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OUTBOARD MOTOR LUBRICATING SYSTEM

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Fig. 1.

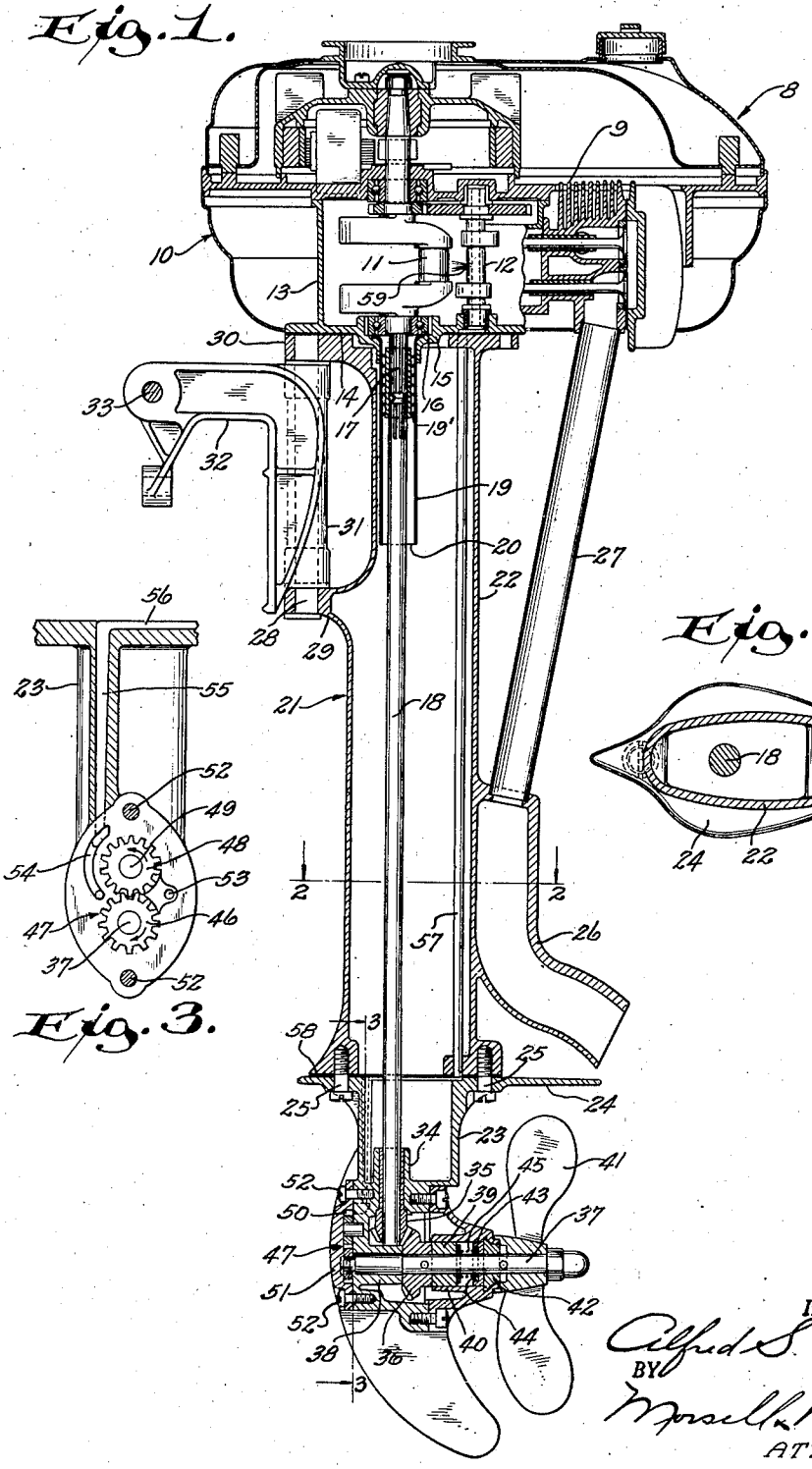


Fig. 2.

Fig. 3.

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OUTBOARD MOTOR LUBRICATING SYSTEM

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3 Claims. (Cl. 123—196)

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This invention relates to improvements in outboard motors.

Outboard motors as commonly constructed are two cycle and lubricated by mixing a minor quantity of lubricating oil with the gasoline or other fuel in the main fuel tank. This requires the preparation of a special mixture and is otherwise objectionable. It is recognized that greater efficiency and economy can be obtained by the use of a four cycle motor wherein there is a separate oil reservoir and mechanism for feeding said oil to the parts to be lubricated, but oil in a separate reservoir has heretofore presented problems in an outboard motor.

In application Serial No. 558,560, filed October 13, 1944, a desirable form of four cycle outboard motor construction with a separate oil reservoir has been shown and described. The present invention is an improvement over the construction of the above mentioned application.

It is a general object of the present invention to provide an improved four cycle outboard motor construction wherein there is a separate oil reservoir located in the lower end of the housing for the vertical drive shaft, wherein there is a novel pump arrangement for forcibly delivering oil to the parts to be lubricated, said pump arrangement rendering the pump readily accessible for repairs, simplifying the manufacture and assembly, and reducing the expense.

A more specific object of the invention is to provide a construction as above described, wherein, instead of mounting the pump on the vertical drive shaft as in the prior application, the pump is mounted on the horizontal propeller shaft at one end thereof.

A further object of the invention is to provide a construction as above described including a cover, readily removable from the exterior, for exposing the oil pump to render the same accessible for repairs.

A further object of the invention is to provide an outboard motor having a lower housing portion and having a gear pump located therein at one end of the horizontal propeller shaft, means formed integral with said housing portion for directing oil from the pump to a duct leading to the parts to be lubricated, the said arrangement facilitating the assembly of the parts.

A further object of the invention is to provide a construction wherein the oil reservoir is so located that the oil therein serves to lubricate the lower bearings for the drive shaft and propeller shaft, and the bottom bevel gears.

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A further object of the invention is to provide an improved outboard motor construction wherein the oil reservoir is so positioned that it is immersed in water during normal use whereby the oil is cooled and the operation of the engine is rendered more efficient.

A still further object of the invention is to provide an improved outboard motor construction wherein there is a reservoir for motor oil in the lower portion of the vertical drive shaft housing and wherein there is a tube surrounding the vertical drive shaft for returning surplus oil from the crank case to the reservoir, the lower end of said tube being located intermediate the length of the drive shaft housing and above the normal level of oil in the reservoir when the motor is in normal operating position.

With the above and other objects in view, the invention consists of the improved outboard motor, and all its parts and combinations, as set forth in the claims, and all equivalents thereof.

In the accompanying drawing, illustrating one complete embodiment of the preferred form of the invention, in which the same reference numerals designate the same parts in all of the views:

Fig. 1 is a vertical longitudinal sectional view through the improved motor;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1; and

Fig. 3 is a fragmentary sectional view taken approximately on line 3—3 of Fig. 1.

Referring more particularly to the drawing, the power head is designated generally by the numeral 8 and this includes a four cycle gasoline engine 9 enclosed in a suitable casing 10. The engine includes a crank shaft 11 and a cam shaft 12 located in a crank case 13.

The bottom 14 of the crank case has a central cup-shaped portion 15 for receiving a ballbearing set 16 in which the lower portion of the crank shaft is journalled, there being a splined crank shaft extension 17 projecting below the lower end of the cup-shaped portion 15. Suitably coupled by a splined coupling sleeve to the lower end of the crank shaft extension 17 so as to be driven thereby is a vertical drive shaft 18 having a splined upper end. Extending downwardly from the cup-shaped portion 15 and surrounding the crank shaft extension 17 and upper portion of the drive shaft 18, is a tube 19 of substantially larger diameter than the shaft portions 17 and 18. The lower end of the tube 19 is open as at 20, so that any surplus oil from the crank case 13, which may flow through the ballbearing set

16 into the space between the shaft 17 and the tube 19, may flow out of the lower end of said tube. If desired a coil spring 19' may be used within the tube 19 to assist the downward flow of the lubricating oil.

A vertical drive shaft housing, designated generally by the numeral 21, comprises an upper section 22, suitably secured at its upper end to the bottom 14 of the crank case, and a lower section 23. The lower housing portion 23 has an anti-cavitation plate 24 formed integral therewith. Bolts 25 extending through holes in portions of the plate 24 secure the lower housing section 23 to the lower end of the upper housing section 22.

The upper housing section 22 has an exhaust conduit 26 formed integral therewith, and this conduit is connected by a pipe 27 with the exhaust of the motor.

A vertical pin 28 which is supported between lateral extensions 29 and 30 on the exterior of the housing portion 22, extends through a pivot sleeve 31. Supported from the sleeve is the usual clamping mechanism 32 for removably securing the motor to a boat. The pin 28 is pivotable within the sleeve 31 to permit steering movement, and the entire motor is swingable on a pin 33 toward a horizontal, inoperative position on the boat.

The lower end of the vertical drive shaft 18 is journalled in a bearing 34 formed as a part of the lower housing portion 23. Below the bearing 34 is a bevel gear 35 which is rigidly mounted on the lower end of the drive shaft 18. This bevel gear meshes with a bevel gear 36 rigidly mounted on a horizontal propeller shaft 37. The inner end of the propeller shaft 37 is journalled in a bearing 38, and an intermediate portion of the shaft is journalled in a bearing 39 suitably mounted in a boss 40. On an outer end of the horizontal propeller shaft 37 is the usual propeller 41. Adjacent the inner side of the propeller, and surrounding the propeller shaft 37 within the boss 40, is a special seal. This seal comprises a brass disc 42, a cup-shaped disc 43 preferably of a phenolic plastic material, and a packing 44 preferably of synthetic rubber. The various members forming the seal are held in effective position by a coil spring 45. The seal effectively prevents escape of oil from the lower housing portion 23 and also prevents the entrance of water.

The inner end of the propeller shaft 37 projects through the bearing 38 and has rigidly mounted thereon one of the gears 46 of a gear pump 47. The other meshing gear 48 of the gear pump is mounted on a stud shaft 49. The gears rotate in a recess 50 formed in a removable cover plate 51. The cover plate is removably held in position by bolts 52.

The lower portion of the housing 21, including the lower housing portion 23, forms a reservoir for motor oil. Oil in this reservoir furnishes constant lubrication for the bearings 34, 38 and 39 and for the gears 35 and 36. Oil from this reservoir is adapted to be sucked into the oil pump through an inlet duct 53 (see Fig. 3). This oil is discharged from the gear pump through an arcuate recess 54 connecting with a vertical duct 55. The vertical duct 55, as well as the curved recess 54, are formed in a wall portion of the lower housing section 23, as is clear from Fig. 3. The upper end of the duct 55 connects with a duct 56 formed by an upwardly opening groove which extends in a horizontal plane at the extreme upper end of the casting 23. This duct connects with the lower end of an oil pipe 57. The top of the horizontal duct portion 56 is sealed by the gasket 58 between the housing portions 22 and 23 except that there is a suitable opening formed in the gasket in registration with the lower end of the pipe 57 to afford communication between the duct 56 and said pipe.

The upper end of the pipe 57 connects with the lower end of the tubular cam shaft 12 to conduct oil under pressure from the pump thereto. This oil is discharged from one or more apertures in the cam shaft as is indicated at 59. This oil is, of course, directed on the crank shaft bearings. Some of the oil in the cam shaft 12 flows upwardly to the extreme upper end to lubricate the top bearing for the cam shaft.

The motor, of course, operates on gasoline undiluted with motor oil. During operation, the gear pump 47 will be operated by rotation of the horizontal propeller shaft 37. This will cause continuous pumping of oil from the reservoir in the housing portion 23 upwardly through the ducts 55, 56, and 57 and into the cam shaft as heretofore explained. Surplus oil from the crank case will continuously drain back through the bearing 16 and tube 19 into the oil reservoir in the bottom of the housing 21.

During normal operation, the lower end 20 of the oil return pipe is located well above the maximum level of oil in the reservoir.

By locating the gear pump 47 on the end of the propeller shaft it is possible to make the pump considerably smaller than would be the case if the pump gears had to be large enough to fit on the vertical drive shaft 18, as is true in the copending application heretofore mentioned. Also by having the gear pump 47 on the end of the propeller shaft 37, assembly is greatly simplified. In addition, removal of the cover 51 renders the gear pump parts readily accessible for repair or cleaning. It is to be noted that with the improved construction, the lower portion of the oil line leading from the gear pump is formed in a wall of the lower housing portion 23. Thus, when the lower housing portion is connected to the upper housing portion during assembly, a connection with the lower end of the oil pipe 57 is simultaneously brought about.

Various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated as may come within the scope of the claims.

What I claim is:

1. In an outboard motor having a top power head and including a combustion engine having a crank case in said power head, a vertical drive shaft depending from said head and driven by said engine, a horizontal propeller shaft adjacent the lower end of said vertical drive shaft, means between said vertical drive shaft and said horizontal propeller shaft for driving the latter, an elongated vertical housing including a top section surrounding all but the lower portion of the vertical drive shaft and a bottom section enclosing said lower portion and also the propeller shaft, there being a joint between said top and bottom sections, said bottom section forming a reservoir for motor oil, a pump in said bottom housing section driven by said horizontal propeller shaft, an oil duct in the wall of said bottom housing section, an oil duct formed at the joint between said top and bottom housing sections with which said first

duct communicates, and means including an oil tube in said top section which communicates with said joint duct for delivering oil to said crank case.

2. In an outboard motor having a top power head and including a combustion engine having a crank case in said power head, said crank case having a closed bottom formed with an opening, a vertical drive shaft depending from said crank case through said opening and driven by said engine, an elongated vertical housing for said vertical drive shaft, a portion of said housing forming a reservoir for motor oil when the motor is in normal operating position, means for delivering oil from said reservoir to said crank case, and means including a tube connected at its upper end to said opening in the bottom of the crank case and through which a substantial length of an upper portion of said vertical drive shaft extends, there being clearance between said shaft and opening and between said shaft and tube through which surplus oil may flow from said crank case to said reservoir.

3. In an outboard motor having a top power head and including a combustion engine having a crank case in said power head, a vertical drive shaft depending from said head and driven by said engine, a horizontal propeller shaft adjacent the lower end of said vertical drive shaft, means between said vertical drive shaft and said horizontal propeller shaft for driving the latter, an elongated vertical housing including a top section surrounding all but the lower portion of the vertical drive shaft and a bottom section enclosing said lower portion and also the propeller shaft, there being a joint between said top and bottom sections, said bottom section forming a reservoir for motor oil, a pump in said bottom housing section driven by said horizontal propeller shaft, and means including a duct formed at the joint between said top and bottom sections for delivering oil from said pump to said crank case.

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The following references are of record in the file of this patent:

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