Feb. 17, 1970 S. DAVIS 3,495,407

MARINE PROPULSION MOTORS

Filed April 16, 1968

FIG. 1

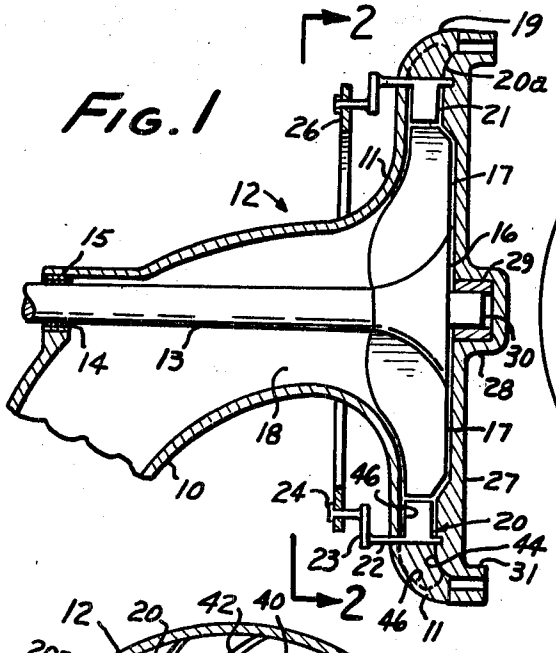
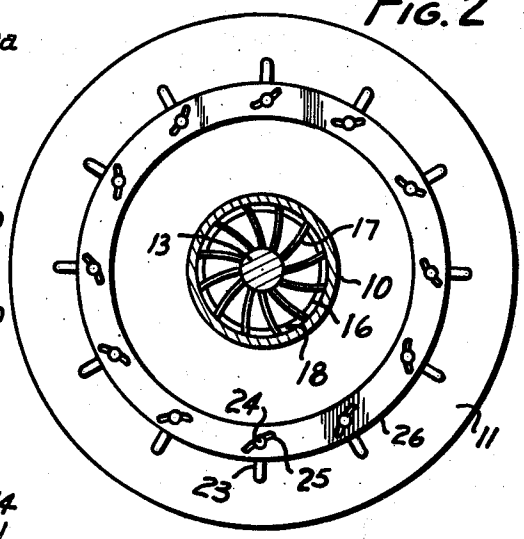


FIG. 2



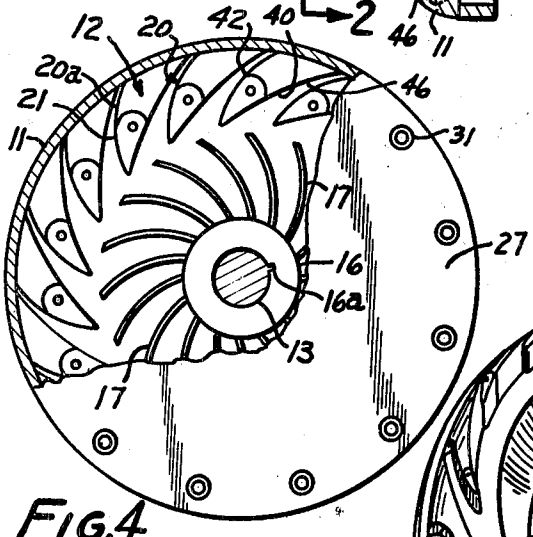
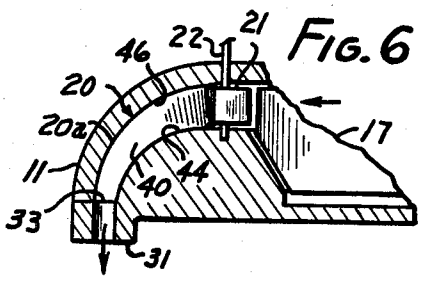


FIG. 4

FIG. 6



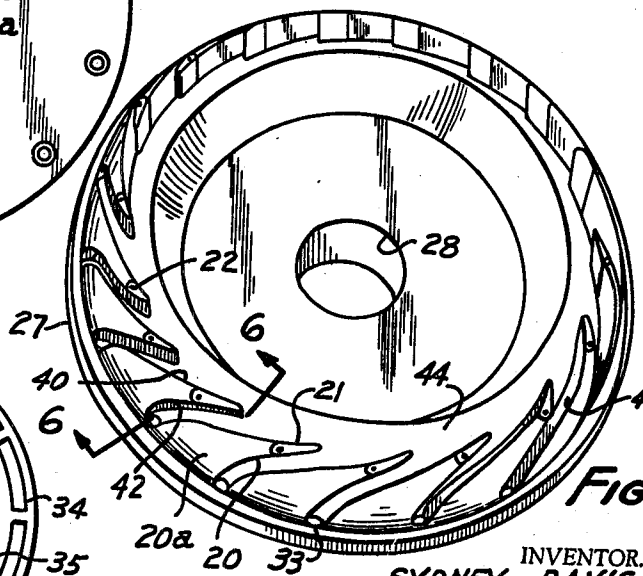


FIG. 3

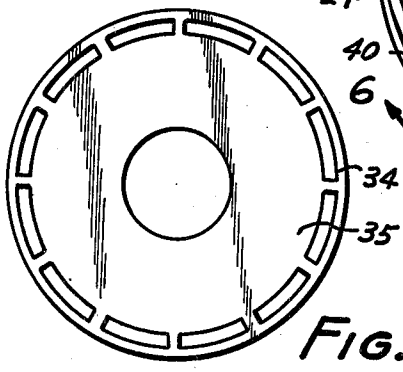


FIG. 5

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MARINE PROPULSION MOTORS

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U.S. Cl. 60—222 2 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to marine propulsion motors, and particularly to marine propulsion motors of the type in which the propulsion is provided by the reactive force of jets of water projected from the marine vessel.

A marine propulsion motor according to the present disclosure includes impeller means arranged in a housing to direct water toward a stator means, the stator means being so arranged and disposed within the housing as to redirect the water axially toward a nozzle means, and the jets of water emitted from the nozzle means are projected axially to impart reaction of the jets to a vessel.

According to an optional and desirable feature of the present disclosure, the stator means includes means for selectively increasing and decreasing the thrust of the motor.

This invention relates to marine propulsion motors, and particularly to marine propulsion motors of the type in which the propulsion is provided by the reactive force of jets of water projected from the marine vessel.

Heretofore, marine jet propulsion motors have included an impeller means adapted to direct water radially to a nozzle to project a radial jet stream from the nozzle. The jet streams of water projected radially from the nozzle were redirected by conduit means so that the jet streams could be projected axially from the stern of the vessel. The conduit means utilized for redirecting the radially flowing jet streams dispersed the jet streams thereby causing random fluctuation in the water velocity of the jet streams. The random fluctuations caused turbulence in the jet streams, thereby reducing the maximum energy available from the motor as well as the efficiency of the motor.

It is an object of the present invention to provide a marine propulsion motor wherein the jet streams are projected axially from the nozzles.

Another object of the present invention is to provide a marine propulsion motor capable of projecting jet streams without substantial turbulence.

Another object of the invention is to provide a hydraulic jet propulsion means so arranged as to reduce ducting to a minimum thereby reducing weight of metal and weight of water contained in the propulsion means and providing a more compact apparatus easier to fabricate and install than heretofore realized.

Another object of the present invention is to provide a hydraulic jet propulsion motor having means for selectively increasing and decreasing the thrust of the motor.

A marine propulsion motor according to the present invention includes impeller means arranged in a housing to direct water toward a stator means, the stator means being so arranged and disposed within the housing as to redirect the water axially toward a nozzle means, and the jets of water emitted from the nozzle means are projected axially.

According to an optional and desirable feature of the present invention, the stator means includes means for selectively increasing and decreasing the thrust of the motor.

The above and other features of this invention will be more fully understood from the following detailed description and the accompanying drawings, in which:

FIG. 1 is a side view, partly in cutaway cross-section of a marine jet propulsion motor according to the presently preferred embodiment of the invention;

FIG. 2 is a view taken at line **2—2** in FIG. 1;

FIG. 3 is a perspective view of a stator means for use in the motor illustrated in FIG. 1;

FIG. 4 is a partly cutaway end view of the motor illustrated in FIG. 1 having impeller and stator means schematically shown to illustrate the principle of operation of the motor;

FIG. 5 is an end view of a modification of the motor illustrated in FIG. 1; and

FIG. 6 is an enlarged section view as in FIG. 1 of a portion of the motor illustrated in FIG. 1 showing a portion of the stator means shown in FIG. 3 taken at line **6—6** in FIG. 3.

In the drawings, there is illustrated a marine propulsion motor according to the present invention. The motor is preferably located above the surface level of the water, and a suction or intake pipe **10** opens into the bottom of the boat and curves upwardly and then axially and is connected to inner casing member **11** of a centrifugal pump **12**. Drive shaft **13** of pump **12** extends into the intake pipe **10** through a bearing **14** and is fitted with a packing gland **15**. Inner casing member **11** is secured to the transom of the boat (not shown).

Pump **12** comprises a blade hub **16** keyed to shaft **13** by key **16***a*. A plurality of pump blades **17** forming an impeller or rotor of appropriate configuration is mounted on the blade hub **16**. Pump casing **11** tapers in cross-section from its intake end **18** toward its outer periphery **19**. Blades **17** extend from the hub **16** and part way to the outer periphery of the casing **11**. The blades are preferably wider at the hub ends than at their outer ends so as to closely fit within casing **11**.

The outer face of the pump casing is closed by a back plate **27** peripherally mounted to casing **11**. Plate **27** may be secured to casing **11** in any suitable manner, such as by means of threaded fasteners (not shown) or the like. Plate **27** includes a central hub portion **28** provided with an outboard bearing **29** adapted to receive portion **30** of drive shaft **13**. Plate **27** is also provided with a plurality of peripheral axial nozzles **31**.

A plurality of fixed stator blades **20** is positioned to occupy the outer portion of the periphery of the pump casing and may be mounted therein in any suitable manner. By way of example, body portion **20***a* of stator blades **20** may be cast together with back plate **27** or may be welded thereto. The tip portion **21** of each stator blade **20** is pivotally mounted to the fixed portion **20***a* of the stator blade by means of pin **22**. Each pin **22** is fixedly mounted to a lever **23** which in turn is fixedly mounted to a pin **24**. Pins **24** register with slots **25** in ring **26**. The slots are so arranged that as ring **26** is rotated about its axis, each lever **23** is rotated to rotate all pins **22** in unison.

Rotation of pins **22** causes pivoting of the corresponding tip portion **21** of the stator blades.

As shown particularly in FIGS. 3 and 6, the body portions of stator blades **20** are of such configuration as to direct water in an axial direction. The body portions **20***a* of the stator blades terminate adjacent apertures **33** which lead to nozzles **31**. The body portions **20***a* of stator blades **20** include flow-diverting surfaces **40** and **42** which cooperate with flow-diverting surface **44** on plate **27** and flow-diverting surface **46** on housing **11** to divert flow of water axially toward apertures **33** and nozzles **31**. Particularly, surfaces **44** and **46** are so arranged and disposed as to redirect water axially toward the nozzles. For this reason, surfaces **44** and **46** are disposed substantially radially adjacent tips **21** of the stator blades and arc to an axial disposition adjacent the nozzle openings. Preferably, the fluid-diverting surfaces on the stator blades are disposed tangentially so that water directed from the impeller flows without substantial turbulence toward the nozzles. The flow-diverting surfaces on the stator blades are disposed between surfaces **44** and **46** to direct the water to the nozzles.

In the operation of the marine motor according to the present invention, shaft **13** is driven by a suitable engine (not shown) thereby rotating impeller or rotor blades **17**. The rotor blades direct water radially toward the stator blades. The stator blades redirect the water axially toward the nozzles. The tips of the stator blades are connected via hinge pins **22** to ring **26** so that the lead of the stator blades may be selectively altered. The tips of the stator blades may be advanced to obtain greater thrust during periods of acceleration and may be retarded for high efficiency during periods of steady cruising.

In FIG. 5 there is illustrated a modification of the nozzle arrangement according to the present invention. In the embodiment illustrated in FIG. 5, the water is emitted through openings **34** which are in the form of a peripheral ring of slots. Water directed by the stator blades through apertures **33** is emitted through slots **34** in plate **35** in the form of a thin sheet of high speed water.

With a marine propulsion engine according to the invention, the water jets are directed axially from the engine. The stator blades redirect water to flow axially, thereby substantially reducing loss of energy and turbulence. With a marine engine according to the present invention, velocities of up to 45 knots have been realized.

The engine according to the present invention is simple in construction and capable of operating at relatively high efficiency. The selective positioning of the stator

blade tips permits advancement of the stator blades to obtain high thrust and retarding of the stator blades to obtain high efficiency of the motor.

This invention is not to be limited by the embodiment shown in the drawings or described in the description, which is given by way of example and not of limitation.

What is claimed is:

1. Propulsion means for a vessel comprising:
- an intake for fluid through which the vessel is propelled;
- a shaft adapted to be rotated about an axis;
- an impeller mounted on said shaft and adapted to receive fluid from said intake;
- a stator adapted to receive fluid from said impeller in a direction perpendicular to the axis of said shaft and having
  - arcuate body portions fixed with regard to said impeller and
  - tip proportions pivotable with regard to said body portions;
- control means connected to said tip portions of said stator arranged to pivot said tip portions and
- nozzle means adapted to receive fluid from said body portions of said stator in a direction parallel to the axis of said shaft and to eject fluid from the vessel in jet form.

2. The propulsion means of claim **1** wherein said control means includes lever means connected to all said tip portions of said stator arranged so that all tip portions are pivoted simultaneously and to the same extent.

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U.S. Cl. X.R.

103—97; 115—16