Sept. 3, 1963 E. C. KIEKHAEFER 3,102,506

OUTBOARD MOTOR PROPELLER CONSTRUCTION

Original Filed Aug. 5, 1960

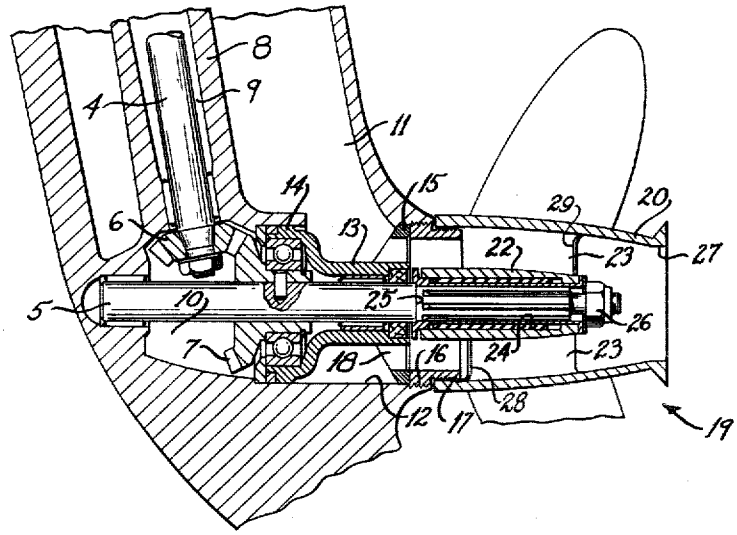


FIG. 2

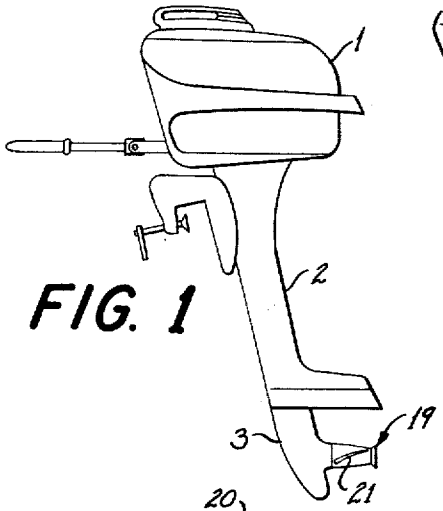


FIG. 1

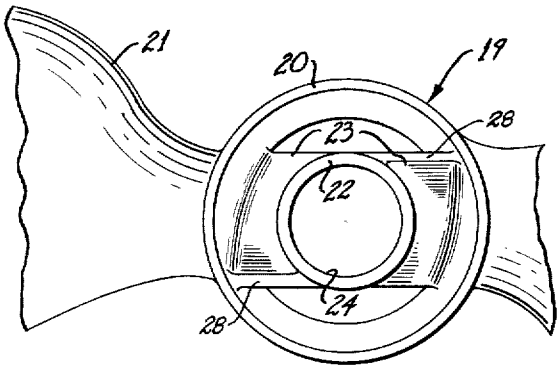


FIG. 4

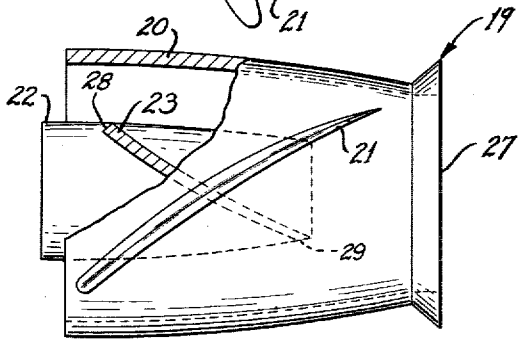


FIG. 3

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3,102,506
Patented Sept. 3, 1963

3,102,506
OUTBOARD MOTOR PROPELLER CONSTRUCTION

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Continuation of application Ser. No. 47,817, Aug. 5, 1960. This application Feb. 27, 1962, Ser. No. 177,697
5 Claims. (Cl. 115—17)

This invention relates to reversible outboard motors of the type wherein the exhaust gases are expelled through the propeller hub and provides for improved flow of exhaust gases through the propeller hub when the motor is operated in reverse.

In outboard motors which exhaust the products of engine combustion through the propeller hub, the hub generally includes a tubular inner hub member adapted for securement on the propeller shaft of the motor and a tubular outer hub member which carries the propeller blades. The inner and outer hub members are spaced apart by means of a plurality of struts to form an exhaust passage therebetween which conducts the products of combustion from the exhaust passage within the drive shaft housing of the motor for discharge into the water rearwardly of the propeller.

When operating a motor having a propeller hub exhaust system in reverse as when backing up to boat to which the motor is secured, a considerable volume of water enters the propeller hub exhaust outlet and interferes with the normal flow of exhaust gases from the engine. As a result back pressures may develop in the exhaust system which adversely affect the efficiency of the engine. It is generally an object of this invention to push or pump the water from the interior of the propeller hub when the motor is operated in reverse and thereby assist the flow of exhaust gases from the engine.

According to the invention, the struts joining the inner and outer hub members of a propeller for a reversible outboard motor having a propeller hub exhaust system are disposed angularly with respect to the axis of the hub members so as to form a pump impeller adapted to push or pump the water from the hub and thereby assist the flow of exhaust gases when the motor is operated in reverse.

The drawings furnished herewith illustrate the best mode of carrying out the invention as presently contemplated and set forth hereinafter.

In the drawings:

FIGURE 1 is a side elevation of an outboard motor having a reversible engine and which is adapted to move a boat selectively in forward and reverse directions;

FIGURE 2 is an enlarged partial sectional view of an outboard motor and shows the propeller hub exhaust system of this invention;

FIGURE 3 is an enlarged view of the propeller hub with parts broken away and sectioned to show one of the struts adapted to push or pump water from the hub when the motor is operated in reverse; and

FIGURE 4 is an end view of the propeller hub of this invention.

Referring to the drawings, the outboard motor includes a reversible engine, not shown, adapted to propel the motor in both forward and rearward directions and disposed within the powerhead **1** supported at the upper end of the drive shaft housing **2** and a lower underwater unit **3** carried at the lower end of the drive shaft housing. The drive shaft **4** extends downwardly within housing **2** and drivingly connects the engine with the propeller shaft **5** of the lower unit **3** through bevel gears **6** and **7** carried respectively by the drive shaft and propeller shaft.

The lower unit **3** includes a housing **8** providing a downwardly extending passage **9** within which the drive shaft **4** is rotatably mounted and a lower horizontal chamber **10** into which the lower end of the drive shaft extends. An exhaust passage **11** communicating with the engine surrounds housing **8** and connects with chamber **10** rearwardly of the drive shaft.

A portion of chamber **10** rearwardly of the drive shaft constitutes a cylindrical bore **12** and is adapted to receive the spool-like member **13** within which the propeller shaft **5** is rotatably supported. The enlarged forward portion **14** of member **13** engages the wall of bore **12** and serves to isolate the forward portion of chamber **10** containing gears **6** and **7** from the remainder of chamber **10** which communicates with the exhaust passage **11** of lower unit **3**. Rearwardly the spool-like member **13** is provided with an annular flange **15** which engages the wall of bore **12** adjacent to the threaded opening **16** to the bore rearwardly of unit **3**. An externally threaded annular collar **17** is threaded into the bore opening **16** and engages the flange **15** to secure the member **13** within the bore **12**. The flange **15** of member **13** is provided with a plurality of circumferentially spaced openings **18** through which the exhaust gases pass from the passage **11** to the propeller unit **19**.

The propeller unit **19** comprises an annular outer hub sleeve **20** which overlaps the rearwardly extending portion of collar **17** and carries the propeller blades **21**. The hub sleeve **20** is spaced outwardly from the inner hub sleeve **22** and a plurality of struts **23** extend between and interconnect the sleeves. The bore **24** of hub sleeve **22** is adapted to be received on the rearwardly extending splined portion of propeller shaft **5** and is secured between shoulder **25** and the nut **26** threaded onto the end of shaft **5**. In operation, the exhaust gases entering the propeller unit **19** pass between the spaced sleeves **20** and **22** for discharge through the nozzle opening **27** rearwardly of the unit.

When operating the outboard motor in reverse, a considerable volume of water ordinarily enters the propeller unit **10** and fills to a considerable depth the exhaust passages in the underwater unit **3** and drive shaft housing **2** which interferes with the normal flow of exhaust gases from the engine giving rise to back pressures in the exhaust system resulting in a lesser engine efficiency.

According to this invention, the struts **23** interconnecting the hub sleeves **20** and **22** are provided with an angularity relative to the axis of the hub sleeve such that the forward edges **28** of the struts lead the corresponding rearward edges **29** rotatively when the propeller rotates to provide for reverse operation of the propulsion unit to form a simple impeller capable of pumping or pushing water from the interior of the propeller unit **19** during reverse operation. In the case of an outboard propulsion unit wherein the propeller blades **21** have a fixed angularity, the struts **23** have an angularity generally opposed to that of the propeller blades. The pumping action of the struts **23** during reverse operation of the motor substantially prevents the entry of water into the exhaust passages of the underwater unit **3** and the drive shaft housing **2** to materially assist the flow of exhaust gases from the engine.

During forward operation of the motor, the hub is substantially free of water so that the struts **23** remain ineffectual as pump impellers and offer negligible resistance to the flow of exhaust gases through the propeller unit **19**.

This application is a continuation of applicant's copending application Serial No. 47,817, filed August 5, 1960, and entitled "Outboard Motor Propeller Construction," now abandoned.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. In a propulsion unit for a boat; a propeller; means to rotate the propeller selectively in one direction for forward operation of the propulsion unit and in the opposite direction for reverse operation of the unit; said propeller comprising an outer hub sleeve and an inner hub sleeve, said sleeves being radially spaced to provide a hub passage therebetween for conducting exhaust gases rearwardly from the unit, and a plurality of struts in said passage extending between and connecting said sleeves, said struts being angularly disposed relative to the axis of said sleeves and having the forward edges thereof lead the corresponding rearward edges rotatively when the propeller rotates in said opposite direction whereby to form an impeller within the hub passage adapted to push water from the interior thereof during reverse operation of the unit.

2. In a propulsion unit for a boat; a propeller mounted on a generally horizontal shaft; means to rotate the propeller in opposed directions selectively to provide for forward and reverse operation of the unit; said propeller comprising an outer sleeve member, a plurality of propeller blades carried by the outer sleeve member and disposed angularly with respect to the axis of said sleeve member, an inner sleeve member adapted to be secured on the generally horizontal propeller shaft, said sleeve members being radially spaced to provide a passage therebetween for conducting exhaust gases rearwardly from the unit, and a plurality of struts extending between and connecting said sleeve members, said struts being disposed angularly relative to the axis of said sleeve members and opposite to the angularity of the propeller blades to thereby form an impeller within the exhaust passage adapted to push water from the interior of the propeller when the propeller rotates to provide for reverse operation of the propulsion unit.

3. In an outboard motor; a propeller unit; an internal-combustion engine to drive said propeller unit; a housing member carrying said engine at the upper end thereof and said propeller unit at the lower end thereof, said housing member having a passage adapted to conduct exhaust gases from said engine to the propeller unit; said propeller unit being selectively rotatable in one direction for forward operation of the outboard motor and in the opposite direction for reverse operation of the motor and comprising an outer sleeve member and an inner sleeve member, said sleeve members being spaced apart radially to provide a passage therebetween to receive the exhaust gases from said housing member and conduct same rearwardly through the unit, and a plurality of struts extending between and connecting said sleeves, said struts being angularly disposed relative to the axis of said sleeve members and having the forward edges thereof lead the corresponding rearward edges rotatively when the propeller rotates in said opposite direction whereby to form an impeller within the exhaust passage of the propeller unit adapted to push water from the interior of the unit during reverse operation of the outboard motor.

4. In a propeller for a watercraft propulsion unit, said propeller being selectively rotatable in one direction for forward operation of the propulsion unit and in the opposite direction for reverse operation of the unit and comprising an outer hub sleeve and an inner hub sleeve, said sleeves being radially spaced to provide a hub passage therebetween for conducting exhaust gases rearwardly from the unit, and a plurality of struts in said passage extending between and connecting said sleeves, said struts being angularly disposed relative to the axis of said sleeves and having the forward edges thereof lead the corresponding rearward edges rotatively when the propeller rotates in said opposite direction whereby to form an impeller within the hub passage adapted to push water from the interior thereof during reverse operation of the propulsion unit.

5. A propeller for underwater propulsion, comprising an outer hub sleeve and an inner hub sleeve spaced radially from each other to provide a hub passage therebetween for discharging gases rearwardly from the propeller, propeller blades extending outwardly from said outer hub sleeve and angularly disposed to provide forward and rearward propulsion by the propeller dependent upon the selective direction of rotation thereof, and a plurality of struts extending between and connecting said sleeve members, said struts being disposed angularly relative to the axis of said sleeve members and opposite to the angularity of the propeller blades to thereby form an impeller within the exhaust passage adapted to push water from the interior of the propeller when the propeller rotates to provide for reverse operation of the propulsion unit.

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