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[54] **EXHAUST SYSTEM FOR MARINE OUTDRIVE**
7 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** ..... **60/29,** 115/0.5, 115/41 R
[51] **Int. Cl.** **F01n 7/08,** B63h 21/32
[50] **Field of Search** ..... 60/29 R; 115/0.5, 41 R

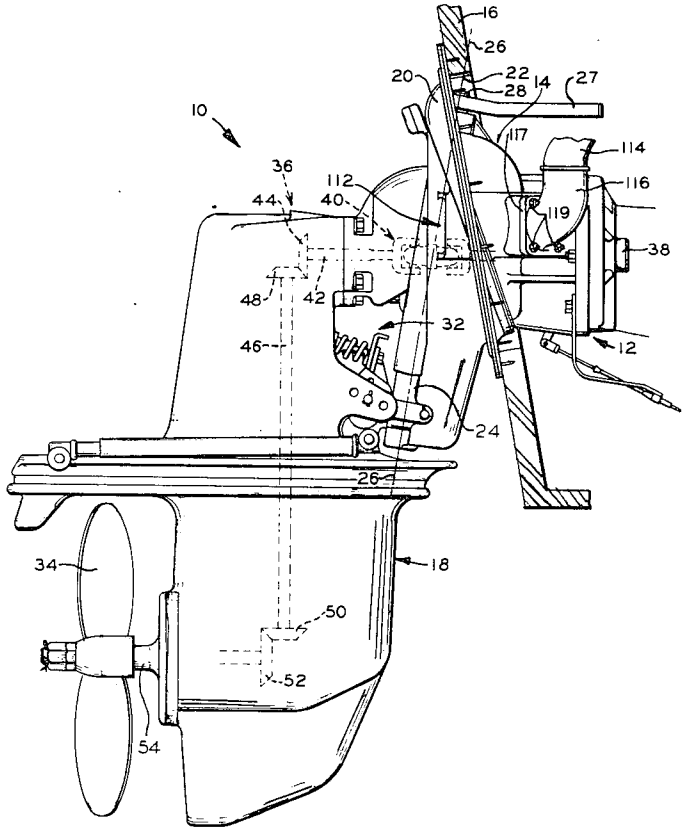
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ABSTRACT: A marine outdrive unit is provided which includes an exhaust system in which there is proper cooling of the exhaust gases and in which an easy connection to the prime mover can be made. Additionally, because of positioning and streamlining of the exhaust arrangement, it eliminates possible turbulence from the exhaust stream when the boat on which the outdrive unit is mounted is proceeding forwardly in high-speed operation.

The exhaust system comprises a pair of cavities which extend arcuately around the periphery of the outdrive housing and open at their inlet and outlet ends into angularly disposed flanges (relative to the axial extent of the marine outdrive unit) so as to provide easy connection to the marine drive engine and an exhaust flow which does not create turbulence adjacent to the propeller of the marine outdrive unit.



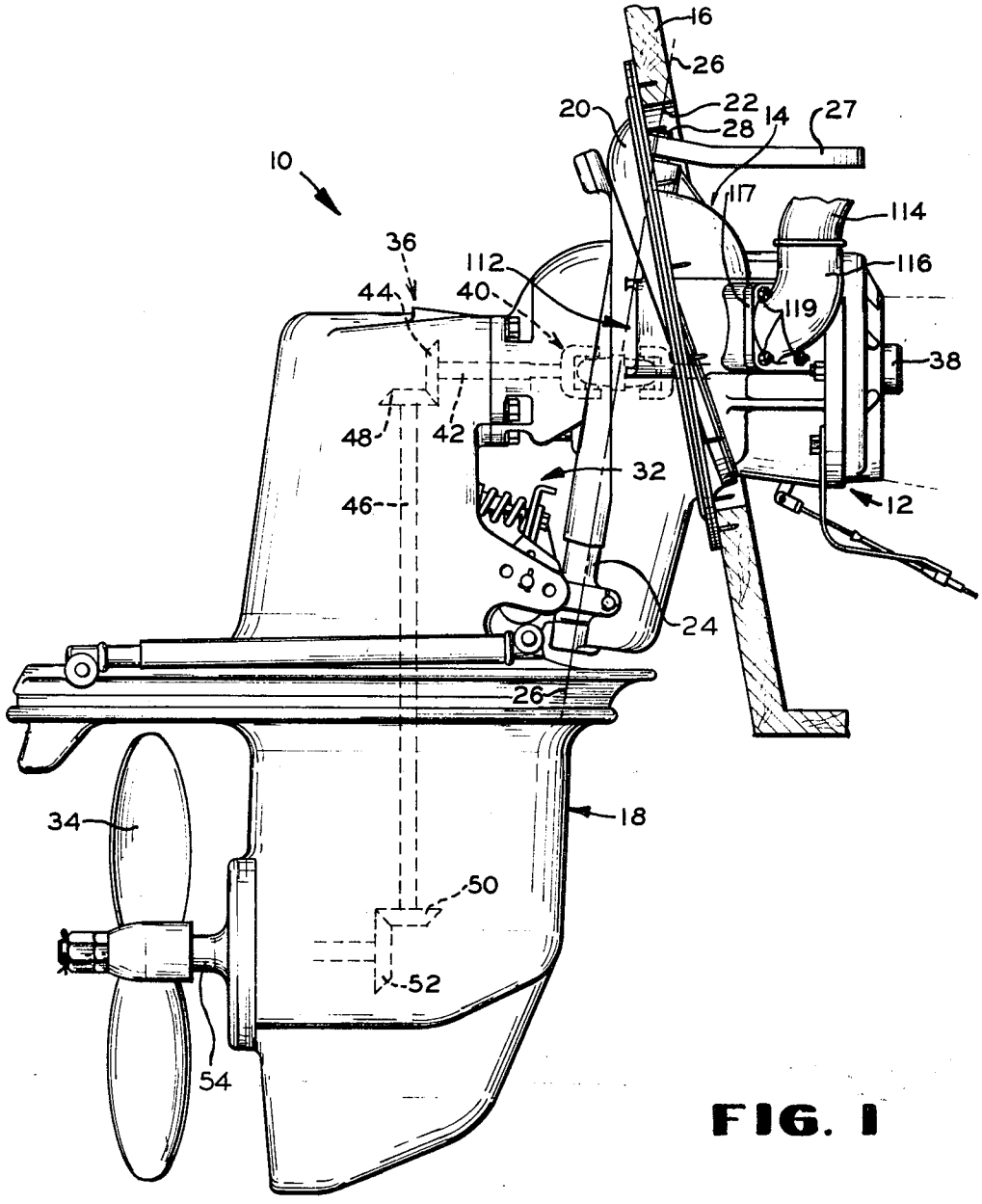


FIG. 1

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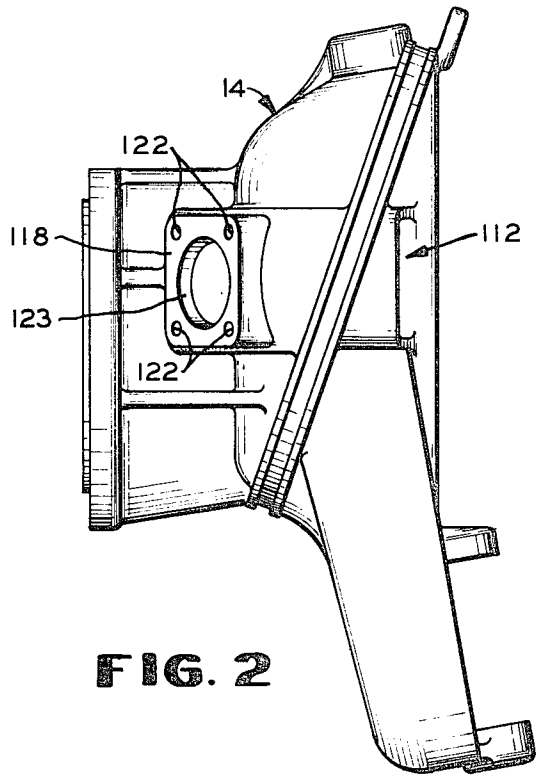


FIG. 2

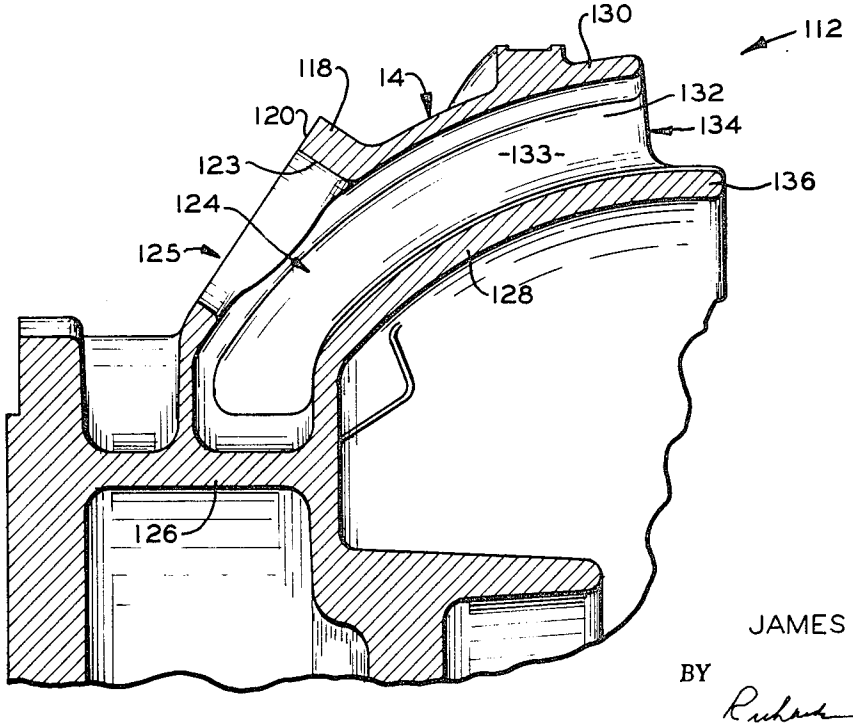


FIG. 4

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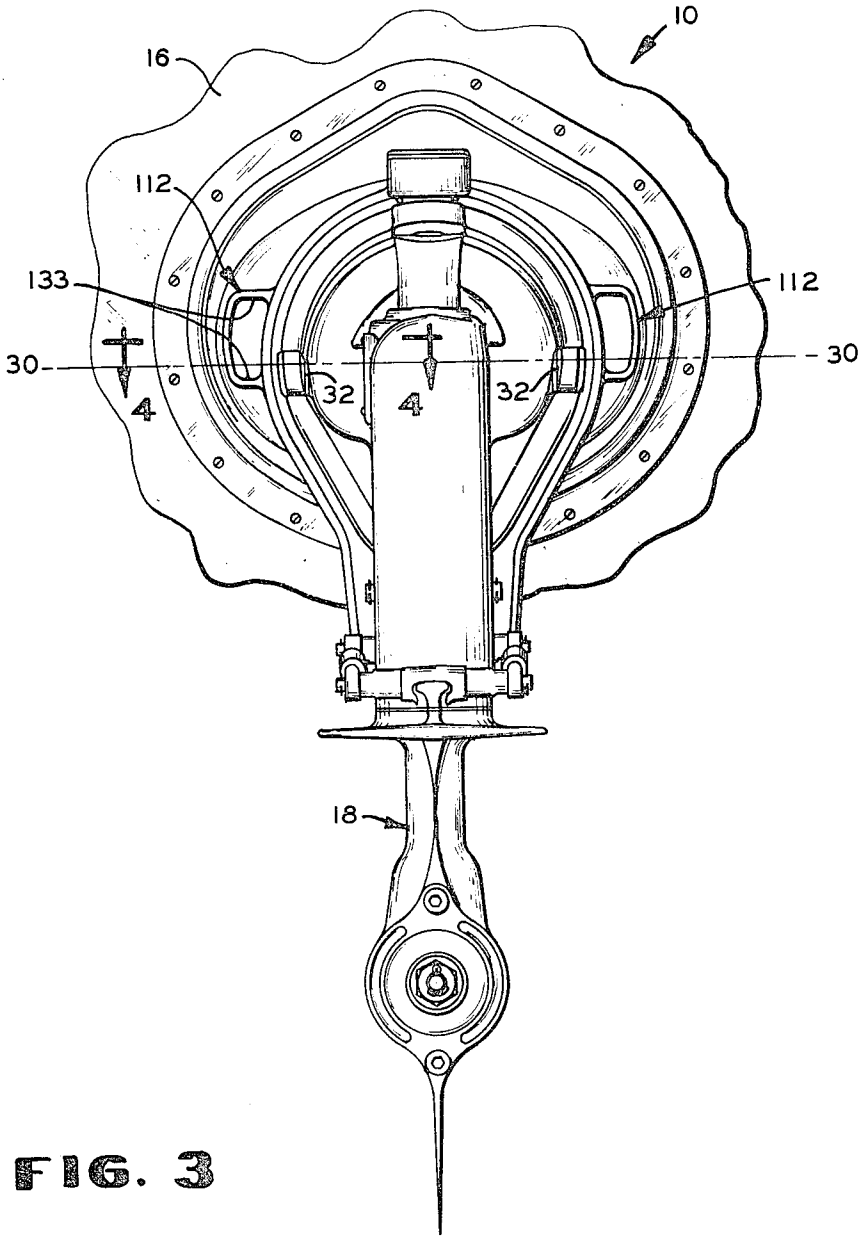


FIG. 3

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EXHAUST SYSTEM FOR MARINE OUTDRIVE

This application is a continuation of application, Ser. No. 742,391, filed July 3, 1968, now abandoned.

Exhaust systems for outboard marine engine units are old and well known in the art. Some of these outboard motor units include provisions for a streamlined exit of the exhaust engine gases above the water line of the boat while it is in forward motion. Some of these units also include provisions for the cooling of exhaust gases as they pass through a portion of the engine and its casing prior to their exit from the boat. However, none of these outboard engine exhaust applications have been concerned with the provision of a satisfactory exhaust system for use with an outdrive unit and which exhaust system also includes provision for receipt of properly cooled exhaust gases, conduction of this exhaust stream through the outboard unit without interference with the operating parts of this unit through a single mounting hole in the transom and provision for the lessening of turbulence due to streamlining and location of the exhaust port. Accordingly, the provision of such an exhaust system, having the above attributes, would be highly advantageous to the outboard marine drive art.

It is, therefore an object of this invention to provide an exhaust system for a marine outdrive unit wherein the arrangement is such that there is easy receipt of properly cooled exhaust gases.

It is another object of this invention to provide an exhaust system for an outdrive unit which is easily connectable to the marine engine.

It is a further object of this invention to provide an exhaust system for a marine outdrive unit which does not interfere with the driveline components, propeller or the propeller shaft of the marine drive unit so as to eliminate any adverse effects due to water and combined exhaust gas caused corrosion or erosion.

It is still a further object of this invention to provide an exhaust system for an outdrive unit which is easily incorporated as an operative portion of the upper housing of the outdrive unit which can be mounted through a single hole in the transom and thereby renders it streamlined, easily and inexpensively manufactured.

Other and further objects of this invention will be apparent from the following description and appended claims and may be understood by reference to the accompanying drawings which, by way of illustration, show a preferred embodiment of the invention and what is considered to be the best mode of applying the above principles.

In a preferred embodiment of this invention a pair of substantially arcuate and rearwardly extending exhaust passageways are provided on the opposite sides of the upper housing portion of the outdrive unit. The inlet ports for each of the exhaust passageways are provided with flanged portions for the attachment of connecting elbows, which in turn, provide connection for the combined exhaust and returning cooling water hoses extending from the marine engine. The exhaust ports for the exhaust system are angularly facing relative to the axial direction of the linear dimension of the outdrive unit so that the combined discharge stream of water and exhaust gases is directed outwardly away from the boat and propulsion propeller. Additionally, because of the relatively high positioning of the exhaust ports in the upper portion of the outdrive unit, the exhaust stream is disposed of above the water line so that, as the boat moves rapidly through the waters there is no interference turbulence between this stream and the desired hydrodynamic turbulence set up by the marine propulsion system (the propeller).

In the drawings:

FIG. 1 is a side view of the outdrive unit as mounted in a boat with portions of the outdrive unit shown in phantom;

FIG. 2 is an enlarged side view of a portion of the outdrive unit showing one of the passageways of the exhaust system with its entrance and exhaust ports;

FIG. 3 is a rear view of the outdrive unit showing the location of the exhaust outlet ports; and

FIG. 4 is a sectional view taken on line 4—4 of FIG. 3 and showing the outwardly extending arc of one of the dual passageways of the exhaust system.

Referring now more particularly to the drawings and specifically to FIG. 1, the invention is seen as comprising a marine drive unit **10** which includes a drive attaching portion **12** formed adjacent to an upper housing **14** of the marine drive unit **10**. The drive attaching portion **12** is adapted for rigid connection to a drive unit (not shown) containing, for example, a forward and reverse gearing mechanism with a marine engine (not shown) located inboard of the drive unit and rigidly affixed to it and the supporting structure forming the frame of the boat. The upper housing portion **14** of the marine drive unit **10** extends from the drive attaching portion **12** outwardly through a transom **16**, forming the rear wall of the boat, so as to provide a mounting means for a lower drive unit **18** of the marine drive unit **10**. To provide a sealing arrangement between the boat and outwardly extending upper housing portion **14**, a bootlike seal **20** is disposed between the transom **16** and periphery of the upper housing portion **14** so as to seal a substantially circular aperture **22** in the transom **16** through which the upper housing portion **14** extends. Seal **20** is a very resilient element, made of thick neoprene or the like, and provides a watertight but nonsupporting connection between the transom **16** and upper housing **14** to insure that no water intrudes into the boat proper. Thus, the outwardly projecting upper housing portion **14**, and thereby the marine drive unit **10** in no way interferes with the seaworthiness of the boat in which it is installed.

Outwardly of the transom **16** of the boat, the marine drive unit **10** includes a gimbal ring **24** which is pivotally mounted on the upper housing portion **14** on a generally vertical axis **26—26** to thereby provide for steering control of the lower drive unit **18**. The axis **26—26**, as seen in FIG. **1**, is angularly disposed relative to the vertical to provide for a portion of the "trim" for the lower drive unit **18** of the marine drive unit **10**. A tiller bar **27**, mounted integral with the upper end of a projecting pin **28** of the gimbal ring **24**, provides for easy turning of the gimbal ring **24** and thereby convenient steering of the lower drive unit **18**. The tiller bar **27** extends inwardly of the transom **16** so as to be manually manipulatable or easily attached to a cable or the like (not shown) for steering by the occupant of the cockpit of the boat.

Gimbal ring **24** is pivotally connected to and mounts the lower drive unit **18** on a horizontal axis **30—30** (FIG. **3**) disposed mediately and on the diametric axis of the gimbal ring **24**. The axis **30—30** may be conveniently formed by a pair of pinlike members **32, 32** fixed to the lower drive unit **18** so as to extend into oppositely disposed bores positioned in the ring like circumference of the gimbal ring **24**. The axis **30—30** thereby provides a horizontal pivot means for the lower drive unit **18** so that it may be easily pivoted upwardly out of the water for repair or kickup upon encountering a water-borne obstruction of the like.

A latch means **32** (FIG. **1**) is provided, mounted generally below the gimbal ring **24**, which is operative between it and the lower drive unit **18** to lockingly couple the lower drive unit to the upper housing portion **14** and control pivotal movement of the lower drive unit **18** relative to the upper housing portion **14**. Thus, unwarranted and unwanted upward pivoting of the lower drive unit **18** of marine drive unit **10** during forward and reverse operation of the boat is prevented. The latch means **32** is more fully disclosed in a copending application owned by a common assignee and entitled "Marine Outdrive Latch" filed Jan. 4, 1968. If desired, reference may be made to this application for a more precise description and understanding of the operation of the latch means **32**.

A drive mechanism **36** (FIG. **1**) is provided for the marine drive unit **10** so as to transfer propulsion force from the drive unit to a propeller **34**. This drive mechanism includes a shaft **38** journaled in upper housing portion **14** and connected to the drive unit by a shaft (not shown) extending therefrom. Shaft **38** extends rightwardly from the lower drive unit **18** and

is connected to and forms a stub shaft for a double Cardan joint 40 which has its center generally on the intersection of the axes 26—26 and 30—30. A shaft 42, forming a leftward extension of the double Cardan joint 40, is journaled within the lower drive unit 18 and carries a bevel gear 44 near its leftward end in nonrotational relationship to provide a right-angle power transfer to a shaft 46 extending vertically in the lower drive unit 18. The shaft 46 in turn, is journaled in the lower drive unit 18 and is connected to the previously mentioned shaft 42 through a bevel gear 48 which is nonrotationally mounted on the shaft 46 so as to be, at all times, in full meshing engagement with bevel gear 44. By this arrangement power can be continuously transmitted from the forward and reverse drive unit to the lower drive unit 18 independent of the pivotal location of the lower drive unit 18 relative to the upper housing portion 14.

At the lower end of the shaft 46, within the lower drive unit 18, the shaft 46 mounts a bevel gear 50 in a nonrotational relationship. The bevel gear 50 is disposed in a position so that it may mesh with a bevel gear 52 mounted at a right angle to it to provide the marine drive unit 10 with propulsion power at propeller 34. The bevel gear 52 and propeller 34 are mounted, generally, in the lowermost portion of the lower drive unit 18, these two parts being mounted on a shaft 54 which is journaled in the lowermost portion of the lower drive unit 18.

In order to provide for the exhaust of cooling water and exhaust gases from the marine engine, a novel exhaust system 112 (FIGS. 1–4) is furnished as a portion of the marine drive unit 10. This exhaust system is contained entirely in the upper housing portion 14 and is isolated from drive mechanism 36 and other operating components of the marine drive unit 10 so that no corrosion or erosion of these parts of the marine drive unit 10 are occasioned by the exhaust of water or waste gases through the marine drive unit 10.

A pair of exhaust hoses 114, 114 (FIG. 1, only one shown) extend from the marine engine, it being understood that the exhaust gases and cooling water from the marine engine are combined into one exhaust flow stream mediately prior to their entrance into the exhaust hoses 114, 114. Each os the exhaust hoses 114, 114 is connected to an elbow 116 or the like that provides the attachment means between the marine engine and exhaust system 112 contained in the upper housing portion 14 and also, in conjunction with its respective hose 114, provides a convenient, streamlined flow path around the bell housing of the marine engine.

A pair of flanges 118, 118 formed in the upper housing 14 and having faces 120, 120 which are generally square are disposed on opposite sides of the upper housing portion 14 with the faces 120, 120 angled at approximately 45° to the general axial extent of the marine drive unit 10. Each face 120, formed on flange 118, is provided with holes 122, 122, 122, 122 for conventional connection to a corresponding flange 117 on one of the elbows 116, this connection being effected by nutted studs 119, 119, 119, 119. The angle of disposition of the faces 120, 120 permits the elbows 116, 116 to take an appropriate configuration relative to the hoses 114, 114 so that these hoses easily extend around the aforementioned bell housing. Each of the flanges 118, 118 provides a circular port 123 (FIG. 4) that serves as an inlet means which opens into a passageway 125 extending generally perpendicular to its respective face 120, this passageway being circular in cross section. The passageway 125, in turn, leads into a cavity 124 contained in the upper housing portion 14. The cavity 124 is generally arcuately shaped in longitudinal cross section and is bounded axially inwardly by an end wall 126 disposed axially inwardly relative to the inlet means which forms a closure portion for one end of the cavity 124. This end wall is positioned in offset relationship relative to the passageway 125 so that the upper housing portion 14 may be easily cast. The end wall 126 smoothly merges into a generally arcuately extending inner wall portion 128 so as to guide the exhaust flow stream at its inward side, substantially outwardly around the inward periphery of the upper housing portion 14 and thereby outwardly of the drive line and gimbal ring and their operating components. An outer wall portion 130 is also provided for the cavity 124. It is also generally arcuate in shape so as to provide, with the inner wall 128, a smooth exhaust flow path having a minimum of turbulence loss. A pair of generally straight sidewalls 133, 133 complete the boundaries of the cavity 124 to form a flow passage 132 of generally rectangular cross section having rounded portions at its corners, this flow passage providing a closed flow path for the combined exhaust gases and cooling water and thus preventing their intrusion into the major extent of the interior of the upper housing portion 14.

An exhaust port 134 is formed at the end of the flow passage 132 with the arcuately extending wall portion 128 extending rearwardly toward the propeller 34 beyond the outer wall portion 130. The terminations of the wall portions 128 and 130 along with the sidewalls 133, 133 thereby provide an angularly offset flange portion 136 which serves to guide the exhaust flow stream outwardly away from the upper housing portion 14 and propeller 34 so as to eliminate turbulence and provide streamlining to the marine drive unit 10. As should be obvious, each of the flow passages 132 formed is exactly similar, only being disposed on opposite sides of a vertical plane extending through the centerline of the marine drive unit 10. The flow passages 132, 132 are also disposed vertically above the centerline of the upper housing portion 14 so that when the marine drive unit 10 is moving forwardly the discharge from these passageways is above the water line, movement of the boat thereby continuously placing the exhaust caused turbulence, in a position much to the rear of the location of the propeller 34.

Although the present invention has been described in connection with a specific example thereof it is not intended to be limited thereby, for example, the described exhaust system for the marine drive unit 10 could be used for outdrive units which are substantially different than the specific unit disclosed. Thus, other obvious equivalents for carrying out the purposes of this invention will occur to one skilled in the art and these equivalents are to be construed by the scope of the appended claims.

What is claimed is:

1. The combination with a marine drive system having an inboard engine with an exhaust system and an outdrive unit, of a housing located intermediate said engine and outdrive unit on a longitudinal axis extending therebetween, said housing having an arcuate inner wall portion, an arcuately shaped passageway extending around the periphery of said wall portion and being defined by an outer wall integral with said inner wall portion, said passageway being ported at one end to a flat faced flange disposed at an angle to said longitudinal axis, the opposite end of said passageway being open to form an exhaust outlet, said inner wall portion extending axially beyond said outer wall at said exhaust outlet whereby exhaust gases may expand outwardly away from said housing, and connecting means for connecting said flat faced flange to the exhaust system of said engine in exhausttight relationship.

2. The combination of claim 1, wherein said arcuately shaped passageway is on a plane substantially parallel to said longitudinal axis.

3. The combination of claim 1, wherein said connecting means comprises an elbow and a flexible conduit assembled in exhausttight relationship.

4. The combination of claim 1, wherein said arcuately shaped passageway is of substantially uniform cross section.

5. The combination with a marine drive system having an inboard engine with an exhaust manifold and a depending outdrive unit, of a housing located intermediate said engine and outdrive unit on a longitudinal axis extending therebetween and providing a support for said outdrive unit, said housing having an arcuate inner wall portion, a pair of opposed arcuately shaped passageways extending around the periphery of said inner wall position and being defined by respective outer walls integral with said inner wall portion, each of said

passageways being ported at one end to a flat faced flange disposed at an angle to said longitudinal axis, the opposite end of each of said passageways being open to form an exhaust outlet, said inner wall portion extending axially beyond each of said outer walls at said exhaust outlets thereby permitting exhaust gases to expand outwardly from said housing, and connecting means for connecting each of said flat faced flanges to the exhaust system of said engine.

6. The combination of claim 5, wherein said arcuately shaped passageways are on a common plane that is substantially parallel to said longitudinal axis.

7. The combination of claim 5, wherein the connecting means for each of flat-faced flanges comprises an elbow and a flexible conduit assembled in exhausttight relationship.

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