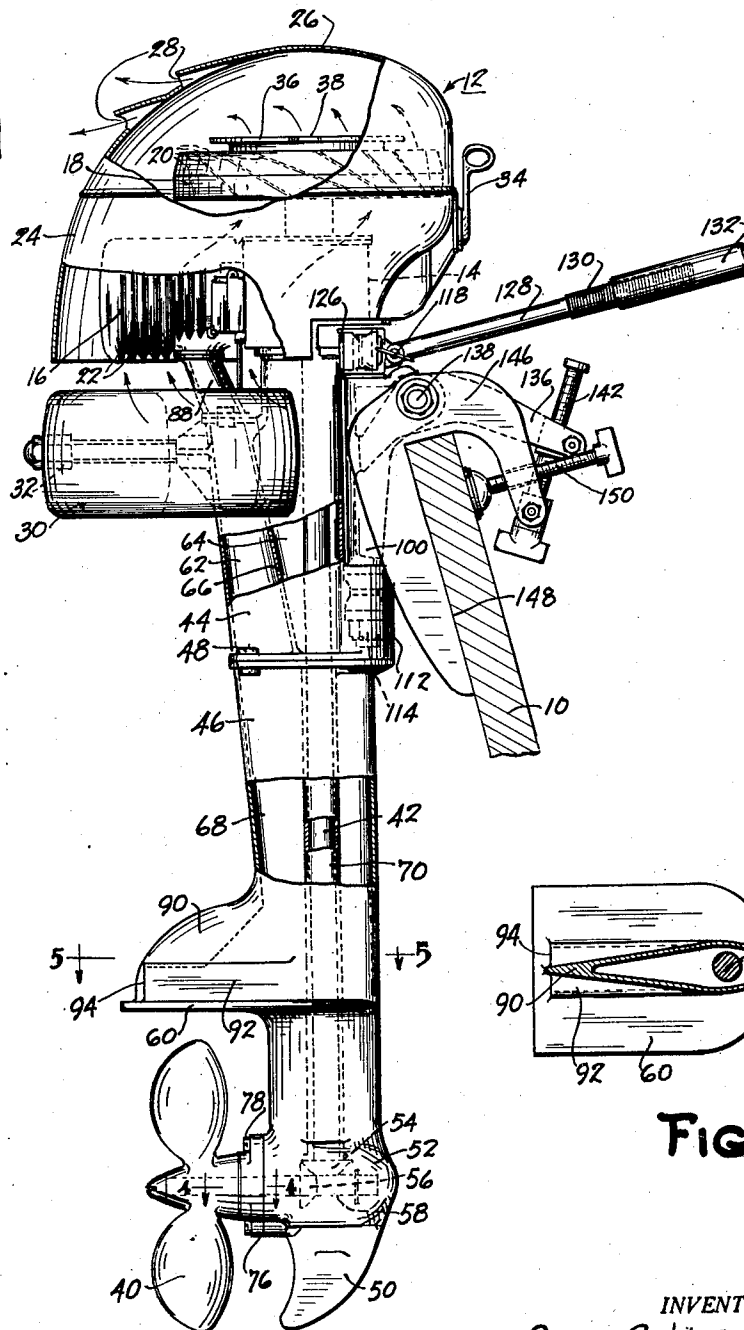


FIG. 5

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FIG. 2

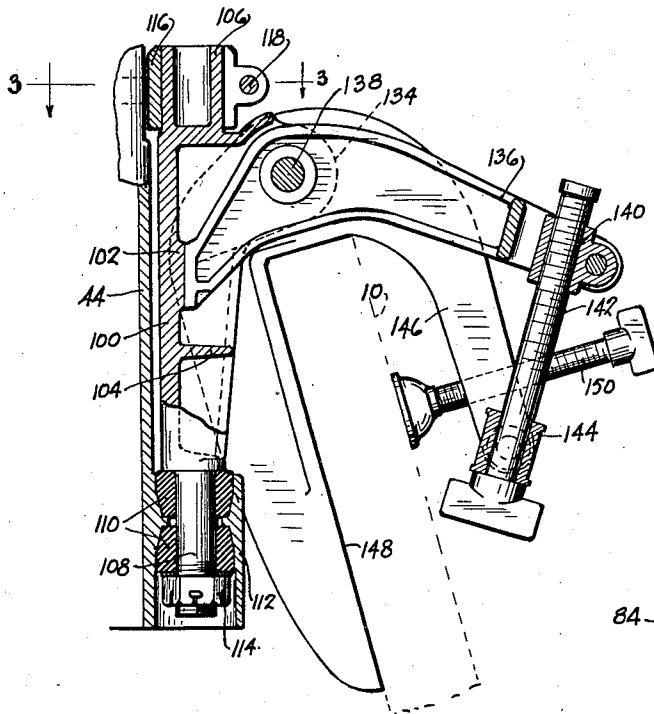


FIG. 4

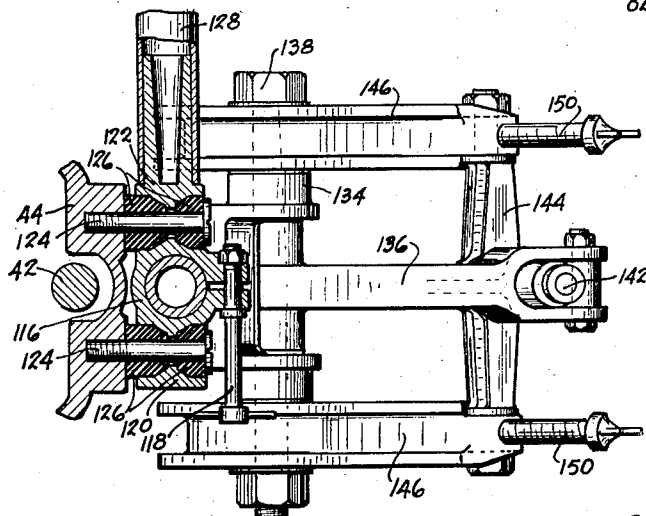
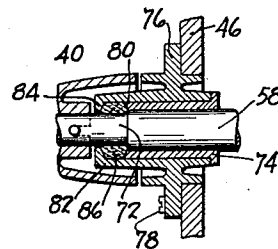


FIG. 3

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OUTBOARD MOTOR ASSEMBLY

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2 Claims. (Cl. 115-18)

This invention relates to power plants, and more particularly to the internal combustion engine type of power plant adapted particularly for use with water-craft. The particular type of engine referred to herein is commonly known as the outboard motor, and is characterized by the fact that the motor is turnable about an axis to effect the steering of the craft to which the motor is attached.

One feature of the invention relates to novel means for attaching the motor to the boat in such a manner that adjustments of the angle between the drive shaft of the motor and the transom of the boat may be easily and quickly made without interrupting the operation of the motor or moving it from the transom of the boat. Preferably the motor is provided with adjustable means for attaching it to any boat regardless of the angle of the transom.

Another feature has to do with novel steering means so arranged that the motor is turnable about an axis adjacent to, but not concentric with, the propeller shaft to effect steering operations of the boat. I prefer to provide the motor with a novel co-pilot having a manually operable member to fix the engine against steering movements or to cause it to steer a predetermined course.

Other features relate to novel means for preventing engine vibration from being transmitted to the boat; to an improved Venturi exhaust effect wherein the exhaust gases are discharged from the engine at the most restricted section of the passage and are immediately directed into a flared passage to reduce back pressure of the gases; to a novel stream-lined drive shaft housing and exhaust passage wherein a portion of the housing is employed as an expansion chamber for exhaust gases; to the provision of a stream-lined under-water exhaust passage communicating with the interior of the drive shaft housing, and adapted to discharge exhaust gases beneath the surface of the water but above the anti-cavitation plate; to an improved combination of a bladed flywheel with a stream-lined hood provided with ventilating louvres for air-cooling the motor; to a novel resilient tiller for steering the craft; and to the arrangement of a stream-lined rubber mounted fuel tank beneath the engine to supply fuel to the engine.

Another object of the invention is to prevent water from entering the lower propeller gear housing.

Having the above and other objects particularly in mind the invention comprehends the combination and arrangement of parts herein-after fully described and illustrated in the accompanying drawings, submitted for purposes of illustration only, and not intended to define

the scope of the invention, reference being had for that purpose to the subjoined claims.

In the drawings, wherein similar reference characters refer to similar parts throughout the several views:

Figure 1 is a side elevation, partly in section, of an outboard motor embodying the present invention;

Figure 2 is a side elevation, partly in section, on a larger scale, showing the means by which the motor is attached to the boat;

Figure 3 is a view on the line 3-3 of Figure 2; Figure 4 is a sectional view on the line 4-4 of Figure 1; and

Figure 5 is a perspective view on the line 5-5 15 of Figure 1.

Referring to the drawings and more particularly to Figure 1, there is shown a portion of a boat having a transom 10 adapted to receive an outboard motor assembly indicated as a whole 20 by the reference numeral 12.

The outboard motor assembly 12 includes an internal combustion engine having a crankcase 14, and, in the preferred embodiment, an air-cooled cylinder 16, and a flywheel 18. The flywheel 18 is provided with a plurality of fan blades 20 to force air to flow over the crankcase 14, and the cooling fins 22 of the cylinder 16 to prevent those parts from becoming too hot due to the heat of combustion.

The engine is surrounded by a stream-lined hood having a lower section 24 and an upper section 26. The stream-lined hood imparts a graceful appearance to the engine and materially assists in directing the flow of cooling air over the engine parts and out through the cooling louvres 28. If desired, the fan blades 20 carried by the flywheel 18 may be positioned to draw air in through the louvres 28 and force it downwardly over the engine parts and discharge it below the lower section 24 of the hood.

A stream-lined fuel tank 30 positioned beneath the lower section 24 of the hood is carried on rubber mountings 32 and supplies liquid fuel for the operation of the engine.

A lever 34 projecting through the lower section 24 of the hood actuates a latch to release the upper section 26 of the hood and sets the spark, throttle and choke valves of the carburetor in the starting positions. The flywheel 18 is provided with a flanged hub 36 having a plurality of notches 38 positioned therein to receive one end of a knotted rope wrapped around the hub 36 to rotate the engine for starting purposes.

The power of the engine is transmitted to a propeller 40 through a drive shaft 42. The drive shaft 42 passes through an upper stream-lined housing 44 and a lower stream-lined housing 46. The upper and lower housings are jointed to-

gether by any suitable means such as the bolts 48.

The lower housing 46 is provided at its lower-most extremity with a propeller protecting fin 50, which travels ahead of the propeller 40 to engage any obstacle which might injure the propeller and move the propeller to a position to avert damage thereto by a mechanism to be hereinafter more fully described.

Immediately above the fin 50 is a propeller drive gear housing 52. The drive shaft 42 is fitted with a bevel gear 54 which meshes with another bevel gear 56 fixed to a propeller shaft 58 which carries the propeller 40.

The lower housing is provided with an anti-cavitation plate 60. The plate 60 has a smooth flat lower surface and lies a short distance above the propeller. The housing 46 is stream-lined below the plate 60 to prevent air from pocketing in front of the propeller 40 due to the forward movement of the boat through the water. The proportions and size of the plate 60 vary in accordance with the speed at which the boat is propelled through the water, that is a motor designed for racing or high speed operation will be designed with a smaller anti-cavitation plate than one intended for slow speed or pleasure operation.

The upper housing 44 is divided into two chambers 62 and 64 by a partition wall 66. The drive shaft 42 passes through the chamber 64, and into a chamber 68 formed in the lower housing 46. A casing member 70 surrounds the shaft 42 and protects it from water, gases, etc. The casing 70 is pressed into fluid-tight relation with the upper portion of the propeller drive gear housing 52 at the lower end, and is a pressed fit through an aperture in the upper end of the housing 46.

Water is prevented from entering the housing 52 from the propeller side by the novel packing illustrated in Figure 4. The propeller shaft 58 is provided with a section of reduced outer diameter 72. The shaft 58 rotates in a bearing 74, pressed into a plate 76. The plate 76 is fastened to the housing 52 in any suitable manner as by the studs 78. The end of the bearing 74 is concave as at 80 to coincide with the end of the section of larger outer diameter of the shaft 58. The plate 76 is provided with an extension 82 having a contracted outer portion 84 adapted to lie closely adjacent to the section of reduced outer diameter of the shaft 58. The space between the sections 72 and 80, and the contracted outer portion 84 of the extension 82 is packed with cork or other suitable packing material 86. In order for water to pass along the shaft 58 to the housing 52 it must follow a tortuous course, and water is thus effectively prevented from entering the housing, and the gear lubricant is successfully retained therein.

The exhaust gases pass from the engine through a short casing member 88 interposed between the exhaust outlet of the engine and the chamber 62 in the upper housing 44. The chamber 62 communicates with the chamber 68 in the lower housing 46.

The housing 46 is provided with a stream-lined fin 90 positioned above the anti-cavitation plate 60 to assist in steering the boat, and to reduce the turbulence of the water flowing past the housing 46. The lower portion of the fin is expanded laterally as at 92 to form a stream-lined exhaust outlet 94 communicating with the chamber 68 in the lower housing 46.

It will be observed that a Venturi exhaust ef-

fect is obtained by discharging the exhaust gases from the engine at the most restricted cross-sectional area of the casing member 88. The exhaust gases travel downwardly through the progressively increasing cross-sectional area of the casing member 88 and the chamber 62 formed in the housing 44 and discharge into the chamber 68 formed in the housing 46.

The increasing area of the exhaust passages 88 and 62 permits the exhaust gases to expand gradually. The chamber 68 forms a convenient and suitable expansion chamber which, together with the progressively increasing volume of the chambers above prevent back pressure from being exerted upon the engine.

Water flowing over the fin 90 of the housing 46 cools the exhaust gases in the chamber 68 thereby causing them to contract and drop to the lower portion of the chamber 68 where they are discharged through the exhaust outlet 94 in the fin 90. The exhaust gases are thus discharged beneath the surface of the water but above the anti-cavitation plate 60. The result is that quiet operation of the engine is effected, and the exhaust gases are discharged to the rear of the propeller so that the density of the water flowing past the propeller is not decreased.

The operation of the device thus far described is as follows. To start the engine the operator moves the lever 34 to unlatch the upper section 26 of the hood; retard the spark, and set the choke and throttle valves of the carburetor to the starting position. A knotted rope, one end of which engages one of the notches 38, is then wrapped around the flanged hub 36 and the engine rotated by pulling the rope, in the known manner.

When the engine starts to operate on its own power the upper section 26 of the hood is closed. Air is drawn by the rotating blades 20 of the fly-wheel 18, through the lower section 24 of the hood, over the engine parts, to absorb heat therefrom, and is then driven out through the louvers 28 formed in the upper section 26 of the hood.

Power is transmitted from the engine by the drive shaft 42 passing through the chamber 64 of the housing 44, and the casing 70 in the chamber 68 of the lower housing 46, to the propeller drive gear housing 52. In the housing 52 a bevel gear 54 carried by the drive shaft 42 meshes with another bevel gear 56 fixed to the propeller shaft 58 to drive the propeller 40 carried by the shaft 58. Water is prevented from entering, and the gear lubricant is prevented from escaping from the housing 52 by the novel packing means fully described heretofore.

The exhaust gases pass from the engine exhaust passage into the casing member 88 wherein a limited amount of expansion is permitted. The gases then pass to the chamber 62 wherein further expansion occurs, and the gases are forced downwardly into the chamber 68 where considerable expansion of the gases is permitted. The temperature of the gases is rapidly lowered due to the cooling effect of the water flowing over the lower portion of the housing 46 and the fin 90. The volume of gases is thereby rapidly decreased and they move toward the bottom of the chamber 68, and are discharged through the exhaust outlet 94 below the surface of the water.

Novel means are provided to fix the motor to the transom 10 of the boat to be propelled. The motor is suspended on a U-shaped pressure plate 100, having a reinforced portion 102, and rigidifying flanges 104. The upper end of the pressure

plate is rounded to form a bearing surface 106, and the lower portion is provided with a threaded bolt section 108. The section 108 passes through resilient bushings 110, which may be made of rubber or other suitable material, received within a housing 112 carried by the upper housing member 44, and is held in place by a nut 114.

The bearing surface 106 carried by the upper end of the pressure plate 100 is engaged by an adjustable clamping bracket 116 having a manually operable thumb screw 118 to vary the resistance to turning movement between the motor and the pressure plate 100. This feature is commonly referred to as the co-pilot and will be more fully discussed hereinafter.

The clamping bracket 116 is provided with laterally extending projections 120 and 122. These projections are adapted to receive bolts 124 to fix the clamping bracket 116 to the housing member 44. Resilient bushings 126, made of rubber or other suitable material, are positioned between the bolts 124 and the housing 44 to damp out vibration, and to coat with the bushings 110 to electrically insulate the motor from the boat.

The projection 122 of the clamping bracket 116 is provided with a tiller 128 for turning the motor about the axis of the pressure plate 100 for steering the boat.

The resilient bushings 126 permit the motor to vibrate freely about the axis of the plate 100 an amount equal to the natural amplitude of its torque vibration. A minimum force is therefore required on the tiller 128 to hold the motor in any desired position or to move it to any new position for steering the boat.

The operating end of the tiller is flexible, having a coiled spring or other flexible member 130 embedded in a resilient handle 132 formed of rubber or other suitable material. Vibration of the motor is thus damped out, and the grip 132 is electrically insulated from the motor.

The pressure plate 100 carries a pair of supporting braces 134. A pressure arm 136 is pivotally mounted on a bolt 138 passing through the supporting braces 134. One end of the pressure arm 136 abuts the reinforced portion 102 of the pressure plate 100. The other end of the pressure arm 136 is provided with screw threads 140 to receive one end of a pressure screw 142. The other end of the screw 142 is held by a pressure bar 144. The pressure bar 144 extends between and is fixed to a pair of U-shaped attaching brackets 146. The brackets 146 are pivoted on the bolt 138, carried by the supporting braces 134, and are provided with boat engaging surfaces 148 which coast with thumb screws 150 threaded through the other leg of the bracket 146 to hold the motor in place on the transom 10 of the boat.

Means are thus provided for varying the angle between the drive shaft 42 of the motor and the transom 10 of the boat. The motor is thus capable of being used on any boat regardless of the angle of transom.

To attach the motor to any boat the brackets 146 are placed over the transom with the boat engaging surfaces 148 contacting the outboard side of the transom. The thumb screws 150 are then tightened to fix the bracket 146 in place. The pressure screw 142 is then rotated to move the motor to any desired angle with respect to

the transom 10. By rotating the screw 142 to project it further through the pressure arm 136 will move the lower portion of the drive shaft 42 in the clockwise direction as viewed in Figures 1 and 2, thereby increasing the angle between the drive shaft 42 and the transom 10.

In operation the thrust of the propeller 40 is exerted upon the pressure arm 136, transferred through the pressure screw 142 to the pressure bar 144 positioned between the attaching brackets 146, and then exerted upon the transom 10, to move the boat through the water.

The reinforced portion 102 of the pressure plate 100 is held in contact with the end of the pressure arm 136 by the weight of the engine and the thrust of the propeller. The motor is however free to swing about the bolt 138 so that if the lower housing 46 or the fin 50 strikes against an object the motor will swing up pivoting about the bolt 38 to avoid injuring the propeller 40.

To steer the boat, the operator grasps the resilient handle 132 and rotates the tiller 128 fixed to the motor. The motor rotates about the axis of the pressure plate 100 to effect the steering of the boat.

If desired, the thumb screw 118 can be rotated to tighten the bracket 116 on the bearing surface 106 to hold the motor from rotation about the axis of the pressure plate 100 while starting the engine or to cause the boat to which the motor is attached to steer any desired predetermined course. The operator is thus relieved of a portion of the physical labor required to steer the boat.

The housings 44 and 46 together with the means for attaching the motor to the boat are so designed that other forms of power plants may be substituted for the power plant shown and described herewith where greater power is required. For instance, a power plant having opposed or parallel cylinders may be employed, and the cooling of this unit may be by air or by liquid.

While the invention has been described with particular reference to a preferred embodiment, it is not intended to limit the scope of the invention to the embodiment shown, nor otherwise, than by the terms of the following claims.

I claim:

1. In an outboard motor, an engine, a propeller, a drive shaft housing comprising upper and lower sections interconnecting the engine and propeller, an exhaust outlet from the engine, means including diverging walls forming a downwardly extending passageway in the upper section, and means including a rearwardly directed under-water exhaust outlet in the lower section of the housing to permit the escape of the expanded gases without heating the engine.
2. In an outboard motor, an engine, a propeller, a drive shaft housing comprising upper and lower sections interconnecting the engine and propeller, a drive shaft in said housing, an exhaust outlet from the engine, means including diverging walls forming a downwardly extending passageway in the upper section of said housing, means including a rearwardly directed under-water exhaust outlet in the lower section of the housing to permit the escape of the expanded exhaust gases without heating the engine, and a liner surrounding the drive shaft.

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