Jan. 10, 1933. T. L. SMITH 1,893,662

GEAR PUMP FOR OUTBOARD MOTORS AND THE LIKE

Filed July 3, 1931

Fig. 1.

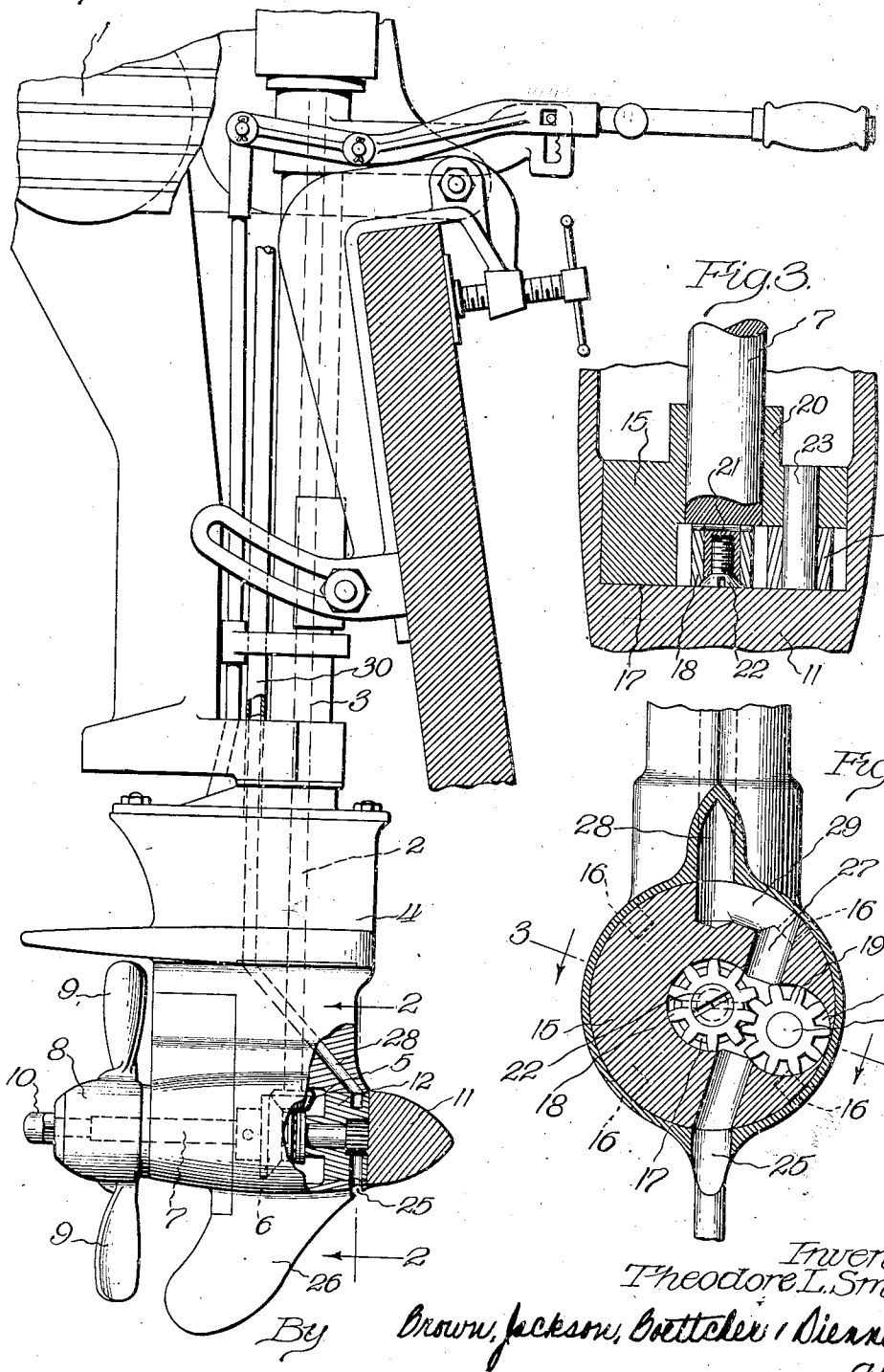


Fig. 3.

Fig. 2.

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UNITED STATES PATENT OFFICE

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GEAR PUMP FOR OUTBOARD MOTORS AND THE LIKE

Application filed July 3, 1931. Serial No. 548,554.

This invention relates to gear pumps for outboard motors and the like.

Outboard motors adapted to be removably attached to a boat and operated to propel that boat, are old in the prior art. Motors of this type usually include internal combustion engines having water jackets into which a quantity of cool water must be pumped to maintain the motor at the proper operating temperature. Various arrangements of which I am aware have been heretofore used for this purpose. One of these arrangements consists of a centrifugal pump mounted upon the drive shaft of the unit and operable to draw the water into the under water portion of the outboard motor and to force that water into the cooling jacket of the engine.

Another prior art pump of which I am aware consists of a positive displacement reciprocating piston pump mounted upon the under water unit and operable by the propeller shaft to force water into the water jacket of the motor.

My present invention provides a new and improved pump for use in a motor unit of this type, a pump which is disposed wholly within the under water unit of the outboard motor. Preferably the improved pump of my invention consists of a gear type pump having one unit mounted directly upon and keyed to the propeller shaft and a cooperating unit mounted upon a stub shaft disposed in the pump casing, which casing is disposed wholly within the under water unit of the outboard motor. An inlet port is provided near the forward end of the under water unit of the motor and an outlet port leads from the pump through the under water unit and then through a pipe to the water jacket of the motor.

A gear pump is particularly advantageous for this use. It is in effect a positive displacement pump and it operates without adding to the vibration of the outboard motor unit.

In my copending applications Serial Nos. 428,261, filed February 14, 1930, and 531,405, filed April 20, 1931, I disclose outboard motor units equipped with adjustable propeller blades through the operation of which the speed at which the boat is driven forward for a given motor speed may be varied. I have illustrated and shall describe hereinafter in connection with the drawing the gear pump arrangement of the present invention in connection with a motor equipped with an adjustable propeller, but it is to be understood that the invention is not limited to such use but may be employed whether the motor has an adjustable or a solid or fixed blade propeller.

Further objects of my invention will be apparent from a reading of the detailed description and claims which follow, reference being had to the accompanying drawing, in which:

Figure 1 is a fragmentary elevational view, partly in section, showing my invention installed in an outboard motor unit;

Figure 2 is a cross sectional view taken along the line 2—2 of Figure 1 looking in the direction of the arrows and showing the details of my gear type pump; and

Figure 3 is a cross sectional view through the pump casing taken along the line 3—3 of Figure 2 looking in the direction of the arrows.

Referring now to the drawing in more detail, it will be seen that the outboard motor unit is of the type disclosed more fully in my copending applications above referred to, and comprising a motor partly shown at 1 which is operable to drive a vertically disposed shaft 2 leading downward through a suitable casing 3 to the under water unit 4, where it is provided with a bevel gear 5 that is meshed with a corresponding gear 6 located upon a horizontally disposed propeller shaft 7 which is journaled in the under water unit. This under water unit is hollow to provide space within it for the gear drive, the bearings, the pump, and the propeller position adjustment mechanism, not shown. A propeller hub 8 closes the open end of the under water unit and serves as a mounting for the blades 9 by which the boat is propelled. This hub is rigidly attached to and keyed to the shaft 7 in any preferred manner such as by a nut 10.

It will be seen in Figure 1, the leading face of the under water unit 4 contains a conical nose portion 11 opposite the propeller

shaft and immediately behind which is located the pump casing 12 in which the gear pump of my invention is located. The shaft 7 extends into the gear casing substantially concentrically of it and of the chamber in the under water unit itself.

The pump casing comprises a cylindrical block 15 which accurately fits into the hollow portion of the under water unit and is held against rotation therein in any preferred manner such as by screws 16. The flat face 17 of the pump casing abuts squarely against the flat inside face of the nose 11 of the under water unit. Located within the casing 15 is a pump chamber 17 consisting of two generally cylindrical portions fitted together. Located within these portions are the gears 18 and 19 which comprise the pump unit proper.

The gear 18 is fitted over the end of the propeller shaft 7 which projects through a suitable bushing 20 in the pump casing and into the chamber 17, the gear being keyed against rotation with respect to the shaft 7 by a suitable key 21, and being held securely upon the end of the shaft in any preferred manner such as by a screw 22.

A stub shaft 23 is securely fastened in the pump casing 15 with its axis substantially parallel to the axis of the propeller shaft 7, and the gear 19 is loosely journaled upon this stub shaft 23. The teeth of the gears 18 and 19 are meshed together as shown.

An inlet port 25 is formed on the under side of the nose 11 of the under water unit adjacent its junction with the keel 26 of that unit, this inlet port leading through the wall of the under water unit and through the pump casing into the chamber 17 in which the gears are located.

A discharge port 27 leads out of the upper side of the chamber 17 and into communication with a discharge passageway 28 located in the under water unit itself. As shown in Figure 2, a cross passage 29 connects the discharge port 27 with the water passage 28.

The upper end of the water passage 28 communicates with a pipe 29 leading upward to the water jacket of the motor 1, this pipe being shown as located outside of the main shaft casing 3 of the motor unit.

When the motor 1 is operated and the propeller shaft 7 revolved thereby through the medium of the vertical shaft 2 and bevel gears 5 and 6, gear 18 is driven in a clockwise direction as seen in Figure 2, and gear 19 is driven thereby in a counter-clockwise direction. Water drawn in through the port 25 travels around in the pocket-like spaces between adjacent teeth on the gears 18 and 19 to the upper side of those gears, where it is squeezed out of these pockets as the teeth mesh one with the other. The water is thus forced into the outlet port 27 and through the connecting port 29 to the passageway where it is carried through the pipe 30 to the water jacket of the motor. Obviously the amount of water delivered to the water jacket will be directly proportional to the the speed at which gears 18 and 19 are revolved since each revolution brings up an equal plurality of pockets which are full of water.

A pump of this type operates with very little vibration and is as efficient at low speed as it is at high speed, and by its use an ample supply of cooling water for the motor is assured.

The use of a pump of this type is particularly advantageous when the blades 9 of the propeller are adjusted in the manner set forth in my copending applications, to drive the boat forward at a very low speed, usually referred to as trowling speed. The propeller shaft revolves slowly when the blades are thus set so that the forward movement of the boat is very slight, and unless the pump is efficient at low speeds, the supply of water delivered to the cooling jacket of the pump may be insufficient to properly cool it.

I have found that the pump of my invention provides sufficient water to properly cool the motor at all speeds, and operates with little or no vibration and is capable of being operated over a long period of time without attention.

As is explained in my above mentioned copending applications, the under water unit itself is sealed and maintained partly full of lubricant which works its way into the bushing 20 to lubricate the engaging surface of the shaft 7 therewith. The pump therefore requires no more attention than the under water unit.

In order to make the outboard motor as light as possible, the under water unit 2 is usually formed of cast aluminum and the pump casing 15 may be formed of a similar material, or if desired, it and the gears 18 and 19 may be formed of brass or steel.

Gear pumps per se are admittedly old; however, the use of a pump of this type in the under water unit of an outboard motor is, insofar as I am aware, novel.

While I have shown my invention by illustrating a preferred embodiment of it, I have done so by way of example only, as the gear pump may be included in the under water unit in a different manner within the teachings of my invention.

Having thus complied with the statutes and shown and described a preferred embodiment of my invention, what I consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

What is claimed is:

1. In an outboard motor, a hollow under water unit having a pointed closed end, the opposite end of said unit being open, a shaft journaled concentrically in said unit and

projecting from the open end thereof, a propeller mounted on said shaft and having a hub closing the open end of said unit, a pump casing disposed in said unit adjacent its closed end and concentric with said shaft, means for securing said casing in position, a channel extending obliquely through said casing and having a circumferential channel at its upper end communicating with an outlet opening, an inlet opening extending through said under water unit and communicating with said oblique channel, and gears disposed transversely of said oblique channel for pumping water therethrough.

2. In an outboard motor, a hollow under water unit having a pointed closed end, a shaft journaled concentrically in said unit and projecting from the open end thereof, a propeller mounted on said shaft and having a hub closing the end of said unit opposite said pointed end, a pump casing disposed in said unit adjacent its closed end and concentric with said shaft, means for securing said casing in position within said unit, a channel extending obliquely through said casing and having a circumferential channel at its upper end communicating with an outlet opening, an inlet channel extending through said under water unit and communicating with said oblique channel, gears disposed transversely of said oblique channel for pumping water therethrough, one of said gears being mounted on and driven by said shaft, and the other of said gears being mounted on a stub shaft carried by said casing.

3. In an outboard motor, a hollow under water unit having a torpedo shaped casing provided with a closed pointed end, the opposite end of said casing being open, a shaft journaled concentrically in said casing and projecting from the open end thereof, a propeller mounted on said shaft and having a hub closing the open end of said casing, a substantially cylindrical pump housing disposed in said casing adjacent its closed end and concentric with said shaft, a gear carried by said shaft and disposed in said housing, said housing having an oblique channel extending therethrough, a stub shaft in said housing, a second gear carried by said stub shaft and meshing with said first gear, said channel extending between said gears along the meshing portions thereof, an arcuate channel formed in said housing at one end of said oblique channel, and inlet and outlet means formed in said casing and communicating with said oblique channel.

4. In an outboard motor, a hollow under water unit having a pointed closed end, a shaft journaled concentrically in said unit and projecting from the open end thereof, a propeller mounted on said shaft and having a hub closing the end of said unit, a pump casing disposed in said unit adjacent its closed end and concentric with said shaft, means for securing said casing in position, a channel extending obliquely through said casing, an arcuate channel extending partly around the edge of said casing and communicating with said oblique channel, inlet and outlet channels formed in said unit, said inlet channel having communication with the oblique channel of said casing, and said outlet channel having communication with the arcuate channel of said casing, and a pair of gears disposed in said casing on opposite sides of said oblique channel, and meshing in said channel, one of said gears being mounted on said shaft.

In witness whereof, I hereunto subscribe my name this 26 day of June, 1931.

THEODORE L. SMITH.