

Oct. 1, 1963

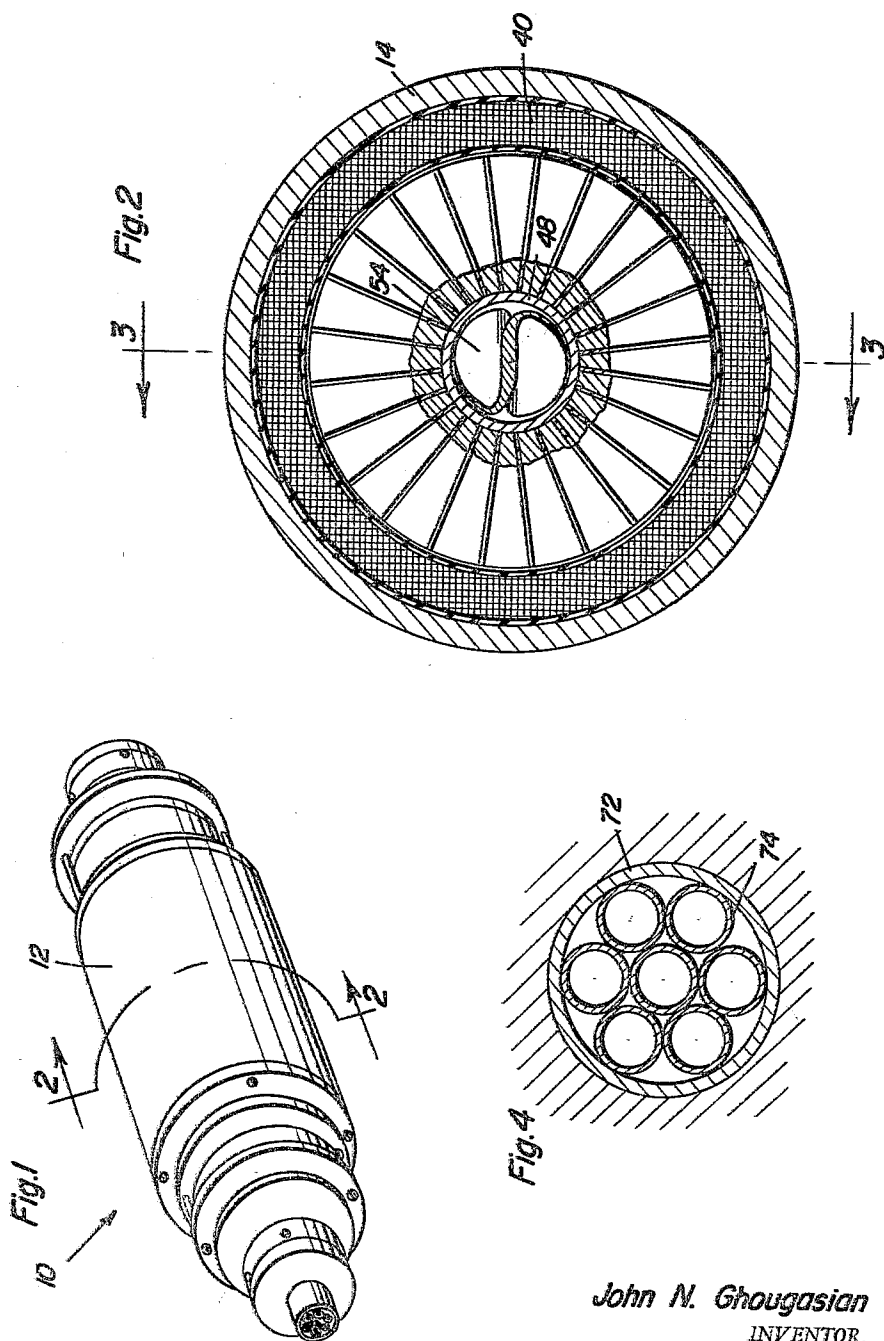
J. N. GHOUGASIAN

3,105,444

PROPULSION UNIT

Filed Dec. 14, 1960

3 Sheets-Sheet 1



John N. Ghougasian
INVENTOR.

BY *Charles A. O'Brien*
and Harvey B. Jackson
Attorneys

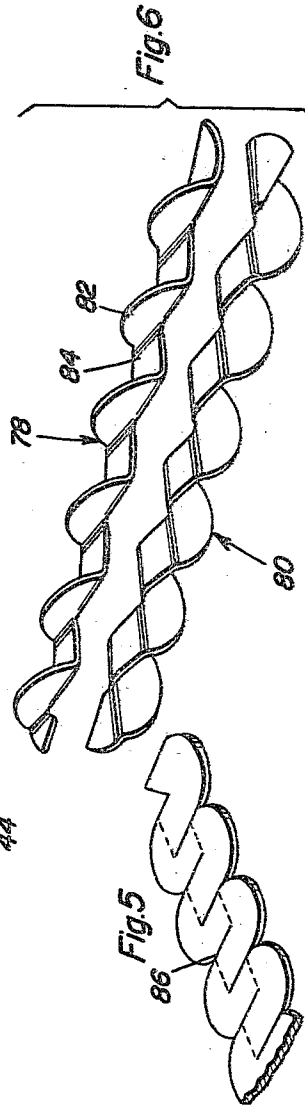
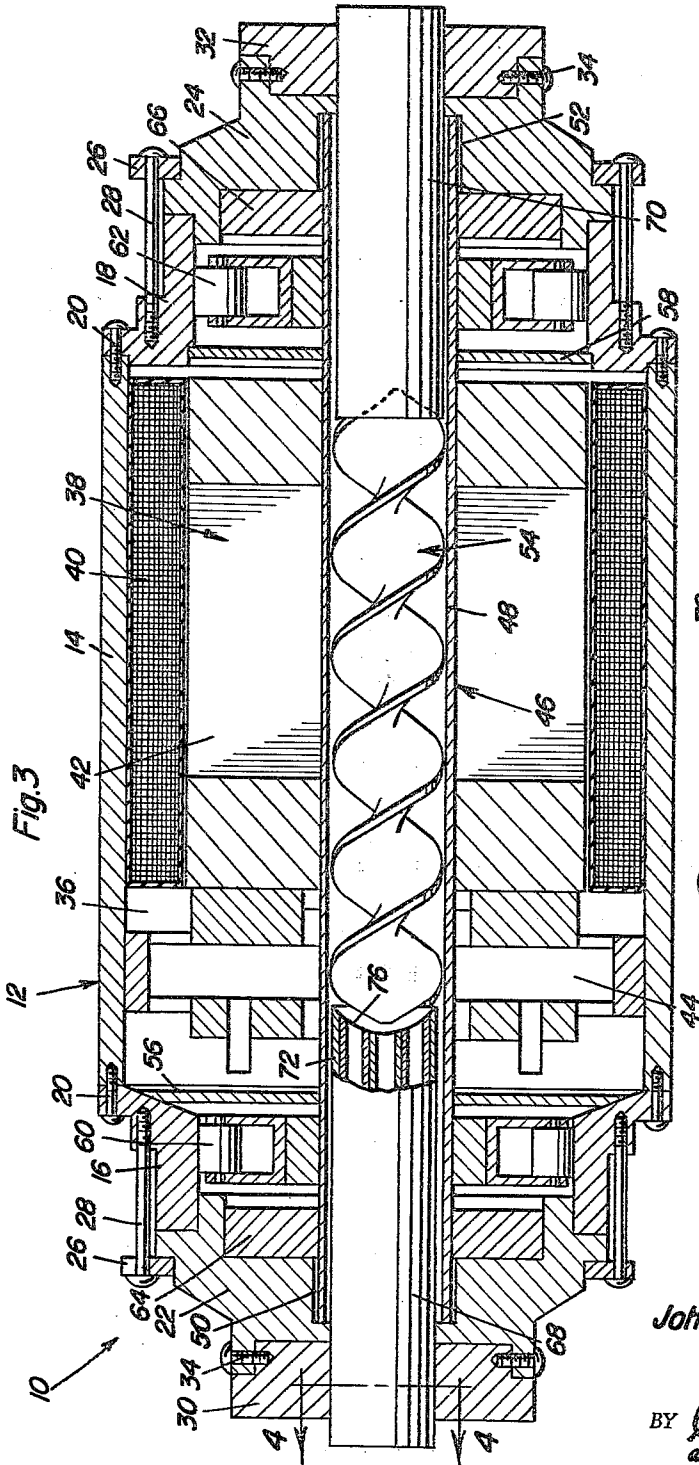
Oct. 1, 1963

J. N. GHOUGASIAN
PROPULSION UNIT

3,105,444

Filed Dec. 14, 1960

3 Sheets-Sheet 2



John N. Ghougasian
INVENTOR.

BY *Alonso A. Priore*
and *Harvey B. Jackson*
Attorneys

Oct. 1, 1963

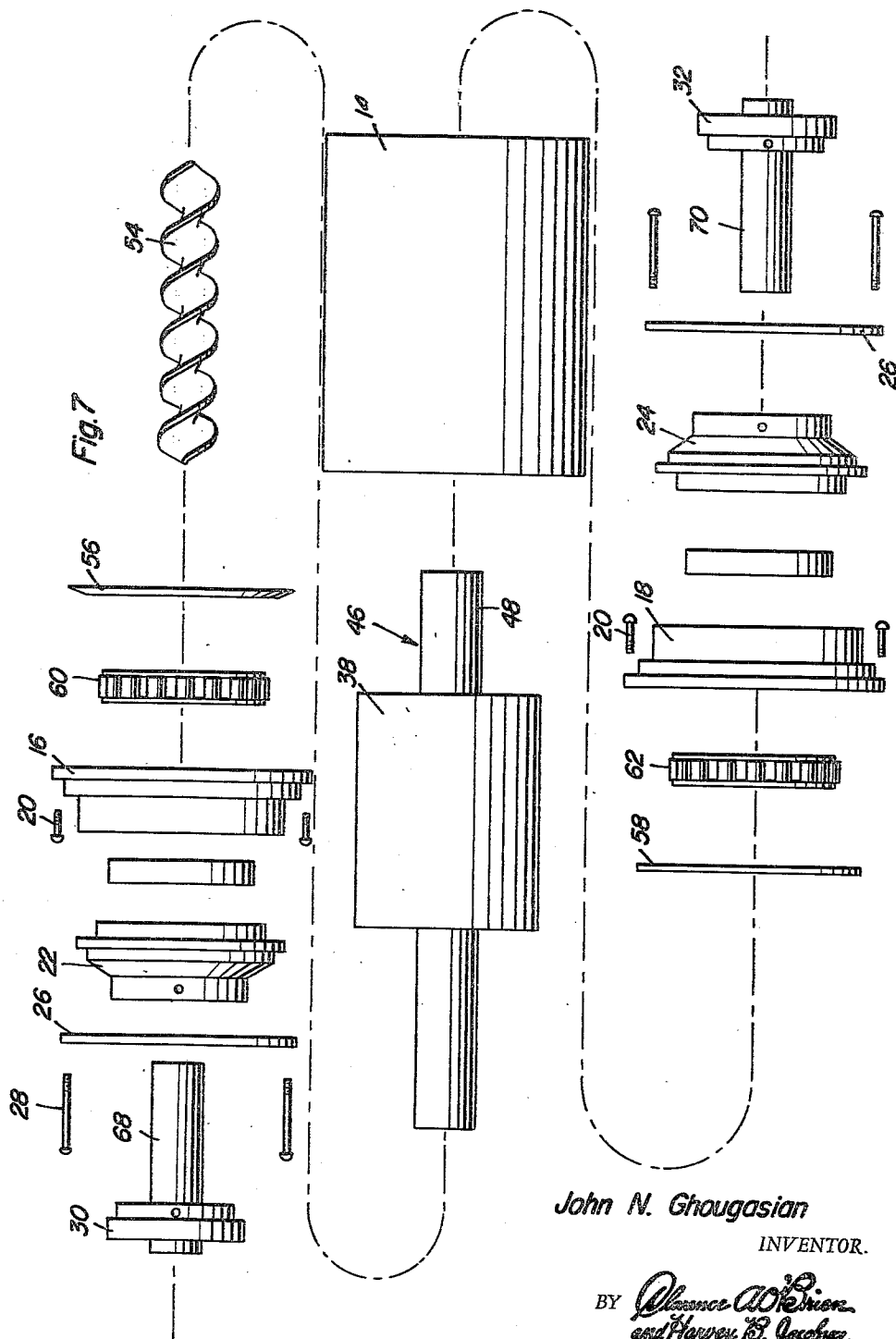
J. N. GHOUGASIAN

3,105,444

PROPULSION UNIT

Filed Dec. 14, 1960

3 Sheets-Sheet 3



John N. Ghougasian

INVENTOR.

BY *Alance A. Bion*
and *Harvey B. Jacobson*
Attorneys

1

3,105,444

PROPULSION UNIT

John N. Ghougasian, 49 Wadsworth Terrace,
New York, N.Y.

Filed Dec. 14, 1960, Ser. No. 75,845

14 Claims. (Cl. 103—87)

The present invention relates to a power unit for propelling liquid therethrough for pumping or propulsion purposes.

It is a primary object of this invention to provide a new and useful mechanism or assembly for propelling liquid therethrough or relative thereto in a more efficient manner than comparable units heretofore used.

Another object of this invention is to provide a liquid propelling unit of novel construction capable of being used as a pumping mechanism or as a marine propulsion unit by more efficiently directing and impelling the flow of water therethrough.

An additional object of this invention is to provide a water or liquid propelling unit including a motor armature driven impeller which ordinarily discharges water with a spiralling motion. A pair of novel modulator assemblies are therefore utilized in conjunction with the impeller for axially directing the water into the impeller and out therefrom so as to provide a radially inner axial discharge from the propulsion unit. A more efficient pumping or propelling action is thereby realized from the novel propelling unit of this invention.

A further object of this invention is to provide a propelling unit so arranged as to be electrically energized by a reversible motor armature which is disposed within a liquid tight chamber also mounting the motor stator winding with the impeller being connected within a water conducting tube rotatable with the motor armature and extending out of the motor chamber for receiving and discharging the water and also rotatably mounting the armature. A pair of water current directing modulator units fixed to the propelling unit casing extend axially into the water conducting tube and terminate adjacent the outer axial end of the impeller, while the outer axial ends of the modulator units extend out of the propelling unit casing for receiving and discharging water therethrough. Accordingly, water ordinarily discharged by the impeller with an outwardly spiralling motion providing an annular distribution of thrust, may be modulated to radially redistribute the flow and direct the thrust in a radially inner and true axial direction. A more efficient propelling unit is thereby unexpectedly obtained from the novel structural arrangement of this invention.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a perspective view of the propelling unit made in accordance with this invention.

FIGURE 2 is a sectional view taken substantially through a plane indicated by section line 2—2 in FIGURE 1.

FIGURE 3 is a sectional view taken through a plane indicated by section line 3—3 in FIGURE 2.

FIGURE 4 is a sectional view taken through a plane indicated by section line 4—4 in FIGURE 3.

FIGURE 5 is a partial perspective view of a sheet metal section member from which part of the impeller blade is made.

FIGURE 6 is a perspective view of the bent impeller blade sections prior to assembly and formation of the impeller blade.

2

FIGURE 7 is a side elevational view of the disassembled parts of the propelling unit of the present invention.

Referring now to the drawings in detail, FIGURE 1 illustrates the propelling unit generally referred to by reference numeral 10. The unit 10 as hereinbefore indicated, may be utilized for either liquid pumping purposes or marine propulsion purposes depending upon the installation thereof. Accordingly, the casing generally referred to by reference numeral 12 for the unit 10, when mounted in a fixed installation may have the axial projecting ends thereof connected respectively to a liquid reservoir and a discharge conduit for pumping purposes. The casing 12 on the other hand, may be mounted within a bottom portion of a marine vessel with the axial ends thereof connected by suitable conduits to opposite ends of the vessel for propelling water through the unit 10 to propel the vessel. It will therefore be understood, that the specific installation for the unit 10 does not form part of the present invention, but it will be appreciated that by virtue of the novel construction of the unit 10 as will be hereafter explained with greater detail, a highly and widely useful unit has been devised.

Referring now to FIGURE 3 in particular, it will be observed that the casing 12 of the unit 10 includes a central tubular portion 14 which is bolted to a pair of annular end portions 16 and 18 by means of bolt fasteners 20. A pair of end plate members 22 and 24 are assembled onto the end portions 16 and 18 respectively and secured thereto by annular ring members 26 and bolt members 28. Finally, the outer axial ends of the casing 12 are sealed by means of closure members 30 and 32 which are fastened to the end cover members 22 and 24 by fasteners 34. It will therefore be appreciated from FIGURE 7, that the unit 10 may be assembled and disassembled in a most facile manner.

Disposed centrally within the casing assembly 12 is a liquid seal tight chamber 36 within which a motor armature 38 is disposed. Also, fixed to the inner wall of the casing portion 14 is the stator field winding 40 which when energized together with the motor armature winding 42 will cause rotation of the motor armature 38. Accordingly, as is well known in the motor art, brush mechanism 44 is provided and mounted on the casing portion 14 for conducting current to the motor armature 38 for energization thereof to cause rotation. The motor structure disposed within the central chamber 36 is of conventional design except for the manner in which the armature rotor 38 is rotatably mounted and the connection thereto of the impeller mechanism generally referred to by reference numeral 46.

The impeller mechanism 40 includes an elongated tubular flow conducting member 48 which is fastened to the motor armature 38 for rotation therewith. The tubular member 48 extends axially outward from the central chamber 36 and is rotatably mounted within axial recesses 50 and 52 formed within the end cover members 22 and 24. Fixed within the tubular member 48 and disposed centrally thereof within the chamber 36 is a continuous impeller assembly generally referred to by reference numeral 54. Accordingly, upon rotation of the armature rotor 38, the tubular member together with the impeller assembly 54 will be rotated to continuously impel liquid through the tubular member 48 between the axial ends thereof projecting out of the central chamber 36. It will be appreciated that the action of the impeller blade 54 on the liquid in addition to imposing an axial force thereon, also imposes a rotational torque causing a secondary rotational flow resulting in a radially outer distribution of flow within the tubular member 48.

It will also be appreciated, that the central chamber 36 must be maintained liquid tight in order to protect the

electrical windings disposed there within. Accordingly, the chamber 36 is separated from the axial end portions of the casing 12 by means of a pair of insulated washer disks 56 and 58, a pair of roller bearings 60 and 62 and a pair of sealed watertight bearings 64 and 66. The bearing assemblies 60 and 62 are mounted on the rotating tubular member 48 and bear against the inner cylindrical surface of the end portion members 16 and 18. The sealed watertight bearing elements 64 and 66 on the other hand, are disposed between the axial ends of the tubular member 48 and the inner cylindrical surface on the end cover members 22 and 24. Accordingly, an effective bearing assembly is provided at each axial end of the casing assembly 12 for rotationally supporting the armature via the tubular member 48 connected thereto and to provide a liquid seal for the chamber 36 within which the electrical components of the unit are disposed.

In order to conduct the liquid into an inlet end of the tubular member 48 and also discharge the liquid from the other or outlet end of the tubular member 48 without leakage losses a pair of modulator units 68 and 70 are provided for such purpose. The modulators 68 and 70 are fixed to the casing assembly by means of the closure members 30 and 32 to which they may be secured in any suitable manner. The modulators 68 and 70 accordingly extend axially into the inlet and outlet ends of the rotating tubular member 48 and terminate at their axially inner ends adjacent to the axially outer ends of the impeller assembly 54. Referring therefore to FIGURES 3 and 4 in particular, it will be observed that each of the modulator units includes an outer tubular member 72 by means of which the modulator unit is fixed to the casing assembly within the end cover members and end closure members. Disposed within the tubular member 72 are a plurality of axial flow separating and directing conduit members or flow tubes 74 by means of which the flow of liquid is directed in an axial and radially inner direction into and from the impeller assembly 54 fixed within the central portion of the rotating tubular member 48. It will therefore be observed that the axially inner ends 76 of each of the modulator units is concaved inwardly in order to accommodate the axially outer ends of the impeller assembly 54 and thereby confine the passage of liquid directly into or received directly from the impeller assembly. The concave surfaces thus formed by the ends of the flow tubes 74, assist in the radial redistribution of flow between the impeller blade and the flow tubes 74. The unique location and construction of the modulator units 68 and 70 accordingly provide the important and advantageous results derived from the radial redistribution of flow as distinguished from the mere use of deflectors for preventing rotational flow.

From the foregoing, it will be realized that not only does the novel propelling unit 10 make available more efficiently operating equipment for pumping and propulsion purposes but also provides a less expensive and more easily manufactured and assembled device than previous comparable units. Accordingly, one of the important features of the present invention includes the construction of the continuous impeller assembly 54 and its mounting within the unit 10.

Referring therefore to FIGURES 5, 6 and 7 in particular, it will be observed that the impeller assembly 54 is composed of a pair of sheet metal sections 78 and 80 as most clearly seen from FIGURE 6. Each section includes a plurality of spaced upturned curved blade portions 82 which are interconnected by oppositely directed base portions 84 which extend from each blade portion 82. It will therefore be apparent from FIGURE 5 that each section 78 and 80 may be formed from a flat sheet metal stock which is cut to shape as indicated in FIGURE 5 and slotted at 86 and approximately bent at the dotted line locations illustrated in FIGURE 5. The base portions 84 of each section 78 and 80 are then assembled against each other so that the radially extending blade

portions 82 on each section which are curved and directed angularly opposite to each other may form a continuous spiral blade. The base portions 84 of each section are therefore welded to each other and the assembled sections filed or otherwise finished to produce the continuous and smooth blade assembly as illustrated in FIGURES 3 and 7. It will also be observed from FIGURE 3, that the radially outer surfaces of the blade portions 82 of the impeller assembly 54 are welded to the inner walls of the tubular member 48. Accordingly, the impeller assembly 54 will rotate with the tubular member 48 to axially receive, spirally impel and axially discharge the water therethrough. Also, by reversing rotation of the motor armature 38 by suitable controls, the impeller assembly may provide its axial thrust in either direction.

Operation and utility of the propelling unit of the invention will therefore be apparent from the foregoing description. It will therefore be appreciated that by virtue of the novel construction of the parts and the locational relationships therebetween, not only is a more efficiently operating propelling unit obtained but a less costly and more easily manufactured and assembled device realized. It will therefore be observed that the impeller blade 54 is made continuous not only for more efficient propulsion but to also avoid the use of a stationary inner spindle which would reduce the flow area through the device and create bearing problems because of its axial length. Moreover, the locational and flow area relationships of the modulator units to the flow tube 48 and continuous impeller blade 54 would not be possible without the foregoing arrangement.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A propelling unit comprising, fluid tight enclosure means, powered rotor means rotatably mounted within said enclosure means, flow conducting means fixed to said rotor means in liquid sealed relation to the enclosure means having a constant flow area for conducting liquid therethrough, continuous flow impelling means mounted within said flow conducting means for impelling flow continuously in an outwardly spiralling path, and axial flow separating means fixed to said enclosure means and projecting into said conducting means for axially conducting flow in a plurality of radially distributed flow paths to and from the impelling means, said enclosure means including a central chamber within which said rotor means is disposed, axial bearing means sealing axial ends of said chamber and rotatably mounting said conducting means extending thereinto, said axial flow separating means being mounted in the bearing means and projecting axially into said conducting means and outwardly from said enclosure means to prevent leakage flow.

2. The combination of claim 1, wherein said conducting means comprises a tubular member fixed for rotation with the rotor means.

3. A liquid propelling unit comprising, liquid tight enclosure means, powered rotor means rotatably mounted within said enclosure means, liquid flow conducting means fixed to said rotor means in liquid sealed relation to the enclosure means and disposed therewithin for conducting liquid therethrough, outwardly spiralling liquid flow impelling means fixed within said liquid flow conducting means for impelling liquid through the conducting means, and axial flow modulator means fixed to said enclosure means and received within said conducting means for directing liquid flow in a radially inner axial direction between inlet and outlet ends of the con-

5

ducting means, said enclosure means including a central chamber within which said rotor means is disposed, axial bearing means sealing axial ends of said chamber and rotatably mounting said conducting means extending thereinto, said modulator means being mounted in the bearing means and projecting axially into said conducting means and outwardly from said enclosure means, said conducting means comprising a tubular member fixed for rotation with the rotor means, said modulator means comprising a pair of fixed tubular assemblies including a plurality of axial conduits extending into said conducting means and terminating adjacent to the impelling means disposed there within.

4. The combination of claim 3, wherein said impelling means comprises an elongated spiral blade assembly fixed within the conducting means.

5. The combination of claim 4, wherein said modulator means includes axially inner ends of concave configuration for accommodating rotating outer ends of the impelling means there within.

6. The combination of claim 5, wherein said elongated spiral blade assembly comprises a pair of sheet metal sections shaped to form a continuous spiral blade when secured to each other.

7. A liquid propelling unit comprising, liquid tight enclosure means, powered rotor means rotatably mounted within said enclosure means, liquid flow conducting means fixed to said rotor means in liquid sealed relation to the enclosure means and disposed therewithin for conducting liquid therethrough, outwardly spiralling liquid impelling means fixed within said liquid flow conducting means for impelling liquid through the conducting means, and axial flow modulator means fixed to said enclosure means and received within said conducting means for directing liquid flow in a radially inner axial direction between inlet and outlet ends of the conducting means, said modulator means comprising a pair of fixed tubular assemblies including a plurality of axial conduits extending into said conducting means and terminating adjacent to the impelling means disposed there within.

8. The combination of claim 7, wherein said modulator means includes axially inner ends of concave configuration for accommodating rotating outer ends of the impelling means there within.

9. The combination of claim 7, wherein said impelling means comprises an elongated spiral blade assembly fixed within the conducting means.

10. The combination of claim 9, wherein said elongated spiral blade assembly comprises a pair of sheet metal sections shaped to form a continuous spiral blade when secured to each other,

6

11. The combination of claim 7, wherein said impelling means comprises a pair of sheet metal sections having spaced upstanding curved blade portions interconnected by oppositely extending base portions.

12. The combination of claim 7, wherein said conducting means comprises a tubular member fixed for rotation with the rotor means.

13. A propelling unit comprising, fluid tight enclosure means, powered rotor means rotatably mounted within said enclosure means, flow conducting means fixed to said rotor means in liquid sealed relation to the enclosure means having a constant flow area for conducting liquid therethrough, continuous flow impelling means mounted within said flow conducting means for impelling flow continuously in an outwardly spiralling path, and axial flow separating means fixed to said enclosure means and projecting into said conducting means for axially conducting flow in a plurality of radially distributed flow paths to and from the impelling means, said axial flow separating means comprising a pair of fixed tubular assemblies including a plurality of axial conduits extending into said conducting means and terminating adjacent to the impelling means disposed therewithin.

14. A fluid propelling unit comprising, rotor means, tubular flow conduit means driven by the rotor means and having a constant flow area, continuous impeller means fixedly mounted within the tubular flow conduit means for rotation therewith to axially impel fluid therethrough producing a radially outer annular distribution of flow within the tubular conduit means, and flow distributing means projecting into said tubular flow conduit means in operatively spaced relation to the impeller means for radially redistributing said annular flow distribution, said flow distributing means including a plurality of stationary axial flow tubes extending into said tubular flow conduit means and uniformly distributed throughout the flow thereof, said flow tubes having ends terminating in spaced adjacency to the impeller means and forming a concave surface to assist radial redistribution of flow between the impeller means and the flow tubes.

References Cited in the file of this patent

UNITED STATES PATENTS

45	623,892	Fairley	Apr. 25, 1899
	1,534,451	Kauter	Apr. 21, 1925
	1,783,887	Morris	Dec. 2, 1930
	2,537,310	Lapp	Jan. 9, 1951
	2,703,045	Gilbert et al.	Mar. 1, 1955

FOREIGN PATENTS

50	210,273	Great Britain	Jan. 31, 1924
----	---------	---------------	---------------