WATER JET PROPULSION DEVICE

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Filed Sept. 12, 1963, Ser. No. 308,513

9 Claims. (Cl. 60—35.5)

This invention relates to a water jet propulsion device and more particularly to such a device in which a water jet is emitted below the water line of an aquatic vehicle for propelling such vehicle.

In the prior art, various types of water jet propulsion systems for aquatic vehicles are shown. In most of these, a water jet nozzle is mounted above the surface of the water, and the jet stream emerges from the vehicle into the air to provide the desired propulsion. Utilizing the jet above the water line has several disadvantages.

Firstly, the use of such a water jet tends to result in water being thrown in a considerable distance behind the boat and thereby tends to cause hazard and discomfort to persons who may be in the vicinity. Secondly, in order to achieve sufficient thrust to propel the vehicle at high speeds, a high velocity jet is required. Such a jet could cause severe injury to persons who might be in its path.

Thirdly, due to the necessity of maintaining the water jet above the water line, it is impractical to use such systems in larger vessels having displacement hulls. It therefore would be highly desirable if the water jets in such propulsion systems could be submerged below the water line.

As shown in FIG. 1, the hazards and other undesirable features of above the water line water jet propulsion systems are eliminated without any sacrifice of efficiency.

This result is achieved in the device of the invention by ventilating the water jet by means of a unique aspirator system. By properly ventilating or mixing the submerged water jet with a gas such as air, substantially the same thrust can be achieved below the water line into the ambient water as is achieved above the water line into the air.

It is therefore an object of this invention to provide a highly efficient submerged water jet propulsion system.

It is another object of this invention to minimize the hazards and discomfort incidental to water jet propulsion systems without sacrificing the efficiency thereof.

It is still another object of this invention to provide means for ventilating a water jet to substantially increase its effective thrust when submerged in water.

Other objects of this invention will become apparent from the following description taken in connection with the accompanying drawings of which,

FIG 1 is a schematic diagram illustrating the basic operation of the device of the invention, and

FIG 2 is a schematic diagram showing the device of the invention as incorporated into the propulsion system of a boat having a displacement hull.

Referring now to FIG. 1, the basic operation of the device of the invention is illustrated. A water jet stream as indicated by arrows 12 is emitted from pipe 11 into aspirator chamber 14. This stream may be generated, for example, by an engine driven pump 27 as shown in FIG. 2. Aspirator unit 15 comprises chamber 14 which surrounds pipe 11 and is fixedly attached thereto. Aspirator unit 15 includes a wider portion 17 which surrounds and is attached to pipe 11 and a narrower portion 18 which extends from the wider portion. Aspirator portion 17 and 18 may both be cylindrical in shape. It is essential that portion 18 be wider in diameter than pipe 11.

Intake pipe 20 is connected to aspirator 15 and provides an inlet channel for a gas such as air. Inserted in intake pipe 20 is a control valve 21 which can be utilized to open and close the supply of gas to the aspirator unit.

As the stream of water 12 enters aspirator unit 15, gas is drawn into the aspirator through pipe 20 and mixed with the water stream. The water stream is thus ventilated with air. The ventilated water jet is emitted from the end of aspirator section 16 into the surrounding water. This water jet tends to take the form of a divergent bubble plume. As indicated in FIG. 1, none of the eddy formations common to submerged water jets of the prior art are present, the stream forming out in the form of a bubble plume 19. The effective thrust of the ventilated jet is substantially the same both when submerged in water and when emitted in air. Control valve 21 may be utilized to control the effective thrust of the water jet. When the air supply is cut off, the effective thrust decreases to about one half. The diameters of pipe 11 and aspirator section 18 have been found not to be critical except that it is essential that aspirator section 18 has a greater inside diameter than pipe 11.

Referring now to FIG. 2, a schematic diagram showing the device of the invention as incorporated into a boat having a displacement hull is illustrated. Installed onto boat hull 26 is an internal combustion engine 25 which may be of the gasoline or diesel variety which drives centrifugal pump 27. This draws water into the boat hull as indicated by arrows 31 and impels this water in a jet stream through pipe 11 into aspirator 15. With valve 21 open, air is drawn through inlet line 20 into the aspirator where it is mixed with the water stream. The ventilated water jet produced thereby is emitted from the back of hull 26 into the surrounding water in the form of a bubbled plume 19. The vehicle is thus propelled through the water.

When the engine is running, valve 37 may be turned to connect line 30 to the exhaust line 29 of engine 25. In this manner, the engine exhaust may be utilized in the aspirator in conjunction with the air taken in through line 20 to provide the ventilating action. Scavenging and after cooling of the engine exhaust can thus be accomplished.

If it is so desired, normal exhaust of the engine can be accomplished by appropriately turning valve 37 to disconnect line 29 from line 30 and connect it to exhaust line 45.

Pump 27 may be utilized as a bilge pump by opening valve 40 to connect line 35 to the pump through aspirator 15 and closing valve 21 to cut off air intake therefrom. Valve 37 should, of course, be turned to disconnect line 30 from exhaust line 29 prior to opening valve 40.

The device of this invention thus provides a simple yet highly effective means for enabling the efficient operation of a submerged water jet. The device of the invention can be utilized on large ships having displacement hulls or small pleasure vehicles, including boats utilizing both inboard and outboard engines.

While the device of the invention has been described and illustrated in detail, it is to be clearly understood that this is intended by way of illustration and example only...
and is not to be taken by way of limitation, the spirit and scope of this invention being limited only by the terms of the following claims.

I claim:

1. A water jet propulsion device for propelling an aquatic vehicle comprising
   a pump mounted in said vehicle,
   means for feeding water from the ambient water supply to said pump, said pump impelling said water in the form of a jet,
   means for ventilating said water jet with air from the ambient supply thereof, and
   means for emitting said ventilated water jet out from the hull of said vehicle below the water line thereof into the ambient water as a propulsive jet for said vehicle.

2. In a water jet propulsion device for propelling an aquatic vehicle,
   a pump mounted in said vehicle, the intake of said pump being connected through the hull of said vehicle to receive water from the water surrounding said vehicle,
   means for driving said pump,
   a water line connected to the outlet of said pump,
   an aspirator unit forming a chamber,
   one end of said aspirator unit being attached to said water line, and
   a gas intake line one end of said intake line being connected to said aspirator unit, the other end of said intake line being vented to the ambient air, water and air mixture being formed in said aspirator unit, said aspirator unit being wider in diameter than said water line and extending through the hull of said vehicle below the level of the surrounding water, said water and air mixture being discharged from said aspirator unit into the surrounding water as a propulsive jet for said vehicle.

3. The device as recited in claim 2 wherein said aspirator unit has wider and narrower portions, said wider portion being attached to said water line, said narrower portion extending from said wider portion into the surrounding water.

4. In a water jet propulsion device for propelling an aquatic vehicle,
   an internal combustion engine mounted in said vehicle,
   a centrifugal pump mounted in said vehicle, said pump being driven by said engine, the intake of said pump being connected through the hull of said vehicle to receive water from the surrounding water,
   a water line connected to the outlet of said pump, an aspirator unit forming a cylindrical chamber having wider and narrower portions, said wider portion being attached to said water line,
   a gas intake line, one end of said intake line being connected to said wider portion of said aspirator unit, the other end of said intake line being vented to the ambient air, a water and air mixture being formed in said aspirator unit,