May 5, 1936. F. T. IRGENS 2,039,535

LOWER UNIT FOR OUTBOARD MOTORS

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Fig. 1.

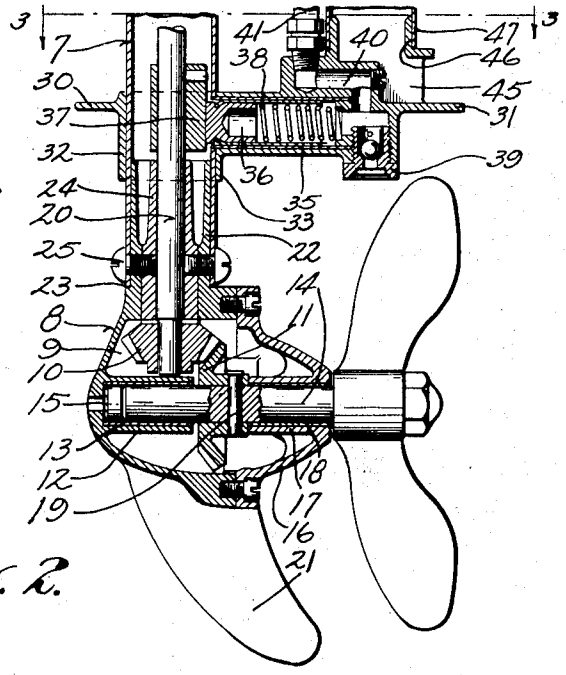


Fig. 2.

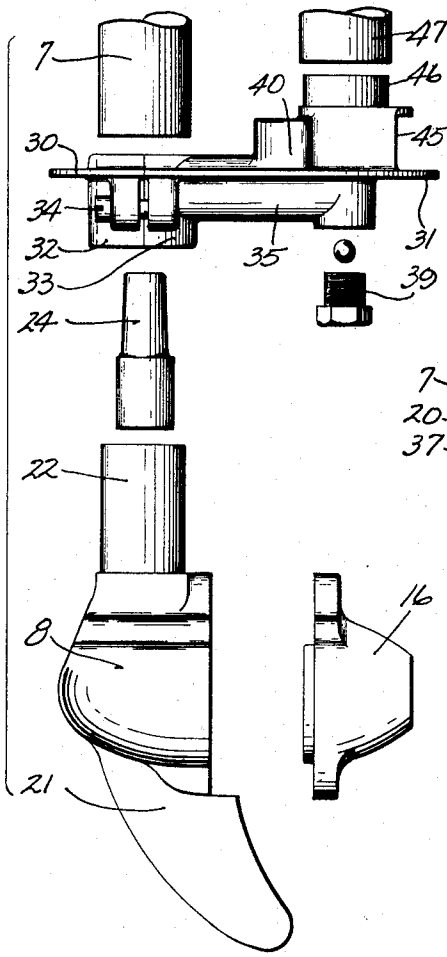
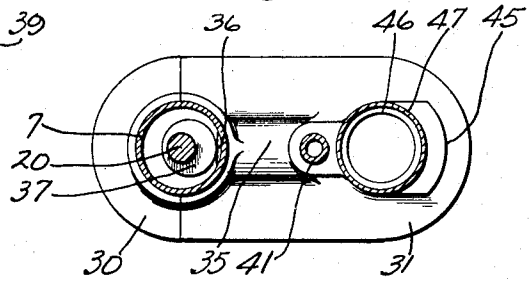


Fig. 3.



INVENTOR
Finn T. Irgens
BY Wheeler, Wheeler & Wheeler
ATTORNEYS

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Fig. 4.

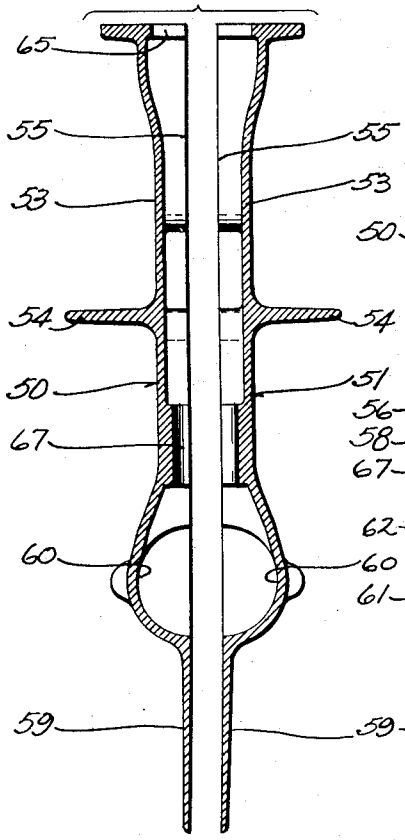


Fig. 5.

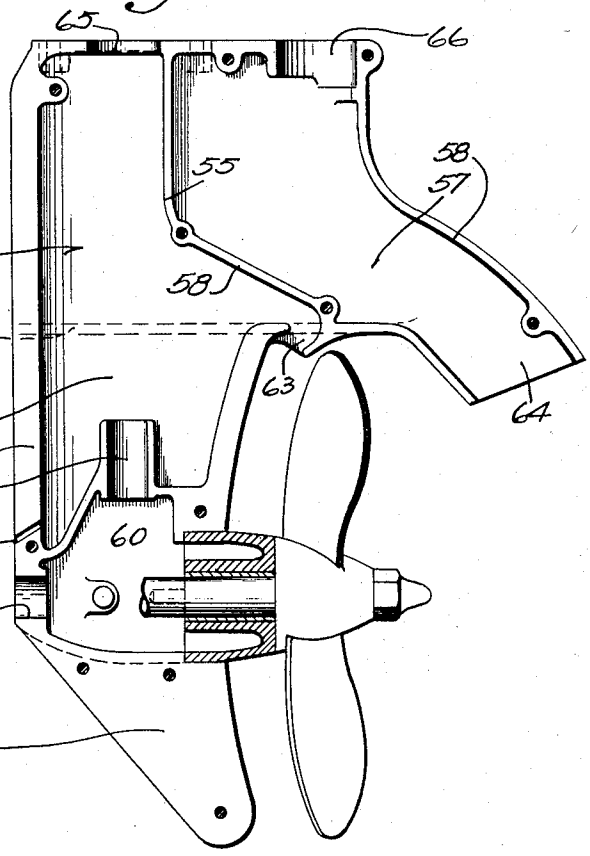
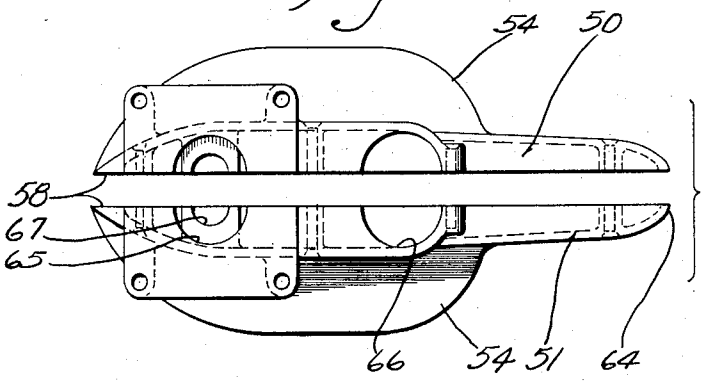


Fig. 6.



INVENTOR
Finn T. Irgens
BY Wheeler, Wheeler & Wheeler
ATTORNEYS

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UNITED STATES PATENT OFFICE

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LOWER UNIT FOR OUTBOARD MOTORS

Finn T. Irgens, Wauwatosa, Wis., assignor to Outboard Motors Corporation, Milwaukee, Wis., a corporation of Michigan

Application June 2, 1934, Serial No. 728,645

8 Claims. (Cl. 115—17)

This invention relates to improvements in lower units for outboard motors.

It is the object of the invention to provide a novel and improved lower unit structure which, in the quantities in which outboard motors are produced, can be made more economically through the use of die casting than would be possible either in the conventional sand casting methods or in the often-proposed resort to stampings. As compared with a stamped lower unit, the device herein disclosed will have more body and strength and be more economical of manufacture. As compared with a sand cast lower unit the device herein disclosed will be extremely light and economical of manufacture.

It is a further object of the invention to provide a die cast lower unit wherein various die cast parts are assembled upon a conventionally drawn tubular shaft housing in a novel and inexpensive manner.

In the drawings:

Figure 1 is a vertical axial section through the lower unit portion of an outboard motor which embodies the invention.

Figure 2 is a view in side elevation, of the several component parts employed in the device illustrated in Figure 1.

Figure 3 is a view taken in section in the plane indicated at 3—3 in Figure 1.

Figure 4 is a view showing in vertical transverse section the component parts of a lower unit comprising a modified embodiment of the invention.

Figure 5 is a side elevation of the interior face of one of the parts shown in Figure 4.

Figure 6 is a plan view of the parts shown in Figure 4.

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

In the construction shown in Figs. 1 to 3 inclusive, the lower unit is assembled in several separately die cast parts upon a conventional shaft housing 7, such as is usually made of drawn tubing or the like. Instead of terminating above the water line, as is now common practice in outboard motors designed for the higher speed ranges, this shaft housing is carried well below the water line to serve as a means of uniting the various die castings and to constitute a part of the so-called "lower unit".

The gear casing 8 is a hollow die casting having an interior cavity at 9 for the bevel gears 10 and 11 which, incidentally, may also be conveniently die cast. An integral sleeve extending rearwardly into the cavity 9 at 12 carries a conventional bushing 13 cast in place for the propeller shaft 14. An opening through the bow portion of the gear casing 8 for the core pin receives a plug 15 which holds a thrust bearing. When the gear casing is completed by the addition of the closure member hereinafter to be described, the bushed bearings for the propeller shaft are aligned by reaming.

The stern side of the cavity 9 is closed by a closure member 16 which is provided internally with an integral sleeve at 17 into which is cast a conventional bushing 18 for the rear end of the propeller shaft. The gear 11 is connected with the propeller shaft between sleeves 12 and 17 by a pin 19, and the gear 10 is suitably fixed to vertical drive shaft 20.

It will be noted that the die cast gear casing unit 8 is integrally provided with a skeg at 21 which is suitably notched to receive closure member 16. At its upper end the gear casing unit 8 is provided integrally with a tubular extension at 22 telescopically received into the end of the drive shaft housing 7 and shouldered at 23 to provide an abutment for the end of said housing. The lower end of the drive shaft 20 is journaled in bushing 24, and one or more screws at 25 pass through the drive shaft housing 7 and the sleeve-like extension 22 of the gear casing into the bushing 24 to hold the several parts in assembled relation.

An anti-cavitation plate exhaust discharge port and displacement pump are made to comprise a separate unit of the assembly.

Formed integrally with the forward portion 30 and the rearward portion 31 of the anti-cavitation plate, are semi-tubular clamp members 32 and 33 held by bolts 34 about the shaft housing 7 and preferably extended downwardly for strength to overlap the upper end of the tubular sleeve 22 of the gear casing.

The pump cylinder 35 is cast integrally with the anti-cavitation plate portion 31 to extend longitudinally thereof directly astern from the shaft housing 7 which is apertured to permit the displacement plunger 36 to enter the shaft housing for engagement with a cam 37 on the drive shaft. A spring at 38 engages the plunger to force it forwardly against the cam.

The plug 39 has a ball check valve to provide an inlet for the pump cylinder and an integrally cast duct 40 leads to the discharge pipe 41. The momentum of upward propulsion of the water is sufficient so that no outlet check valve is required for the pump.

A rearwardly directed discharge mouth 45 is likewise cast integrally with the anti-cavitation

plate section 31. It carries an integral sleeve at 46 to which the exhaust manifold 47 is connected.

Obviously the amount of metal required is very small as compared with other cast lower units, and a very strong structure is inherently produced with parts which are very light of weight per se.

The construction disclosed in Figs. 4, 5 and 6 presents a fully streamlined lower unit which may be die cast complete in two sections united on the longitudinal and vertical plane which includes the propeller shaft and drive shaft. These shafts are not illustrated, being similar to those disclosed in Fig. 1.

The two parts used in Figs. 4 to 6 are generically designated by reference characters 50 and 51. They are identical in outline and form and are complementary counterparts of each other. Each provides a smooth surfaced and externally streamlined wall portion at 53 reinforced externally by the longitudinally divided half 54 of an anti-cavitation plate and reinforced internally by a partition 55 which separates a water passage 56 from the exhaust passage 57.

Due to the idle casting operation employed in the manufacture of the component parts 50 and 51, it is possible to provide thickened metallic surfaces at 58 wherever the parts 50 and 51 are to be united. Each of the parts 50 and 51 carries its own portion of the skeg at 59, and the several holes clearly shown in Fig. 5 are adapted to receive rivets whereby the component parts 50 and 51 are connected together in operative relation to provide a closed lower unit.

Complementary semi-circular openings in the component parts 50 and 51 provide a gear casing at 60, a propeller shaft bearing at 61, a drain opening at 62, a water inlet at 63, an exhaust outlet at 64, a drive shaft and water circulation port at 65, and an exhaust connection at 66, and a drive shaft bearing at 67.

As compared with any other form of assembled lower unit of this general type, the die cast construction shown in Figs. 4, 5 and 6 offers substantial advantages in economy, simplicity, low cost of dies, and strength and ease of manufacture.

I claim:

1. An outboard motor lower unit comprising the combination with a gear casing section and an anti-cavitation plate section, of a tubular drive shaft housing connecting said sections, said sections having complementary sleeves telescopically engaging said housing in mutually overlapping relation.

2. In an outboard motor, a unit comprising an anti-cavitation plate integrally including a displacement pump and cylinder, said plate having an aperture for a drive shaft housing to which said cylinder is open.

3. In an outboard motor, the combination with a tubular shaft housing, of a member mounted thereon and comprising integrally an anti-cavitation plate, a displacement pump cylinder substantially radial with respect to said housing and provided with water inlet and outlet fittings, and an exhaust gas fitting, together with a second member complementary to the first member and cooperative therewith in fastening said first member to said housing.

4. In an outboard motor lower unit, the combination of a gear casing having an integral upwardly projecting sleeve, of a shaft housing outwardly telescoped upon said sleeve, a bushing inwardly fitted to said sleeve, and securing means passing through said shaft housing, sleeve, and bushing, together with an anti-cavitation plate comprising complementary parts having integral semi-tubular portions telescopically engaging said housing externally thereof and in overlapping relation to said sleeve.

5. In an outboard motor, the combination with a drive shaft housing and an exhaust pipe spaced rearwardly therefrom, of a clamp embracing said housing, a pump casing carried by said clamp and projecting rearwardly from said housing, an exhaust outlet fitting mechanically supported on said pump casing and providing a rearwardly directed exhaust gas outlet, said fitting being connected with said exhaust pipe whereby said pump casing provides mechanical support for said pipe from said housing.

6. In an outboard motor, the combination with a tubular shaft housing, lower unit and propeller, of a member connected with said shaft housing above said lower unit and including unitarily a pump casing projecting over the path of movement of the propeller, an inlet fitting communicating with the pump casing, an outlet passage provided with a water connection and communicating with the pump casing, and an elbow mounted on the pump casing and having an upwardly extending opening arranged to receive an exhaust pipe, and a rearwardly extending opening for the discharge of gases therefrom.

7. In an outboard motor, the combination with a shaft housing and a shaft therein provided with a cam, of a pump cylinder mounted on said shaft housing to project substantially at right angles therefrom, a displacement piston operable in said cylinder and arranged to be acted on by said cam, a downwardly opening valve fitting at the end of said cylinder and leading longitudinally along the top thereof toward said housing and provided with a pipe connection intermediate the ends of the cylinder, and an exhaust fitting comprising an elbow with an upwardly opening inlet and a horizontally opening outlet, said pump discharge passage being formed within said elbow.

8. In an outboard motor, the combination with a pump casing provided with a discharge passage communicating vertically with said casing and elbowed to provide a horizontal portion along the top of said casing, of an exhaust fitting integral with said pump casing and including an elbow having an upwardly extending inlet and a rearwardly opening discharge mouth, the horizontal portion of said pump discharge passage being partially disposed within the exhaust fitting elbow and being provided with a closure accessible through said exhaust discharge mouth.

FINN T. IRGENS.