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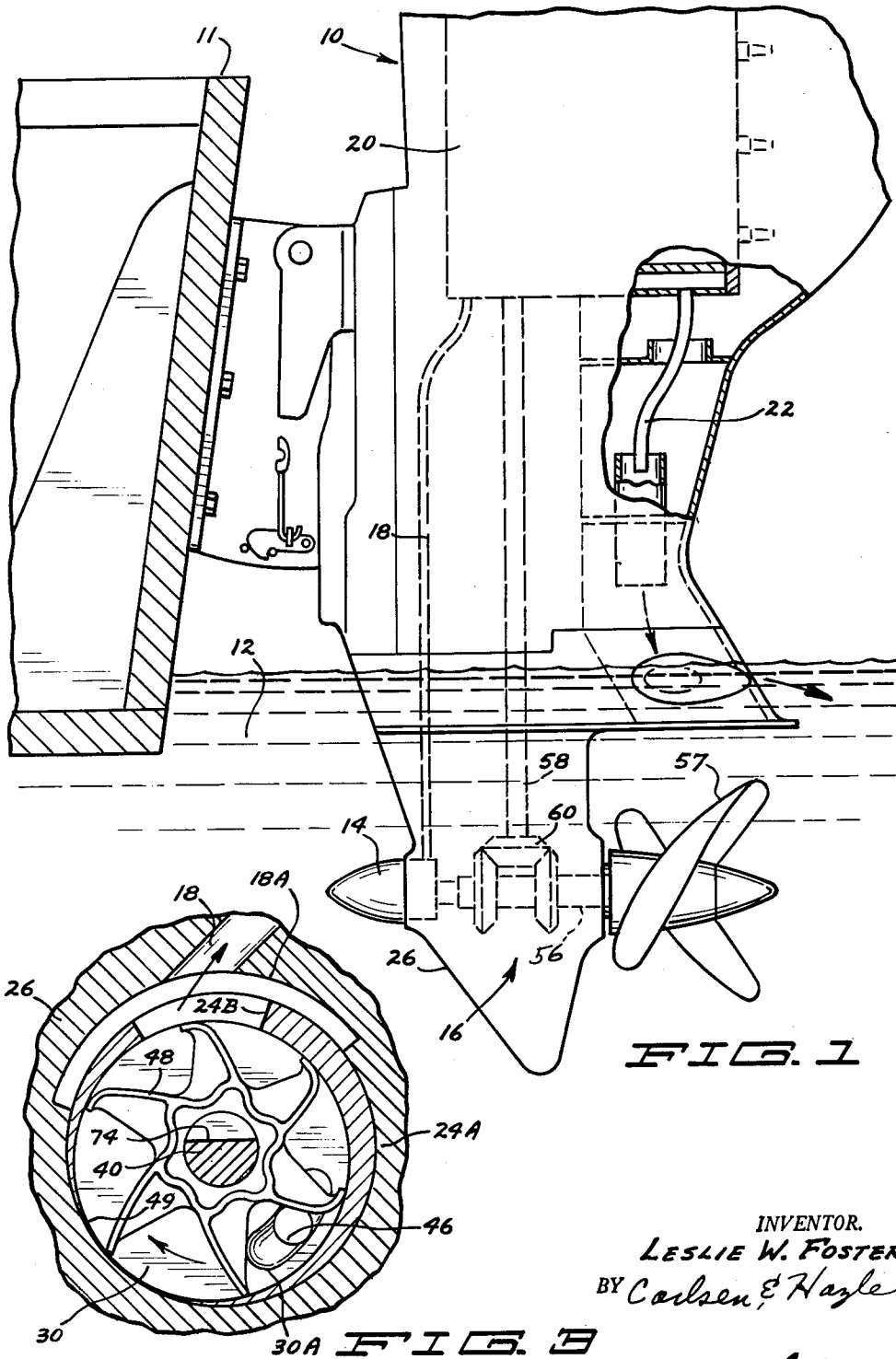
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OUTBOARD MOTOR WATER PUMP ARRANGEMENT

Filed Oct. 28, 1959

2 Sheets-Sheet 1



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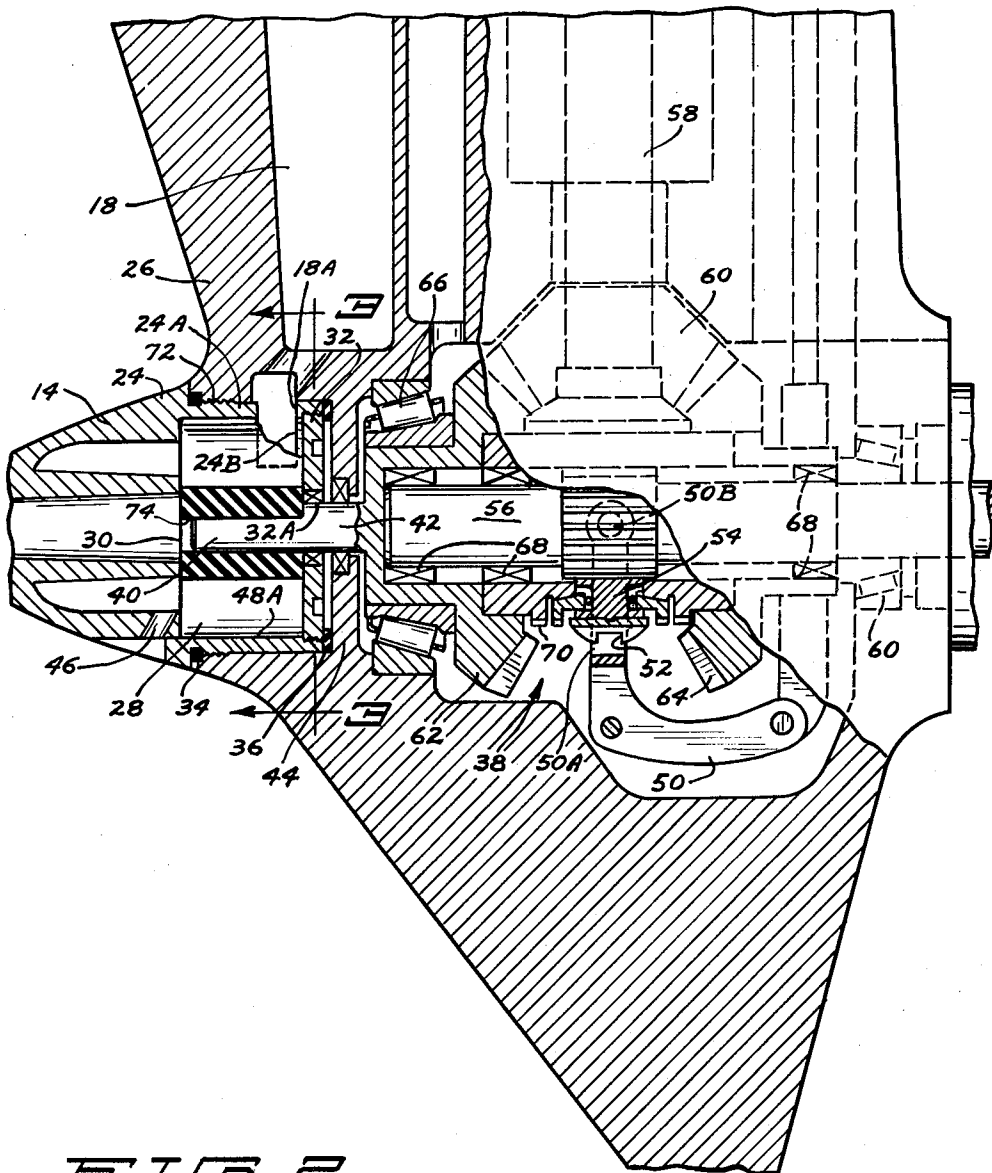
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OUTBOARD MOTOR WATER PUMP ARRANGEMENT

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This invention relates to improved means for mounting and operating a water pump in an outboard motor.

In marine engines it is the usual procedure to draw the cooling water from the supporting body of water and exhaust same back into the supporting body after passing it through the engine. In outboard motors the cooling water flows through the engine under pressure usually supplied by an impeller type pump in the water inlet to the engine. Particles suspended in the water, such as found in rivers and lakes, when forced through the pump cause increased wear on the impeller requiring it to be replaced more often than other parts in the motor. Previous water pump constructions and mountings have required that portions of the outboard motor unit be disassembled to inspect the impeller, as a consequence thereof impellers were left in the water pump until completely worn out which could cause damage to the engine. Replacement of impellers has required at least a partial tear down of the outboard motor unit resulting in substantial labor costs.

This invention obviates the above difficulties and simplifies the water pump mounting by making the water pump insertable into circuitous relation with the cooling system from outside the engine housing. The pump is mounted through an aperture in the outboard motor lower unit with the impeller being in non-rotatable relation to a suitable drive gear.

It is a further object of this invention to provide in an outboard motor unit having a gear shift, a water pump impeller removably connected to one drive gear used in the unit power train.

It is still another object of the present invention to provide in an outboard motor unit a removably mounted water pump with a housing forming part of the lower unit housing.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, in which—

FIG. 1 is a side elevational view of an outboard motor unit mounted on a boat in operating position and embodying the present invention.

FIG. 2 is an enlarged partially cutaway side elevational view of the FIG. 1 motor unit lower portion having an exemplary embodiment of the present invention installed therein.

FIG. 3 is a vertical sectional view taken along the line 3-3 of FIG. 2 in the direction of the arrows and showing typical water pump impeller construction as may be used with the present invention.

With reference now to the drawing like numbers designate like parts and structural features in the various views. An outboard motor unit 10 is disposed in operating position on a boat 11 floating on a body of water 12. A water pump 14 is operatively connected to the motor unit gear train 16 for circulating water under pressure through the tube 18, thence through engine 20 for cooling same and returning it to the body of water through the tube 22 and the engine exhaust system.

As best seen in FIG. 2 the pump 14 consists of a housing 24 which is screwed into the lower unit housing 26 and extends inside thereof. A rotary impeller 28 is

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disposed inside the cylindrical section 24A between the wear plates 30 and 32. Annular seals 34 and 36 are provided between the housings. The impeller 28 is non-rotatably and axially slidably mounted on the forward halved end portion 40 of shaft 42. Shaft 42 rotatably extends through forward housing end wall 44 of the transmission 38 compartment in water and lubricant sealing relation. As the shaft 42 rotates, water is drawn through the inlet 46 and aperture 30A by the impeller blades 48 sliding over the cylindrical section 24A inward eccentric surface 49 in water sealing relation. The water is forced through pump housing 24 peripherally extending aperture 24B, arcuate moat section 18A, the water tube 18 and thence through the engine 20.

The rear wear plate 32 is screwed into the cylindrical section 24A closing the rear end thereof. The plate 32 is also provided with a central aperture 32A lined with a water seal rotatably receiving the shaft 42.

It may be noted that the inlet 46 is radially adjacent and immediately forward of the radial outward portion of the pump housing 24. As the motor moves forwardly, water is forced through the inlet 46 and aperture 30A toward the impeller 48 resulting in increased pump operating efficiency.

The lower unit transmission 38 includes manually operated shipper lever 50 which has a bifurcated end 50A with radially inwardly extending pins 50B. The pins 50B engage the axially splined collar 52 in its radially outwardly facing peripheral groove. The collar 52 is axially movably and relatively non-rotatably mounted on the annular outwardly splined member 54. The member 54 is fixedly associated with the shaft 56 on which the usual propeller 57 is mounted.

The vertical engine-driven shaft 58, which is disposed immediately above the shaft 56, has a bevel drive gear 60 gearingly connected to the driven gears 62 and 64. The gears 62 and 64 rotate slower than the shaft 58. The two driven gears are journaled about the shaft 56 in bearings 66 and 68 and are disposed on opposing sides of the shaft 58 axis for rotation in opposing directions to provide forward and reverse drives to the shaft 56. The forward drive connection is provided by manually actuating the lever 50 to move the collar 52 toward the gear 62 for engaging the collar internal splines to both the gear 62 radially outwardly extending splines 70 and the member 54. The reverse drive connection is similarly provided by moving the collar 52 toward the gear 64 until it meshes with both the member 54 and the gear 64. Neutral is provided by disengaging the collar from both gears 62 and 64, as shown.

The shaft 42 is integrally formed with the gear 62 for rotating the impeller 28 as heretofore described. Since the gear 62 is continuously rotating with the shaft 58 regardless of the drive connections, the pump operation is continuous with the engine 20. As best shown in FIG. 2, a compact lower unit arrangement is provided by mounting the water pump through the unit housing 26 and coaxial with and immediately forward of the transmission unit 38 and the propeller shaft 56. Additionally the water pump is readily accessible from outside the unit housing.

As viewed from the forward end wall 44 the impeller 28 is rotated clockwise and yieldably urges the housing 24 to rotate in a like direction. It is important for this reason that the threaded engagement at 72 between the pump and unit housings be such that the impeller urging tends to screw the pump housing inwardly of the unit housing for providing a tighter support. In the illustrated embodiment left hand threads are used. The rear wear plate 32 is likewise urged to rotate by the impeller rotation, however as the housing 24 is moved axially

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toward the wall 44 the resilient seal 36 is compressed to brake the plate against rotation.

To remove the pump 14 from the outboard motor for impeller inspection or replacement the housing 24 is merely unscrewed from the unit housing 26, then moved axially outwardly for freeing the impeller hub from the halved end portion 40. The impeller hub has a halved cylindrical shaftway 74 which easily axially slides over the portion 40. When unscrewing the pump housing the impeller remains stationary on the shaft section 40, that is section 24A rotates about the impeller against the friction between the blades 48 and the surface 49.

After removing the housing 24 the end wear plate 32 is unscrewed therefrom exposing the impeller which may then be removed by lifting it out of the portion 24A. To reassemble the reverse process is followed.

By properly indexing the threads at 72 with the axial position of the housing 24, the peripheral aperture 24B will be aligned with the arcuate moat 18A when the two housings are tightly engaged. It is preferred that the moat 18A extend a substantial distance about the section 24A for providing increased thread tolerances and ensuring that the moat and the aperture are aligned in fluid communicative relation each time the pump is installed into the lower unit.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. In an outboard motor unit having an engine driven shaft inside a unit housing extending below the water line when the unit is being operated, a propeller shaft journaled in the unit housing below the water line, gear shifting means coaxially mounted over the propeller shaft and operatively connected to the engine driven shaft for selectively transferring power therefrom, one gear in said means being continuously operatively connected to the engine shaft and journaled about the forward end of the propeller shaft, the gear having a forwardly extending

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integrally formed pump shaft with a halved end portion, a water pump mounted through the unit housing below the water line and being coaxial with the one gear, engine cooling means in fluid communication with the pump for receiving water therefrom under pressure, the pump having pressure impelling means axially slidably and non-rotatably engaging the halved end portion, and the pump being in fluid communication with outside the housing at a point immediately forward and radially adjacent the pump outer side for having water forced therein as the unit moves through water.

2. In an outboard motor unit having an engine driven gear in a unit housing which extends below the water line, propulsion means selectively engageable with the gear, a unit housing wall adjacent the gear, the gear being journaled in the wall and having a portion extending therethrough, the unit housing having a threaded aperture coaxial with said portion, a water pump comprising a housing threadingly engaging the aperture threads and having a hollow cylindrical section extending through the aperture toward the wall, the section forward end being closed and the rear end open, rotary impeller means disposed inside the section in interior peripheral frictional engagement therewith and being non-rotatably and axially slidably engaged to the gear portion, a rear end plate threadingly engaged to the section for closing the rear end and having an aperture through which the gear portion extends to be engaged with the impeller means, resilient means compressed between the wall and the end plate for locking the plate against rotation as the impeller means is rotated, the impeller means rotation urging the pump housing to rotate for tightening its threaded engagement with the unit housing, and engine cooling means in circuitous relation to the pump.

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