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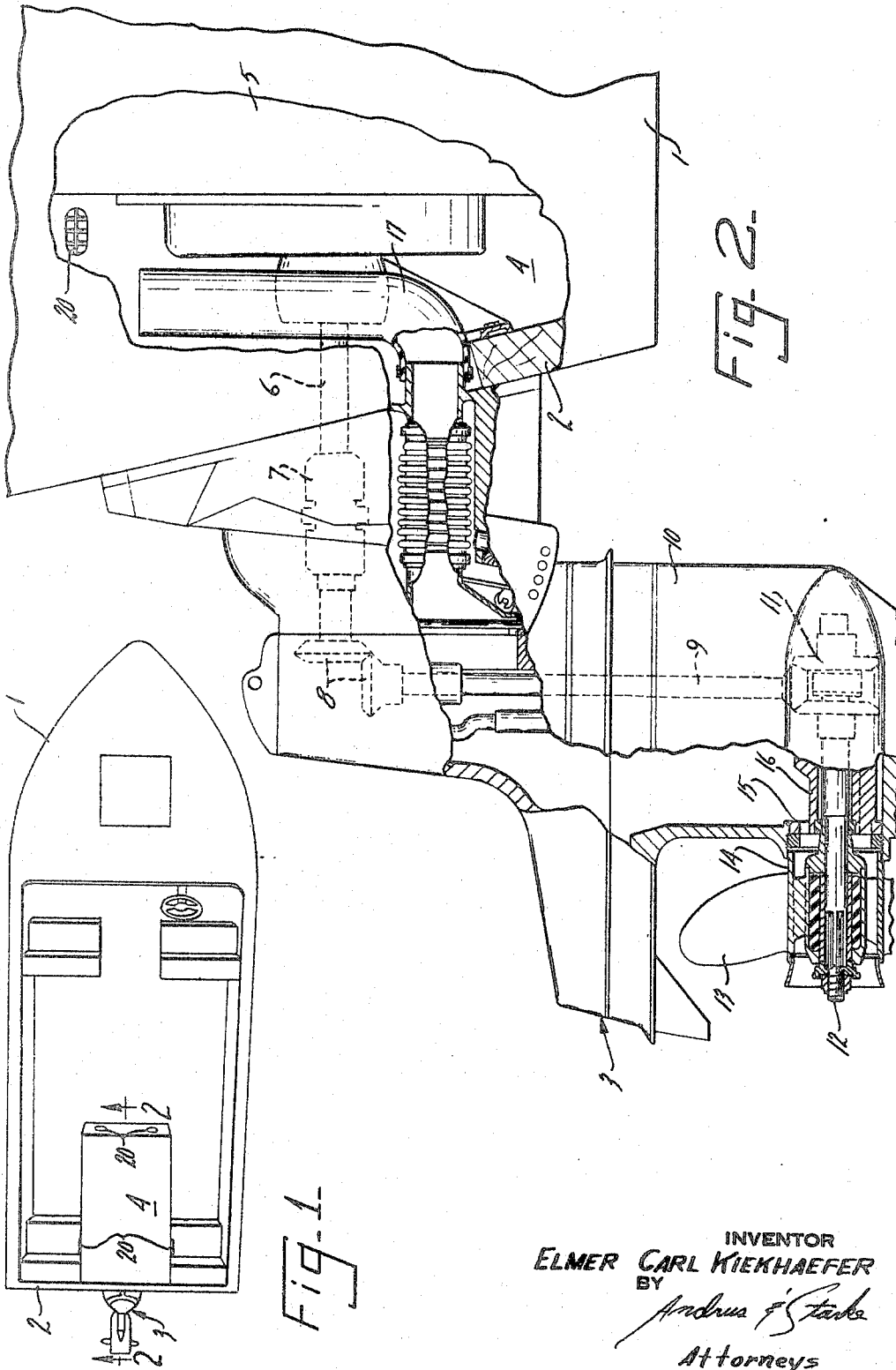
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3,487,804

UNDERWATER PROPELLER WITH AIR-VENTED SLIP STREAM

Filed Oct. 10, 1967

3 Sheets-Sheet 1



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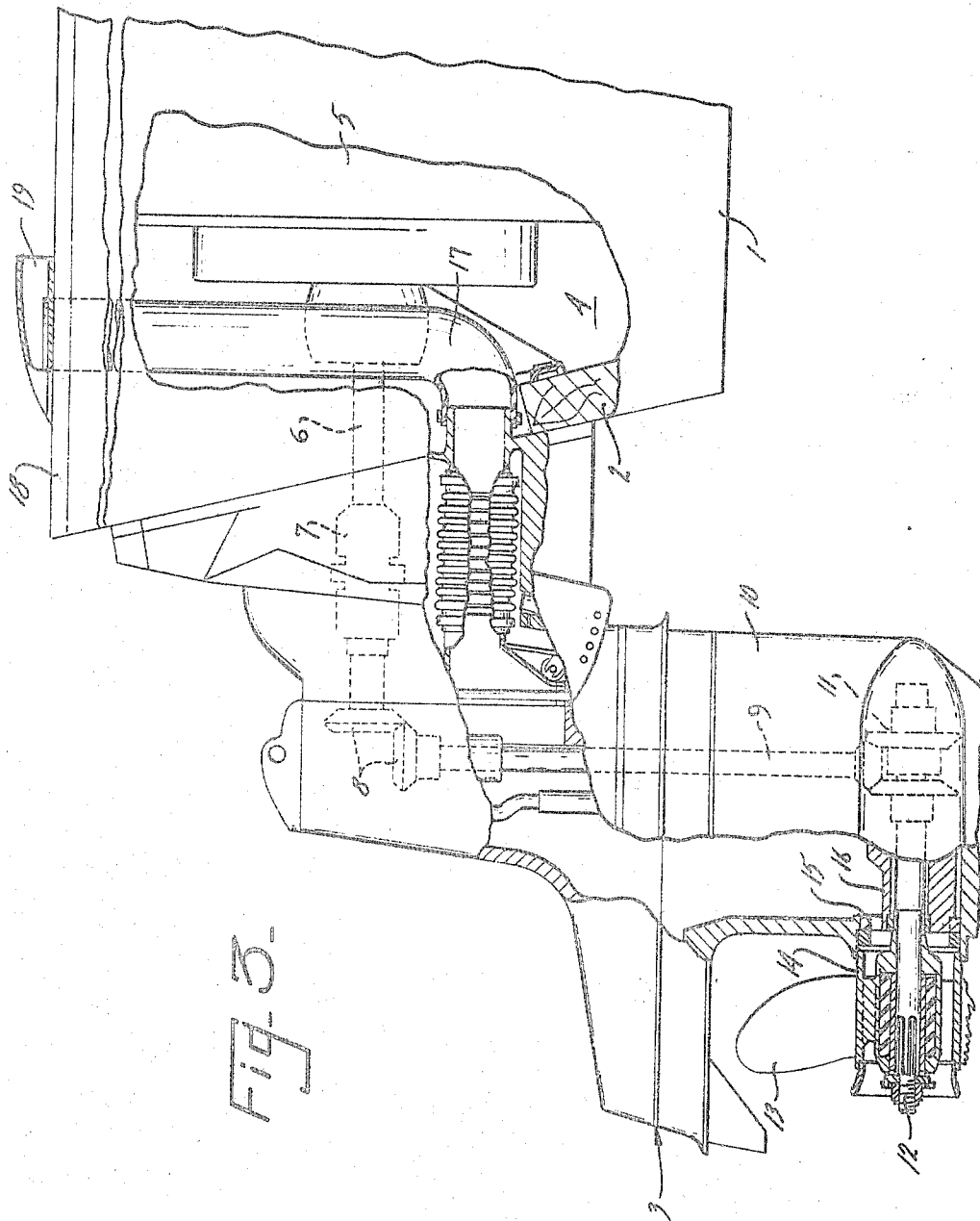
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

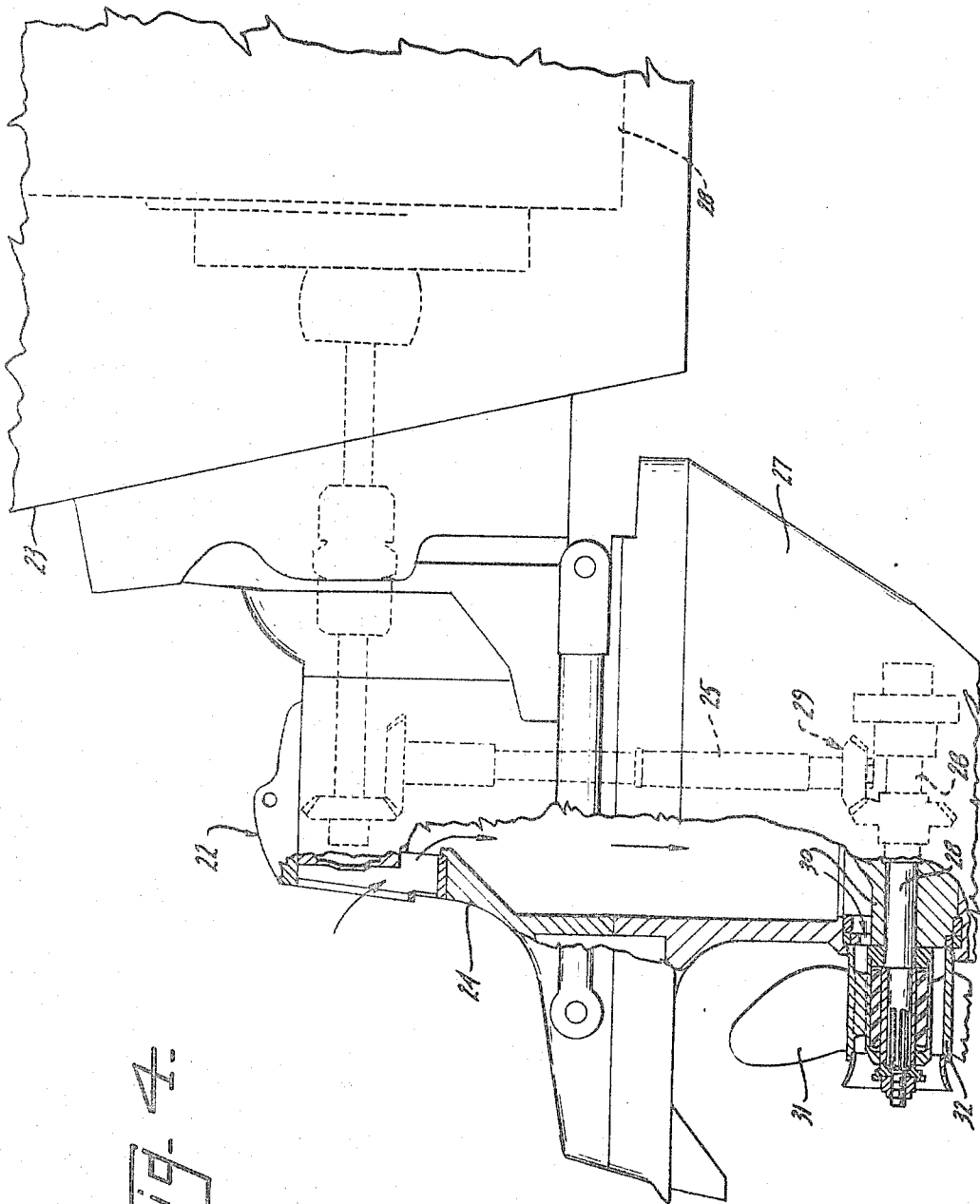


Fig. 4.

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## UNDERWATER PROPELLER WITH AIR-VENTED SLIP STREAM

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4 Claims

### ABSTRACT OF THE DISCLOSURE

A hollow propeller hub opens rearwardly into the slip stream and is supplied with air from above or by suitable forward passage connections leading from the interior of the boat or from the engine compartment whereby the reduced pressure of the slip stream is at least partially overcome and ventilation of the engine compartment or boat is attained.

This invention relates to the air venting of the slip stream of an underwater propeller to increase its efficiency. If desired the invention may additionally provide means for ventilating the engine compartment and/or other parts of the boat.

The invention is primarily directed to overcoming the drag-inducing turbulence and vacuum that exists behind the conventional tail cone type of underwater propellers. Secondly, the invention provides a simple means of exhausting the fumes from the usual engine compartment without reducing the available engine power applied to the propeller.

In carrying out the invention a hollow propeller hub is employed which opens rearwardly into the slip stream behind and which is connected forwardly to an air inlet which may be through suitable passage means to the interior of the engine compartment or other region of the boat to be ventilated, whereby air is drawn into the slip stream from the engine compartment or boat.

The efficiency of the propeller is increased by a reduction of the drag otherwise induced by the slip stream, and at the same time the engine compartment or other region of the boat may be ventilated. If no added ventilation is needed the air passage may either be open to the air above the propulsion unit or it may connect with a forwardly facing air scoop above the boat deck to supply air to the slip stream as for high speed boat operation.

The invention is illustrated and described as applied to a stern drive of the present day inboard-outboard type, but it will be understood that the principle involved may be applied to any type of underwater propeller drive.

In the accompanying drawings:

FIGURE 1 is a top plan view of the rear portion of a boat having an inboard-outboard drive;

FIG. 2 is an enlarged vertical longitudinal section taken generally on line 2—2 of FIG. 1;

FIG. 3 is a detail section showing a modification for the air supply to the passage illustrated in FIG. 2; and

FIG. 4 is a detail section showing another modification.

Referring to the drawings, the boat 1 has a rear transom 2 to which an outboard drive 3 is attached, and an engine compartment 4 forward of the transom and in which an inboard engine 5 is located.

The engine 5 has its output shaft 6 connected through the transom by suitable universal means 7 and gearcase 8 to drive a generally vertical shaft 9 in the housing 10 of the outboard drive 3.

The vertical shaft 9 in turn is connected by gearing 11 to a horizontal propeller shaft 12 extending fore and

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aft of drive 3 and to the rear end of which the underwater propeller 13 is secured. The gearing 11 provides a forward and reverse drive for propeller 13 and which is not described here since it is of no importance to the present invention, it being understood, however, that when the propeller is reversed in operation there is no slip stream and the water tends to enter housing 10 through the propeller hub thereby blocking the air movement of the present invention.

The propeller 13 has a hollow hub construction 14 similar to present day jet prop exhausts as illustrated in Patent No. 3,181,495 issued to the present applicant on May 4, 1965. The hollow hub 14 opens rearwardly into the slip stream behind the propeller and is connected forwardly to the interior of housing 10 through the spider 15 at the end of the bearing spool 16 for the shaft 12.

The upper end of housing 10 is connected by a suitable duct 17 through the transom 2 to the inside of the engine compartment 4 in the embodiment of FIG. 2.

In the embodiment of FIG. 3 the duct 17 extends upwardly through the deck 18 and connects with an up-standing air scoop 19 opening forwardly of the boat.

In the embodiment of FIG. 2 air is drawn through the duct 17 from the engine compartment 4, through housing 10, through spider 15 and then through the hollow hub 14 into the slip stream behind the propeller 13. The engine compartment 4 is vented as by openings 20 to permit air to enter the same from the outside.

The movement of air just described occurs by reason of the suction provided by the propeller slip stream, and the air flowing into the slip stream tends to reduce the partial vacuum of the slip stream and to thereby reduce the drag on the forward movement of the propeller. At the same time the air flow through the compartment 4 from the vents 20 to the mouth of duct 17 tends to purge the compartment of any dangerous or undesirable fumes.

The rear end of the hub 14 may have an extension ring 21 formed integral therewith or separate therefrom, and which may be either cylindrical or flared, as shown, for the purpose of increasing the suction through the hub and the consequent air flow into the slip stream of the propeller.

In the embodiment of FIG. 3 the fast forward movement of the boat tends to scoop the air into scoop 19 from which it flows downwardly through duct 17, through housing 10, through spider 15, and through the hollow hub 14 into the propeller slip stream. In this instance the air flow is effected both by the suction of the slip stream and by the forward motion of scoop 19.

The embodiment of FIG. 4 illustrates a simple construction for improving the efficiency of the propeller.

In FIG. 4 the stern drive unit 22 is secured to the back of the boat transom 23 and has a housing 24 containing a vertical drive shaft 25 driven from the engine 26 which is disposed in the boat.

The housing 24 carries an underwater gear unit 27 having a horizontal propeller shaft 28 driven by suitable gears 29 from the vertical drive shaft 25.

The propeller shaft 28 is rotatably mounted in suitable bearings in unit 27 and extends rearwardly through a spider member 30 and carries the propeller 31 on its rear end.

The propeller 31 has a hollow hub 32 through which air may pass into the slip stream of the propeller. For this purpose air enters housing 24 freely through the openings 33 and passes downwardly through the housing 24, through member 30 and through the hollow hub 32 into the slip stream behind.

The relatively short air passage thus provided in the construction of FIG. 4 gives rise to a free flow of air in response to the suction in the slip stream, and thereby substantially adds to the efficiency of the propeller.

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The subject matter which is regarded as the invention is particularly pointed out and distinctly claimed as follows:

1. A power boat having an engine driven rotary underwater propeller characterized by air duct means opening rearwardly through the propeller hub into the propeller slip stream and having an air inlet opening exposed to the atmosphere and located forwardly and upwardly of the propeller hub to receive a supply of ambient air and transmit the same substantially unchanged to the propeller hub, the air duct means including an annular passage through the propeller hub and having an outlet opening located rearwardly of said hub beyond the region of the propeller blades, whereby all of the air introduced into said inlet opening passes through the annular passage and is discharged through said outlet opening to reduce the slip stream drag on the boat.

2. The construction of claim 1 in which the forward end of the air duct means opens into the engine compartment whereby the air flow through the duct means tends to purge the compartment of fumes.

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3. The construction of claim 1 in which the forward end of the air duct means connects with a forwardly facing air scoop.

4. The construction of claim 1 in which the propeller is carried by drive means having a housing which constitutes a portion of the air duct means, and the housing is provided with air inlet openings for free entrance of air to the housing and from there to the propeller hub.

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TRYGVE M. BLIX, Primary Examiner

U.S. Cl. X.R.

115—17

**Disclaimer**

3,487,804.—*Elmer Carl Kiekhaefer*, Winter Haven, Fla. UNDERWATER PROPELLER WITH AIR-VENTED SLIP STREAM. Patent dated Jan. 6, 1970. Disclaimer filed Oct. 8, 1970, by the assignee, *Brunswick Corporation*.

Hereby enters this disclaimer to claim 1 of said patent.  
[*Official Gazette November 17, 1970.*]