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OUTBOARD PROPULSION UNIT EXHAUST SYSTEM

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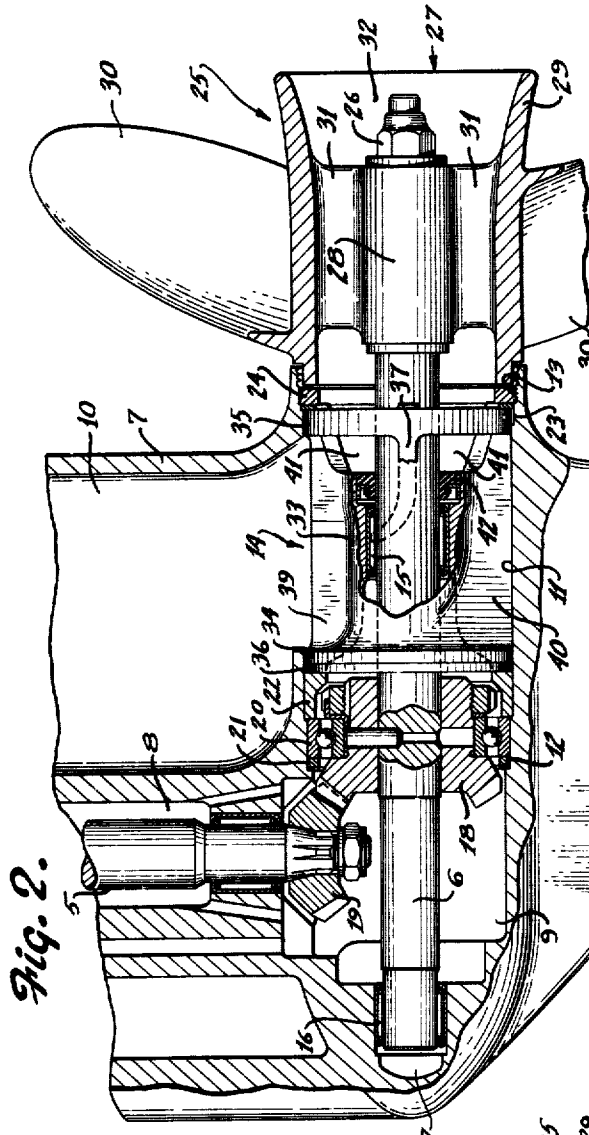


Fig. 2.

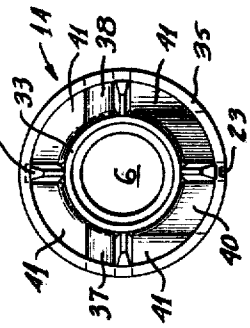


Fig. 4.

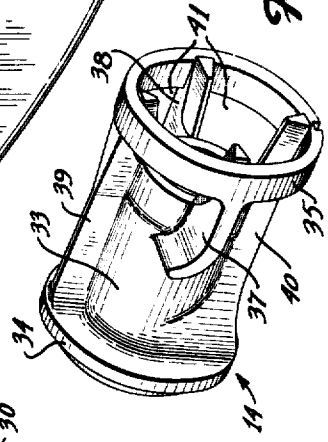


Fig. 3.

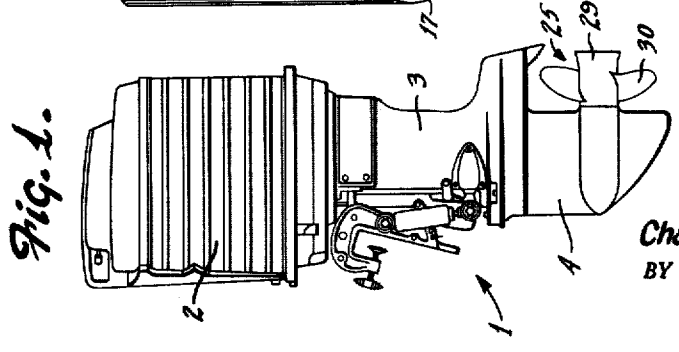


Fig. 1.

INVENTOR.
Charles F. Alexander, Jr.
BY
Andrus & Starke
Attorneys

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OUTBOARD PROPULSION UNIT EXHAUST SYSTEM

Charles F. Alexander, Jr., Oshkosh, Wis., assignor, by mesne assignments, to Kiekhaefer Corporation, Chicago, Ill., a corporation of Delaware

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This invention relates to the exhaust system of an outboard propulsion unit of the type wherein the engine exhaust products are discharged from the unit through the propeller hub, and more particularly to means for directing the flow of the exhaust gases through the system with a minimum of turbulence and thereby reduce the absolute back pressures in the system.

Of necessity, the lower or underwater assembly of an outboard propulsion unit must remain of minimum proportions so as to produce a minimum of drag on the unit in service. This requirement imposes rather stringent space limitations in the exhaust system where exhausting is effected through the propeller hub. The problem of exhaust flow through the propeller hub is further aggrivated by the fact that the stream of exhaust gases must change direction within the underwater assembly from a generally vertical passage to a generally horizontal direction which can give rise to turbulence and eddies within the relatively narrow confines of the system resulting in unduly high back pressures which adversely affect engine efficiency. It is generally an object of this invention to provide for improved flow of the exhaust products through the exhaust system of an outboard propulsion unit which discharges the exhaust through the propeller hub to thereby prevent buildup of undue back pressures in the system.

In an outboard propulsion unit adapted to discharge the engine exhaust products through the propeller hub, the lower or underwater assembly comprises a housing having a generally cylindrical horizontal bore which opens rearwardly of the housing and is adapted to receive exhaust gases from a downwardly extending passage in said housing. A bearing support member is secured in the bore and a propeller shaft is rotatably supported in the bearing support member and extends rearwardly through the bore opening. Means are provided within the housing for rotating the shaft. A propeller is mounted on the shaft rearwardly of the housing and includes a hub portion having a rearwardly extending passage means generally aligned with the housing bore and terminating with a discharge opening. The hub passage means is adapted to receive the exhaust gases from the housing bore for discharge through the rear opening.

According to this invention, the bearing support member secured within the bore of the underwater assembly includes external structural members which serve as baffle means for directing the flow of the exhaust gases from the downwardly extending passage of the assembly into the rearwardly extending passage means of the propeller hub with a minimum of turbulence to thereby reduce the possibility of developing back pressures in the exhaust system.

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

In the drawings:

FIG. 1 is a side elevation of an outboard motor employing the propeller hub exhaust system of this invention;

FIG. 2 is an enlarged elevational view partially in section showing details of the improved exhaust system of this invention;

FIG. 3 is an enlarged perspective view of the propeller shaft bearing support member showing in greater detail

the external baffle means for directing the exhaust flow from the downwardly extending passage of the lower assembly into the generally horizontal passage means through the propeller hub; and

FIG. 4 is an end elevational view of the bearing support member as viewed from the right or rear of the showing in FIGURE 2.

The outboard motor 1 shown in the drawings includes an engine, not shown, enclosed within a cowl 2 supported at the upper end of the drive shaft housing 3, and a lower underwater unit 4 carried at the lower end of the drive shaft housing. The drive shaft 5 extends downwardly within the housing 3 and drivingly connects the engine with the propeller shaft 6 of the lower unit 4.

The lower underwater unit 4 comprises a housing 7 having a downwardly extending passage 8 within which the drive shaft 5 is rotatably disposed and a lower generally horizontal chamber 9 into which the lower end of the drive shaft extends. An exhaust passage 10 communicating with the engine surrounds passage 8 and connects with chamber 9 rearwardly of the drive shaft.

Rearwardly of drive shaft 5, the chamber 9 constitutes a cylindrical bore 11 terminating at shoulder 12 and is provided with a threaded opening 13 rearwardly of housing 7. Bore 11 is adapted to coaxially receive the spool-like bearing support member 14 through which the propeller shaft 6 extends.

The propeller shaft 6 is rotatably supported within the spaced needle bearings 15 and 16 disposed respectively within support member 14 and recess 17 formed in housing 7 forwardly of chamber 9 and extends rearwardly through opening 13. The driven gear 18 is secured on the propeller shaft 6 forwardly of support member 14 and meshes with the bevel gear 19 secured on the end of drive shaft 5 within chamber 9. The hub of gear 18 on propeller shaft 6 extends rearwardly into bore 11 and is rotatably supported within bearing 20 secured longitudinally between thrust washer 21 seated against shoulder 12 and the annular spacing ring 22. The spool-like bearing support member 14 is disposed in engagement with the annular spacing ring 22 and is locked against rotation by means of the key 23 seated between member 14 and housing 7. Bearing support member 14, together with the propeller shaft assembly, is secured longitudinally within chamber 9 by means of the annular threaded collar 24 which is threaded into opening 13 of housing 7 into engagement with member 14.

Rearwardly of housing 7, the propeller shaft 6 carries the propeller 25 which is secured longitudinally of the shaft between a shoulder, not shown, and the lock nut 26. The propeller hub 27 includes an inner sleeve 28 mounted on shaft 6 for rotation therewith and an outer sleeve 29 which carries blade 30 and is spaced from the inner sleeve by means of a plurality of angularly spaced fins 31. Forwardly, the outer sleeve 29 of hub 27 extends into opening 13 of housing 7 and is spaced from collar 24 to provide a running clearance and the inside diameter of sleeve 29 generally corresponds to the inside diameter of collar 24. During operation of motor 1, the exhaust gases move from passage 10 around the bearing support member 14 in chamber 9 and through collar 24 into the propeller hub 27 for discharge under water throught the discharge opening 32 rearwardly of the hub.

The spool-like bearing support member 14 disposed in bore 11 of chamber 9 is provided with external structural means in the form of projections or fins which provide for proper spacing and support of the propeller shaft 6 within the bore. The structural means in the form of projections or fins further constitute baffle means adapted to direct or guide the flow stream of exhaust products through the limited flow area around mem-

ber 14 from the generally vertical passage 10 into the generally horizontal propeller hub 27 with a minimum of turbulence to thereby prevent undue back pressure in the system.

The spool-like bearing support member 14 comprises generally a cylindrical body portion 33 which is provided with a flange 34 forwardly and annular collar 35 rearwardly. Flange 34 and collar 35 generally correspond to the bore diameter to properly seat and align the member 14 within the bore 11. Support member 14 is fully closed forwardly and flange 34 is stepped forwardly to accommodate an O-ring seal 36 between member 14, spacing ring 22 and the wall of bore 11 to preclude passage of exhaust gases and moisture into the forward portion of chamber 9 housing the gears 18 and 19.

The collar 35 is spaced rearwardly from the cylindrical body portion 33 and is connected thereto by means of integral structural members in the form of fins or projections. The structural members connecting collar 35 and body portion 33 include a pair of generally horizontally disposed fin members 37 and 38 generally aligned each to the other on opposed sides of member 14. Fin members 37 and 38 generally lie in the plane of the axis of bore 11 and curve upwardly at the forward end thereof terminating at a location generally midway between flange 34 and collar 35. The outer surfaces of members 37 and 38 are disposed generally to correspond with the wall of bore 11 and therefore assist in the positioning of member 14 within the bore.

Member 14 also includes an upper reinforcing web or fin 39 connecting collar 35 and body portion 33 and extending between the collar and flange 34 generally in the vertical plane through the axis of bore 11.

A lower projecting member 40 disposed generally in the vertical plane through the axis of bore 11 also connects collar 35 and body portion 33 and extends from the collar to flange 34. Member 40 is relatively narrow between collar 35 and body member 33 of member 14 and then flares outwardly in the forward direction. The width of member 40 at its forward extremity corresponds generally to the diameter of the body portion 33. The outer surface of member 40 is disposed generally to correspond with the wall of bore 11 so that the member like fins 37 and 38 assists in the positioning of member 14 within the bore.

The several structural members 37, 38, 39 and 40 define a plurality of exhaust passages 41 between body portion 33 and collar 35 of member 14 whereby the exhaust gases enter the propeller hub 27. A sealing member 42 closes the rearward end of body member 33 to prevent ingress of exhaust gases and moisture and egress of lubricant.

In the flow of exhaust gases through bore 11, the spool-like bearing support member 14 divides the column of such gases from passage 10 into separate portions on the respective sides of the member. The curved horizontal structural members 37 and 38 further divide the separate portions of the gases and smoothly deflect or guide the flow from the generally vertical direction to the generally horizontal direction for entry into hub 27. The lower flared member 40 provides for a relatively constant flow area beneath fins 37 and 38 and likewise serves to smoothly deflect or guide the exhaust gases into the propeller hub.

Thus, for an outboard propulsion unit exhausting through the propeller hub, the invention provides for the adequate support of the propeller shaft within the limited confines of the underwater housing along with improved flow of the exhaust gases through such housing.

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 an outboard propulsion unit underwater assembly, a housing having a generally cylindrical horizontal bore which opens rearwardly of said housing and is adapted to receive exhaust gases from a downwardly extending passage in said housing, a bearing support member secured in said bore and having axially spaced end portions adapted to engage the bore wall, a propeller shaft rotatably supported within said bearing support member and extending rearwardly throught said bore opening, means within said housing to effect rotation of said shaft, a propeller having a hub mounted on said shaft rearwardly of said housing, said hub including rearwardly extending passage means generally aligned with said bore and terminating with a discharge opening and adapted to receive the exhaust gases from the bore for discharge through said opening, and baffle means within said bore outwardly from the bearing support member and intermediate the end portions of said member to direct the flow of exhaust gases from the downwardly extending passage into the rearwardly extending propeller hub passage means with a minimum of turbulence and thereby reduce the absolute back pressure in the exhaust system.

2. The invention as set forth in claim 1 wherein the baffle means are formed integrally with the bearing support member and extends outwardly therefrom to generally engage with the wall of the bore in the underwater housing to assist in properly aligning and seating the bearing member within the bore.

3. In a lower unit assembly of an outboard propulsion unit, a housing having a generally cylindrical horizontal bore which opens rearwardly of said housing and is adapted to receive exhaust gases from a downwardly extending passage in said housing, a bearing support member secured in said bore, a propeller shaft rotatably supported within said bearing support member and extending rearwardly through said bore opening, means within said housing to effect rotation of said shaft, and a propeller having a hub mounted on said shaft rearwardly of said housing, said hub including rearwardly extending passage means generally aligned with said bore and terminating with a discharge opening and adapted to receive the exhaust gases from the bore for discharge through said opening, said bearing support member comprising a cylindrical body portion having a generally vertical external partition means adapted to divide the column of exhaust gases flowing into the bore from the downwardly extending passage in the housing, said body portion further having opposed horizontally disposed fins which curve upwardly at the forward end thereof and terminate intermediate the length of said body portion to further divide the column of exhaust gases and direct the flow of exhaust gases from the downwardly extending passage in said housing into the horizontal propeller hub passage means, said partition means and fins extending outwardly generally into engagement with the wall of said bore and thereby providing for proper alignment and support of the bearing support member within the bore.

4. The invention as set forth in claim 3 wherein the vertical external partition means on the cylindrical portion of said bearing support member is relatively narrow rearwardly and is flared outwardly in the forward direction to present a desired flow area beneath said fins and to guide the exhaust gases passing beneath said fins into the propeller hub passage means.

5. In a lower unit assembly of an outboard propulsion unit, a housing having a generally cylindrical horizontal bore which opens rearwardly of said housing and is adapted to receive exhaust gases from a downwardly extending passage in said housing, a bearing support member secured in said bore, a propeller shaft rotatably supported within said bearing support member and extending rearwardly through said bore opening, means within said housing to effect rotation of said shaft, and a propeller having a hub mounted on said shaft rearwardly of said housing, said hub including rearwardly extending passage means generally aligned with said bore and terminating

with a discharge opening and adapted to receive the exhaust gases from the bore for discharge through said opening, said bearing support member comprising a cylindrical body portion having an annular flange forwardly and an annular collar rearwardly, said flange and collar corresponding generally to the diameter of the bore in said housing, said collar being spaced rearwardly from said body portion and being connected thereto by means of a plurality of relatively narrow structural members defining a plurality of openings between the body portion and collar for passage of exhaust gases into the propeller hub passage means, said structural members including opposed horizontally disposed fins extending forwardly from said collar generally in a horizontal plane through the axis of said bore and which curve upwardly at the forward end thereof and terminate substantially midway between the flange and collar to direct the flow of exhaust gases from the downwardly extending passage in said housing into the horizontal propeller hub passage means, said structural members further including a downwardly projecting member disposed generally in the vertical plane through the bore axis, and extending between said flange and collar, said downwardly projecting member having a relatively narrow rearwardly portion between the collar

and body portion of the support member and thereafter being flared outwardly in the forward direction to a width corresponding generally to the diameter of the cylindrical body portion to present a relatively constant flow area beneath said fins and to guide the exhaust gasses passing beneath said fins into the propeller hub passage means, said fins and downwardly projecting member extending outwardly to the diameter of said collar and flange generally into engagement with the wall of said bore and thereby provide for proper alignment and support of the bearing support member and propeller shift within the bore.

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