

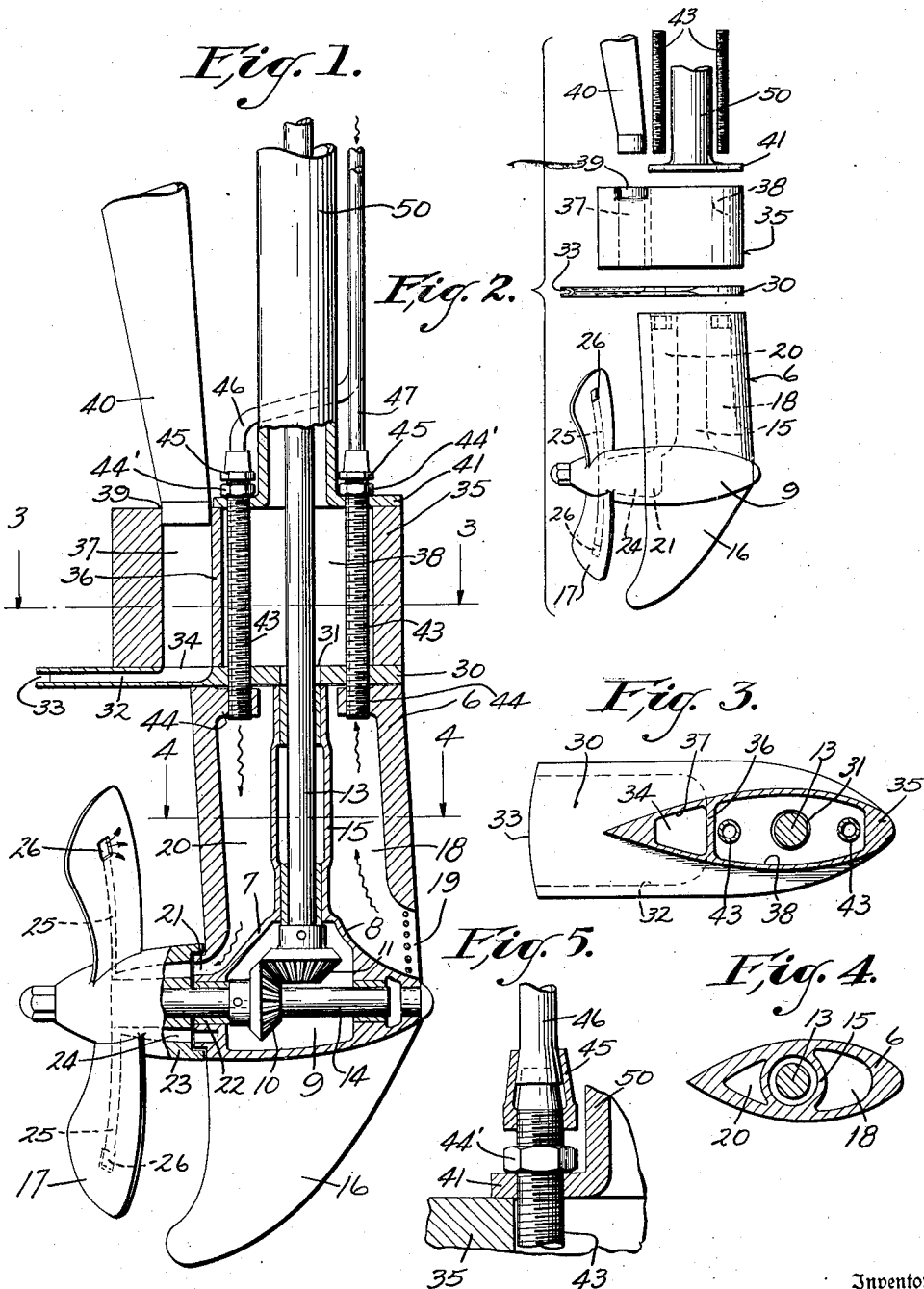
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LOWER UNIT FOR OUTBOARD MOTORS

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LOWER UNIT FOR OUTBOARD MOTORS

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

It is the object of the invention to reduce manufacturing costs by simplifying the patterns required for the casting of lower units.

It is my further purpose to make economies in the manufacture of outboard motors through a structure which permits of standardization and facilitates the interchange of parts of a lower unit to vary the overall dimensions and design of the assembled lower unit to suit the requirements of different outboard motors.

In the drawing:

Figure 1 is a view partially in side elevation but largely in vertical axial section from front to rear through an outboard motor lower unit embodying the invention.

Figure 2 is a view in side elevation showing in dissociated positions and on reduced scale, the component parts making up the lower unit shown in Fig. 1.

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

Figure 4 is a detail view taken in section in the plane indicated at 4—4 in Fig. 1.

Figure 5 is an enlarged fragmentary detail showing the anchorage means employed at the end of one of the tubular bolts used to fasten the parts together and to serve as a water pipe.

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

It will be understood that the particular design of the parts illustrated is merely illustrative of the possibilities in the way of employing the invention in actual practice. Wide changes in design may be made without departing from the spirit and purposes of the invention as herein set forth. Details of water circulation, under-water exhaust, and the relative shapes and dimensions of parts may be modified as desired.

The integral casting of lower units has involved the use of expensive patterns and molding and finishing processes. According to the present invention the lower unit is in effect "stratified", and the anti-cavitation plate is made separately from the portion of the lower unit thereabove and the portion therebeneath. The gear housing section 6 of the lower unit preferably has interior partitions at 7 and 8 defining a closed gear chamber at 9 for the bevel wears 10 and 11 which connect the drive shaft 13 to the propeller shaft 14. A vertically extending central partition 15 is made tubular to enclose the drive shaft 13 and the bushings therefor. This portion of the device is prefer-

ably stream-lined in horizontal cross section as shown in Fig. 4, and is integrally provided with the usual skeg at 16 to protect the propeller 17.

The chamber 18 forwardly of partition 15 has a water inlet at 19. The chamber 20 rearwardly of partition 15 has an annular outlet at 21 surrounding the propeller shaft bearing 22. The hub 23 of the propeller has an opening 24 registering with the annular port 21 and leading to radial ducts 25 in the propeller blades. These ducts discharge their contents centrifugally through the terminal openings 26, thereby producing a partial vacuum in chamber 20 in order to circulate water through the cooling system of the outboard motor, as will hereinafter be described.

The upper surface of the section or casting 6 of the lower unit is preferably finished to a planiform surface to which another component part of the lower unit is applied. Ordinarily, the next component part will be the anti-cavitation plate section 30 although, obviously, this may be omitted in a motor which does not employ an anti-cavitation plate or an under-water exhaust.

The particular motor illustrated has both an anti-cavitation plate and an under-water exhaust. The section 30 of the lower unit comprises a thin plate-like section adapted to close the upper ends of chambers 18 and 20, provided at 31 with clearance for the drive shaft 13, and provided at 32 with a wide flat interior passage having a discharge mouth at 33 and an intake port opening upwardly at 34.

If the lower unit of the device is to be stream-lined to a point above the water line, a top section 35 is used above the anti-cavitation plate. A transverse partition web 36 divides the interior of casting 35 to separate the exhaust passage 37 from the interior compartment 38 thereof. The top of the casting is socketed at 39 to receive the end of the exhaust pipe 40 and leading from the engine or power head (which is not shown).

The usual means connecting the power head with the lower unit is shaft housing 50, of which the lower end appears in the drawing. The shaft housing is provided at its lower end with a flanged terminal portion 41 adapted to be fitted to the top of section 35 of the lower unit or, if section 35 be omitted, the shaft housing flange 41 may be fitted directly to the plate 30 or to the lower section 6.

While any desired means may be used to hold the parts together, I prefer to employ tubular

bolts such as those shown at 43. These bolts are threaded through apertured bosses 44 in casting 6, and extend through apertures in the plate section 30 and flange 41. Retaining nuts 44' threaded to the upper ends of the respective bolts 43 maintain the several parts of the lower unit in rigid assembly.

It will be noted that each of the tubular bolts 43 communicates with one of the water passages 18 or 20 of the lower section or casting 6. By using the anchorage nuts 45 to hold the tapered lower ends of pipes 46 and 47 to the tubular bolts 43, the said bolts and pipes are made to comprise part of the usual water circulation system which includes the engine jacket (not shown). It will be understood that water admitted through port 19 to chamber 18 passes upwardly through the tubular bolt communicating with said chamber and thence through pipe 47 to the engine jacket, from which the water returns through pipe 46 and the other tubular bolt 43 to chamber 20, and is exhausted through propeller 17 due to the centrifugal discharge of the water in ducts 25 of the propeller blades.

It is particularly to be observed that not only are the pattern making and casting and coring operations greatly simplified through the use of the present invention but, in addition, the structure is so designed as to permit of wide modification for different types of motors while using standardized parts to the greatest possible degree. For example, it is possible to provide two different streamline contours for the lower section 6 to adapt a given motor to different speed requirements so that all parts of the motor will be identical except the lower section in which change of contour is desired. It is also possible to provide two entirely different lower sections 6 to receive gears and shafting for transmitting greater or less power, whereby the lower unit is adapted for use with entirely different power heads.

If no under-water exhaust is desired, the discharge passage 32 in the plate section 30 may be omitted, and if no anti-cavitation plate is required the entire section 30 may be omitted. Likewise, if no stream-lining is desired at the water level, or if it be desired to provide different types of stream-lining for different purposes, or to omit the exhaust passage 37, the top section 35 of the lower unit may be modified or omitted accordingly.

The foregoing illustrations are merely intended to exemplify the wide variety of purposes to which the present invention may be applied, and the numerous combinations which are possible through the use of standard parts assembled in accordance with the present invention.

While the present invention contemplates that the lower unit be "stratified" or divided into sections on horizontal planes at any desired points, it is preferred that the division should take place immediately below the water line at the plane in which the anti-cavitation plate is customarily located. For the purpose of the present invention the water line may be assumed to be approximately at the point indicated by the section line 3-3 in Fig. 1. Where the component parts or sections of the lower unit are joined immediately below the water line, I achieve a maximum convenience and adaptability in the way of combining various purely under-water contours with various contours used at the water line. Since the lower unit herein disclosed is adaptable for use on a wide variety

of outboard motor power heads, it constitutes an article of manufacture and may be made commercially available as such.

I claim:

1. In an outboard motor structure, the combination with a shaft housing having a terminal head, of a lower unit comprising a plurality of sections divided substantially horizontally, and means connecting the respective sections with each other and with said head, said means comprising part of the cooling system for said motor.

2. An outboard motor lower unit comprising a gear casing section, a top section joined thereto upon a plane below normal water level, an anti-cavitation plate receivable between said sections and means for detachably connecting the respective sections to each other and alternatively to an outboard motor, whereby said top section may be omitted if said plate is omitted, each of said sections being interchangeable with substitute sections.

3. An outboard motor lower unit comprising a gear casing section having front and rear passages opening upwardly through its top, another section detachably connected with said first mentioned section and joined thereto below normal water level, and water supply means extending through said last mentioned section to the respective passages of the first mentioned section, said last mentioned section having a single compartment through which said water supply means passes, and said water supply means constituting joining elements for said sections.

4. In an outboard motor lower unit, the combination with a plurality of detachably connected sections, of tubular bolts connecting said sections, and water conduit means connected with the respective bolts.

5. In an outboard motor lower unit, the combination with a shaft housing provided with a terminal head and a gear casing section having its top end disposed below normal water level, of an intervening section, and means for releasably clamping said intervening section between said head and said gear casing section, said clamping means comprising part of a water circulation system.

6. In an outboard motor structure, the combination with a gear casing section provided with a propeller shaft and propeller and extending sufficiently far above said propeller shaft so that other sections mounted thereon and overhanging the propeller will afford clearance for propeller rotation, of a stream-lined top section detachably applied to said gear casing section and adapted for partial immersion and provided internally with an exhaust gas passage, means communicating with said exhaust gas passage and extending rearwardly over the path of propeller travel, a shaft housing provided with a mounting head, and means releasably connecting said head, top section, and gear casing section together, said head and said gear casing section being shaped and arranged for direct connection with each other upon the removal of said top section and gas exhaust means.

7. In an outboard motor lower unit, the combination with a gear casing section having an upstanding portion divided into forward and rearward compartments by a shaft bearing partition, said compartments opening at the top of said section, an upper section having a central

chamber, an intervening plate projecting exteriorly beyond said sections and interiorly serving as a partition between said passages and compartment, and means penetrating said plate and
5 extending through said compartment providing water supply communications with the respective passages.

8. In an outboard motor lower unit, the combination with a shaft housing having a terminal
10 head, of a gear casting section provided with a propeller shaft and propeller, intermediate sec-

tion means connected between said head and said gear casing section and providing a downwardly extending exhaust gas passage, and a rearwardly opening discharge mouth communicating therewith and affording clearance for the
5 propeller, together with a manifold extending to the passage of said intermediate section means, said terminal head, said gear casing section, and said intermediate section having mutually complementary engaging surfaces.
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