Jan. 10, 1939. H. PALMER 2,143,573

OUTBOARD MOTOR CONSTRUCTION

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Fig. 1.

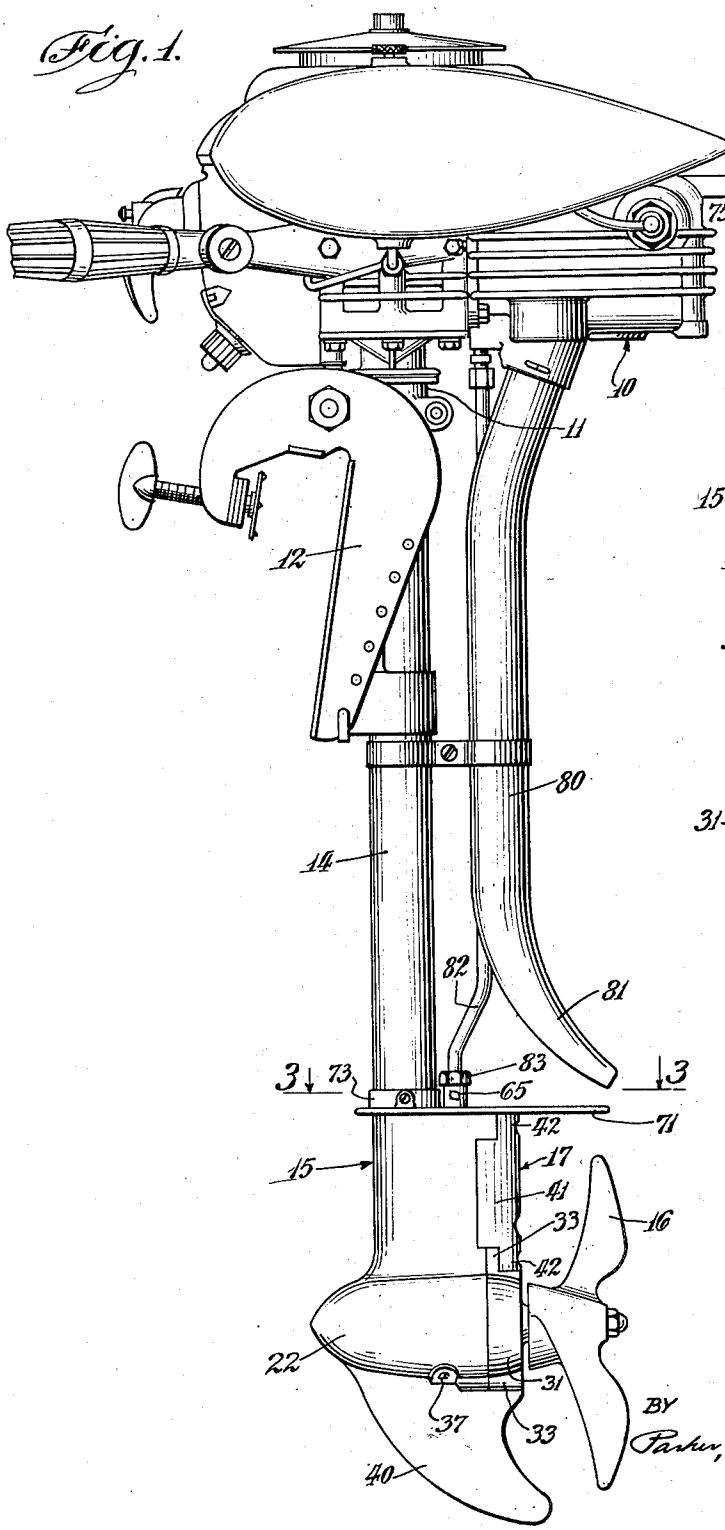

Fig. 2.

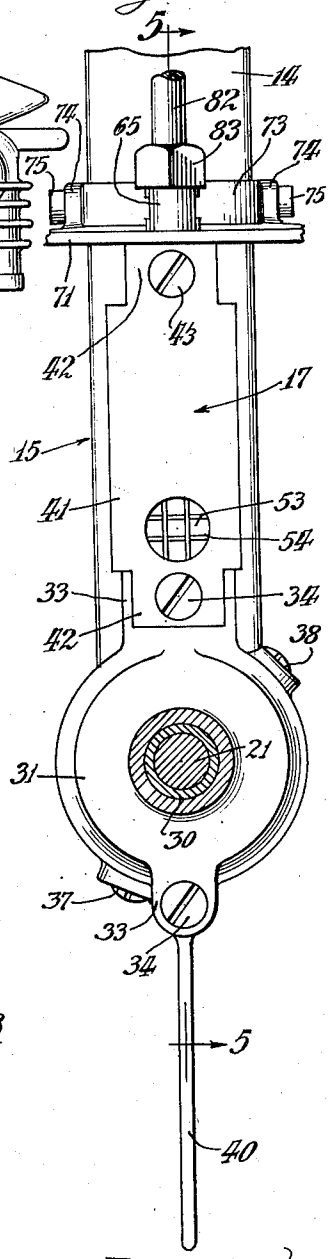

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Fig. 3.

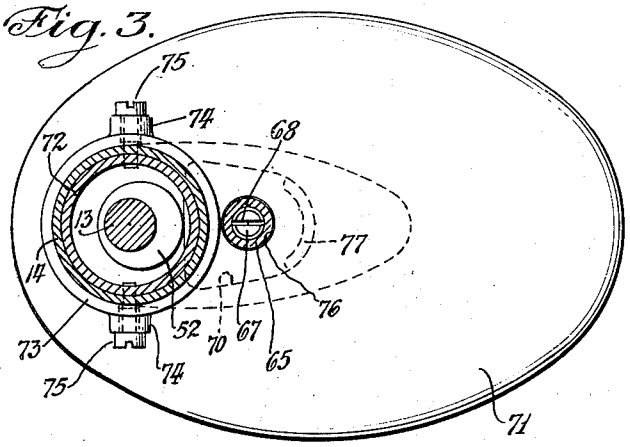


Fig. 4.

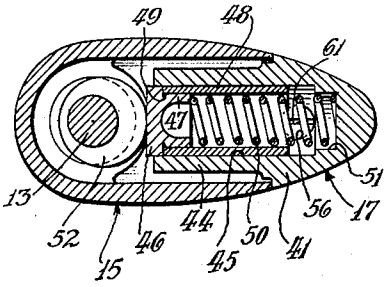
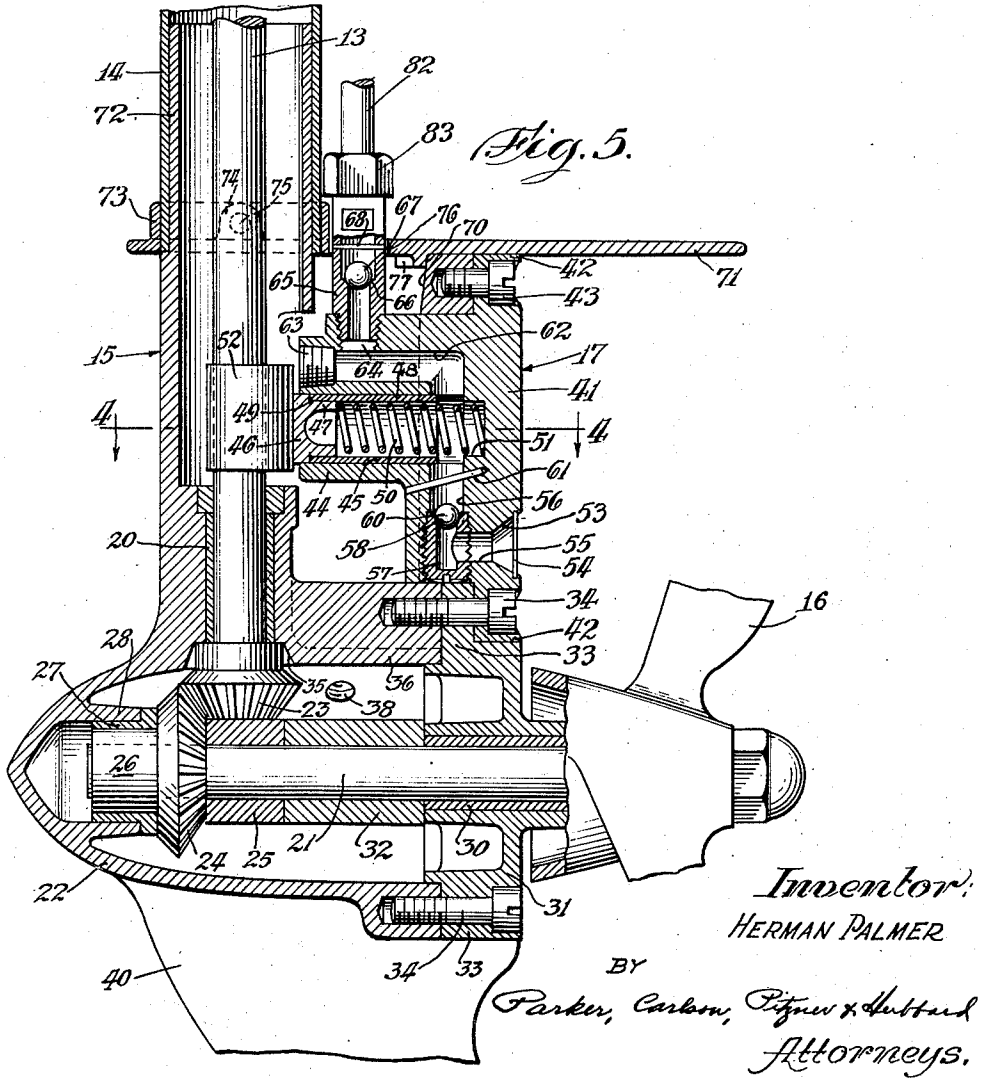


Fig. 5.



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UNITED STATES PATENT OFFICE

2,143,573

OUTBOARD MOTOR CONSTRUCTION

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Application January 20, 1936, Serial No. 59,804

7 Claims. (Cl. 115—17)

The invention relates generally to marine propulsion devices and more particularly to an outboard motor.

The general object of the invention is to provide an outboard motor, the underwater portion of which is of a generally streamline shape and has incorporated therein a pump for supplying cooling water to the motor, the pump being removable as a unit from said underwater portion by a simple lateral movement.

More specifically, it is an object to provide an outboard motor having an underwater portion enclosing a vertical drive shaft with a piston pump located on a horizontal axis and actuated by said shaft, the pump and underwater portion together presenting an external streamline shape and being readily separable by a simple lateral movement.

It is also an object to provide an outboard motor having a vertical drive shaft casing from which is suspended an underwater unit having a portion secured in telescopic relation to the casing, and an anti-cavitation plate carried on the top of said unit and secured by means of a collar surrounding said casing.

Another object is to provide an outboard motor having a vertical drive shaft casing from which an underwater unit is suspended, with an exhaust pipe paralleling said casing and a pipe for supplying cooling water to the motor extending upwardly from the underwater unit and into said exhaust pipe.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawings, in which:

Figure 1 is a side elevational view, on a reduced scale, of an outboard motor embodying the features of the invention.

Fig. 2 is a fragmentary rear elevational view of the lower end of the motor shown in Fig. 1.

Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 1.

Fig. 4 is a horizontal section taken on the line 4—4 of Fig. 5.

Fig. 5 is a vertical section taken on the line 5—5 of Fig. 2.

An outboard motor embodying the features of the invention comprises generally a motor unit rotatably supported by a bracket adapted to be clamped to the stern of a boat. Extending downwardly from the motor unit is a vertical drive shaft casing from the lower end of which is suspended an underwater unit housing therein mechanism for driving a propeller. The underwater unit has a horizontal cross-section constituting a portion of a streamline or tear-drop shape, and completing such shape is a pump unit. The latter extends into the housing unit and has a piston reciprocable on a horizontal axis by the drive shaft within the housing unit, the pump unit being removable for purposes of repair merely by a horizontal movement, and replacement thereof in the housing unit places the piston of the pump unit in operative relation to the shaft.

The pump unit has an intake port opening at its rear edge, while its outlet port is located at the top within the housing unit and is provided with a pipe fitting extending upwardly through an aperture in the top of the housing unit to the rear of the drive shaft casing. A separate anti-cavitation plate is carried on the top of the housing unit and is provided with a collar at its forward end surrounding the lower end of the drive shaft casing, the pipe fitting extending through the plate.

The motor unit has an exhaust pipe extending downwardly and paralleling the drive shaft casing at the rear thereof, with the lower portion of the exhaust pipe bent rearwardly and terminating adjacent the rear edge of the anticavitation plate. Connecting the pump unit with the motor unit to supply cooling water thereto is a water pipe extending from the pump outlet fitting and entering the exhaust pipe at the bend adjacent the lower end thereof.

As shown in the drawings, the preferred embodiment of the invention comprises a motor unit, indicated generally in Fig. 1 as 10. The motor unit is rotatably supported, for steering purposes, by a bearing 11 carried on a bracket 12 adapted to be clamped on the stern of a boat. Extending downwardly from the bearing 11 and the motor unit is a drive shaft 13 enclosed by a drive shaft casing 14 which in the present instance is a round tube. Suspended from the lower end of the casing 14 is an underwater unit, indicated generally at 15, housing a drive mechanism for a propeller 16 mounted on a horizontal axis.

The underwater unit has a partial streamline or tear-drop contour in horizontal cross-section and completing such contour is a pump unit, indicated generally at 17, so that the underwater and pump units together provide a complete external shape of streamline contour. In the preferred form, the front end of the underwater unit is rounded, and the drive shaft 13 extends therein substantially concentric with the rounded

end and is journalled in a bushing 26 supported in the lower portion of the unit.

The propeller 16 is carried on a horizontal shaft 21 housed in the lower part of the underwater unit which is enlarged to provide a barrel-shaped portion 22. The portion 22 provides space for a pair of bevel gears 23 and 24 (see Fig. 5) affording a driving connection between the drive shaft 13 and propeller shaft 21. The bevel gears 23 are preferably so proportioned that the speed of propeller shaft 21 is less than the speed of the drive shaft 13. The gear 23 is splined on the lower end of the drive shaft 13 and is held in position by a block 25 through which the propeller shaft 21 extends. The gear 24 is splined on the front end of the propeller shaft 21 and has a hub portion 26 journalled in a thrust bushing 27 carried in an annular flange 28 formed on the inside of the front end of the barrel-shaped portion 22.

The rear end of the propeller shaft 21 is journalled in a bushing 30 carried by a cap 31 closing the rear end of the barrel-shaped portion 22. Between the cap 31 and the block 25 is a spacing bushing 32. The cap 31 is removably secured in place, so that the propeller shaft 21 and related parts may be removed, and to this end is provided with lugs 33 secured to the barrel-shaped portion 22 by screws 34. In removing the parts, the propeller shaft 21 is pulled out, together with the spacing bushing 32 and block 25. Then, to remove the gears 23 and 24, the drive shaft 13 is removed from the gear 23, and the latter is tipped sidewardly to disengage it from the gear 24, the recess in the wall of the housing being cut at an angle as shown at 35 (see Fig. 5) to permit the tipping movement of the gear 23.

The interior of the barrel-shaped portion 22 is separated from the rest of the unit by a transverse wall 36 so that the portion 22 may be filled with grease in which the gears run. To replenish the supply of grease, a greasing hole 37 and a vent 38 closed by screws are provided. Extending downwardly from the barrel-shaped portion 22 is a fin 40 to assist in steering and serving as a guard.

As mentioned above, the pump unit 17 constitutes a part and completes the streamline contour of the underwater housing unit 15. It has, as one of its chief advantages, the feature of being readily removable by a simple horizontal movement relative to the housing unit 15. Moreover, it is so positioned that it may be actuated from the drive shaft 13, rather than the propeller shaft 21, to take advantage of the higher speed of the former.

To these ends, the pump unit comprises a pump body 41 constituting the rear edge portion of the underwater unit and completing the streamline contour thereof. To secure the pump body 41 in place, it is provided with lugs 42 at its upper and lower ends. The upper lug 42 is secured directly to the housing unit 15 by a screw 43, while the lower lug 42 fits into a step cut into the upper lug 33 of the cap 31 and is secured in place by the cap-securing screw 34.

The pump body 41 has a portion 44 extending into the underwater housing unit 15, which is horizontally bored as at 45 to serve as the cylinder of the pump. Slidably mounted in the cylinder bore 45 is a piston comprising a head 46 having a reduced portion 47 telescoped into a sleeve 48. The sleeve 48 is rigidly secured to the head 46 by having its abutting end spun into an undercut 49 in the head. The piston is urged toward the drive shaft 13 by a coiled spring 50 extending into the sleeve 48 and bearing at one end against the reduced portion 47 of the head and seated at its other end in a counterbore 51 in the pump body 41. To actuate the piston, an eccentric 52 is carried on the drive shaft 13 in abutment with piston head 46.

The water passages for the pump are provided by bores in the pump body 41. Thus, an inlet port 53 is provided preferably in the lower part of the pump body and at the rear edge thereof. The inlet port 53 is preferably protected by a screen 54. Extending inwardly from the inlet port 53 is a horizontal bore 55 communicating with a vertical bore 56 entering the cylinder. An inlet valve member 57 is threaded in the vertical bore 5 and at its upper end is provided with a valve seat 58. Coacting with the valve seat 58 is a ball 60 retained in the bore 56 by a pin 61.

The vertical bore 56 extends beyond the cylinder bore 45 and meets at its upper end a horizontal bore 62 closed by a plug 63. Opening within the housing unit 15 is an outlet port 64, in which an outlet valve fitting is threaded. The outlet valve fitting preferably comprises a body member 65 provided with a valve seat 66 and a coacting ball 67 retaining within the fitting by a cross pin 68. The top of the housing unit 15 is apertured as at 70 to permit the fitting 65 to extend therethrough.

Cooperating with the propeller 16 is an anti-cavitation plate 71, and one of the prominent features of the invention lies in the structural relation of the plate 71 to the underwater unit and the manner of securing the plate in place and securing the underwater unit to the drive shaft casing 14. The underwater unit 15 is provided with a sleeve 72 extending upwardly from the rounded front portion and telescoped into the drive shaft casing 14, the sleeve and casing having a snug fit. The anti-cavitation plate 71 is carried on the flat top surface of the underwater unit and at its front end is provided with means to secure it in place. Preferably said means comprises a collar 73 encircling the lower end of the drive shaft casing 14 and provided with diametrically opposite bosses 74 threaded to receive screws 75 extending through the drive shaft casing 14 and the sleeve 72. The screws 75 thus not only hold the anti-cavitation plate 71 in place but also hold the casing 14 and the sleeve 72 together.

The anti-cavitation plate covers the aperture 70 in the top of the underwater unit and is itself apertured at 76 for the outlet fitting 65. To hold the plate 71 properly centered, it is provided with an arcuate lug 77 on its lower face fitting into the aperture 70.

The motor unit 10 is provided with an exhaust pipe 80 (see Fig. 1) extending downwardly from the motor unit in parallel relation to and at the rear of the drive shaft casing 14. The lower end of the exhaust pipe is bent rearwardly as at 81 and terminates at substantially the rear edge of the anti-cavitation plate.

The outlet fitting 65 of the pump unit 17 is connected to the motor unit 10, to supply cooling water thereto, by a water pipe 82 connected to the outlet fitting 65 by a coupling 83. To conceal the water pipe and thus improve the appearance of the motor, the pipe 82 is bent to enter the exhaust pipe 80 at the bend therein and extends upwardly within the exhaust pipe to the motor.

The passage of the water pipe through the exhaust pipe tends to cool the exhaust gases and hence reduces the pressure thereof and the back pressure against the engine.

In operation, the rotation of the drive shaft 13 reciprocates the pump piston by means of the eccentric 52, the spring 50 holding the piston in contact with the eccentric 52. Should the pump become clogged or any of its parts worn, it may be readily removed. Thus, to remove it, the outlet fitting 65 is unthreaded from the pump body 41, and the screw 43 holding the upper end and the screw 34 holding the lower end are removed. The complete pump may then be removed as a unit simply by moving it rearwardly. On replacing the pump unit, the piston is moved into operative relation with the eccentric 52 merely by the movement of pump body into place in the housing unit.

From the above description, it will be apparent that I have provided an outboard motor having an underwater portion provided with a pump removable as a unit by a simple lateral or horizontal movement. The pump is driven by the vertical drive shaft extending down from the motor and after being removed and returned, assumes an operative relation thereto. The pump body extends into the housing unit and has an external portion completing the streamline contour of the underwater unit. The underwater unit is secured to the drive shaft casing in telescopic relation, and the anti-cavitation plate is carried on the top of the underwater unit and is secured in place by a collar encircling the drive shaft casing. The motor exhaust pipe parallels the drive shaft casing and the pipe carrying the water from the pump to the motor extends up through the anti-cavitation plate and enters the exhaust pipe.

I claim as my invention:

1. An outboard motor having a downwardly extending drive shaft casing of circular cross-section, an underwater unit of streamline contour comprising a rounded front end with a trailing rear portion, the rounded front end of said unit being alined with said casing and secured thereto, and an anti-cavitation plate carried on the top of the trailing rear portion of said unit and being secured to said casing at its connection with said unit.

2. An outboard motor having a downwardly extending drive shaft casing of circular cross-section, an underwater unit having a streamline cross-section comprising a rounded front portion concentric with said casing and a trailing rear portion, said unit having a sleeve telescoped into said casing, and an anti-cavitation plate carried on the top of said trailing rear portion and having a collar at its forward end surrounding said casing and said sleeve and rigidly attached thereto for securing the plate in place.

3. An outboard motor having a downwardly extending drive shaft casing of circular cross-section, an underwater unit of streamline cross-section with its forward portion in alinement with said casing and trailing rearwardly therefrom, said unit having a flat top with an aperture in the trailing rear portion, and an anti-cavitation plate carried on the top of said unit and having a collar surrounding said casing, said plate being provided with a lug on its lower face entering the aperture in the top of said unit to hold the plate centered with said unit.

4. An outboard motor having a vertical drive shaft casing, an underwater housing unit of streamline contour comprising a front portion alined with said casing and a trailing rear portion, the top of said trailing portion having an aperture opening from the interior of said unit, a pump located within said unit and having an outlet fitting extending upwardly through said aperture, and an anticavitation plate carried on the top of said unit and having an aperture through which said fitting extends.

5. An outboard motor having a vertical drive shaft casing of circular cross-section, an underwater housing unit of streamline cross-section comprising a rounded front portion alined with said casing and a trailing rear portion, said rear portion having a flat top with an aperture opening from the interior of the unit and located immediately in the rear of said casing, a pump housed within the rear portion of the unit and having an outlet fitting extending upwardly through said aperture, and an anticavitation plate carried on the flat top of said unit and provided with a collar surrounding the lower end of said casing, said plate having an aperture to receive said fitting and having a lug entering the aperture in the top of said unit to hold the plate against turning.

6. An outboard motor comprising a motor unit, a drive shaft casing extending downwardly therefrom, an underwater unit on the lower end of said casing, a pump housed in said underwater unit, an exhaust pipe extending downwardly from said motor unit in parallel relation to said casing and having its lower end bent rearwardly, and a water pipe from said pump for supplying cooling water to the motor unit, said water pipe extending upwardly from said underwater unit and entering said exhaust pipe at the bend in the lower end thereof.

7. An outboard motor comprising a motor unit, a drive shaft casing extending downwardly therefrom, an underwater unit on the lower end of said casing, a pump housed in said underwater unit, an anti-cavitation plate located at the top of said underwater unit and extending rearwardly therefrom, an exhaust pipe extending downwardly from said motor unit and paralleling said casing, said exhaust pipe having its lower end bent rearwardly to overlie the rear edge of said plate, and a water pipe leading from said pump for supplying cooling water to said motor unit, said water pipe extending upwardly from said underwater unit through said plate and entering said exhaust pipe at the bend therein.

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