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JET PROPULSION ASSEMBLY FOR SHIPS
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- (56) Prior Art Documents
US 4474561
SE 424845
FR 1281286
- (57) Claim

1. A jet propulsion assembly for ships, comprising:
 - a drive unit;
 - a drive shaft attached to said drive unit for rotation by said drive unit;
 - a pump housing having an inlet side connected to a water inlet canal, an opposite outlet side, and a water passageway extending therebetween; and
 - a propeller pump housed within said pump housing, said propeller pump including:
 - a hub casing fixedly attached within said pump housing and positioned within said water passageway;
 - a pump wheel having a bowl-shaped portion and being rotatably journalled within said hub casing; and
 - means coupling said pump wheel to said drive shaft for causing rotation of said pump wheel by said drive shaft, providing torsional resistance and permitting angular deflection of said drive shaft, said means including a flexible coupling disposed within said bowl-shaped portion.
2. The jet propulsion assembly of claim 1, wherein said propeller pump further includes a hub journalled for

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rotation within said hub casing by roller bearings, said hub being secured to said pump wheel and to said flexible coupling.



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(21) International Application Number: PCT/SE88/00269 (22) International Filing Date: 20 May 1988 (20.05.88) (31) Priority Application Number: 8702121-8 (32) Priority Date: 21 May 1987 (21.05.87) (33) Priority Country: SE (71) Applicant (for all designated States except US): MJP MARINE JET POWER HB [SE/SE]; Box 130, S-742 00 Östhammar (SE). A3 (72) Inventors; and (75) Inventors/Applicants (for US only) : TÖRNEMAN, Gerard [SE/SE]; Algatan 1, S-740 52 Gimo (SE). LUNDBERG, Nils, Erik [SE/SE]; Gimogatan 26, S-740 63 Österbybruk (SE). (74) Agents: KYHLBERG, Gunnar; Dr Ludwig Brann Patentbyrå AB, P.O. Box 1344, Drottninggatan 7, S-751 43 Uppsala (SE) et al.	(81) Designated States: AT (European patent), AU, BE (European patent), CH (European patent), DE (European patent), FI, FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), NO, SE (European patent), US. Published <i>With international search report.</i> <i>In English translation (filed in Swedish).</i> <div style="text-align: center;"> <p>A.O.J.P. 23 FEB 1989</p> <div style="border: 1px solid black; padding: 5px; display: inline-block;"> AUSTRALIAN 21 DEC 1988 PATENT OFFICE </div> <p style="font-size: 2em; font-weight: bold; margin-top: 10px;">630072</p> </div>	
(54) Title: JET PROPULSION ASSEMBLY FOR SHIPS		
(57) Abstract The present invention briefly concerns a jet propulsion assembly for ships, said assembly comprising a propeller pump of axial or semi-axial type. The propeller pump has a pump housing (6), the inlet side of which is connected to a water inlet canal and the outlet side of which is connected to a outlet device. There is provided in the water flow way through the pump housing (6) a pump wheel (11), which is rotatably journalled in a stationary hub casing (8). A shaft (12) for driving the pump wheel (11) extends from a drive unit through the water inlet canal to the pump wheel (11). The pump wheel (11) and drive shaft (12) are connected by a flexible coupling (13) which is essentially torsion resistant, but which allows of angular deflections between the drive shaft (12) and the pump wheel (11) rotation axis.		

Jet Propulsion Assembly for Ships

The present invention relates to propulsion devices for ships and in particular to a water jet propulsion assembly comprising a propeller pump enclosed in a pump housing.

The pump wheel of the jet propulsion assembly of the kind concerned by this invention is normally mounted to the drive shaft which extends through the inlet canal. The drive shaft end is journalled in the pump housing by means of water-lubricated bushings, oil-lubricated spherical bearings or similar. See for instance the Swedish patent No. 8008288-6.

With a pump wheel mounted in such a way directly to the drive shaft, there is merely one problem present, i.e. the dimensioning of the drive shaft. Since the drive shaft disturbs the affluence of the water to the pump, the result is an uneven load on the pump wheel vanes. Such an uneven load induces a bending moment, which is transmitted to the pump shaft, and which has to be taken into consideration when dimensioning the shaft. It is appreciated that due to the bending moment the shaft be given a relatively generous diameter, which in turn increases the disturbance of the water flow to the pump, and thus renders increased losses. Another close problem consists in that the drive shaft deviates from the theoretically correct position, which leads to either increased wear on the bearing in the pump housing or, if the bearing is fitted to receive angular deviations, a large risk that the pump wheel vanes will bump into the inner walls of the pump housing, since the pump wheel is directly mounted to the drive shaft. For the best power economy possible, the pump wheel vanes should terminate as closely to the pump housing inner walls as possible.



~~The purpose of the present invention is to eliminate the above~~

The present invention provides an improved jet propulsion system.

According to the invention, there is provided a jet propulsion assembly for ships, comprising:

a drive unit;

a drive shaft attached to said drive unit for rotation by said drive unit;

a pump housing having an inlet side connected to a water inlet canal, an opposite outlet side, and a water passageway extending therebetween; and

a propeller pump housed within said pump housing, said propeller pump including:

a hub casing fixedly attached within said pump housing and positioned within said water passageway;

a pump wheel having a bowl-shaped portion and being rotatably journalled within said hub casing; and

means coupling said pump wheel to said drive shaft for causing rotation of said pump wheel by said drive shaft, providing torsional resistance and permitting angular deflection of said drive shaft, said means including a flexible coupling disposed within said bowl-shaped portion.

In the assembly of the invention, it is preferred that said propeller pump further includes a hub journalled for rotation within said hub casing by roller bearings, said hub being secured to said pump wheel and to said flexible coupling.



~~problems. The purpose is attained by the provision of a jet propulsion assembly of the above mentioned kind, wherein the drive shaft is fitted not to be affected by a bending moment or by other forces, for example pressure forces, from the pump wheel but only to transmit turning moments from the drive machinery, at the same time as the angular deflections of the drive shaft do not affect the precise bearing of the pump wheel. The actual invention object as well as that which is characteristic thereof are evident from the accompanied patent claims.~~

The invention will now be described in more detail, in conjunction with the attached drawings, which in the exemplary form of the invention show an embodiment of a jet propulsion assembly according thereto.

FIG. 1 illustrates a longitudinal view partially in cross section of a jet propulsion assembly according to the invention, and

FIG. 2 illustrates an axial section through the pump unit of a jet propulsion assembly according to the invention.

Referring to Fig. 1 a jet propulsion assembly S is mounted at the stern of a ship, of which only the stern 1 and the ship bottom 2 are schematically implied. The jet propulsion assembly S includes an inlet canal 3, which extends from a water inlet 4 in the ship bottom to a mounting flange 5 for the pump housing 6 of the assembly. The inlet 4 is provided with a grid 7, which prevents objects from being sucked into the actual jet propulsion assembly S.

In the illustrated embodiment the pump is comprised of a propeller, which is journalled for rotation in a hub casing 8, which is provided downstreams centrally through the pump housing 6. This hub casing is supported by articulated vanes



9, which extend between the inside of the pump housing 6 wall and the outside of the hub casing 8. In the hub casing 8, a hub 10 equipped with a flange is journalled for rotation, and the pump wheel 11 is secured in place on the hub 10 flange. A drive shaft 12 extends from an engine 24 through the inlet canal 3 and projects into the pump housing 6. A flexible coupling 13 is provided between the flanged hub 11 and the drive shaft 12. This coupling is such that neither pressure forces nor bending moments can be transmitted from the pump wheel 11 to the drive shaft, which allows dimensioning of drive shaft solely for transmission of turning moments from the drive machinery 24. A flexible sealing 14 seals the drive shaft 12 against the flow passage in the inlet canal and this flexible sealing 14 allows of a less precise alignment of the drive shaft and coupling to the drive machinery 24.

The pump housing 6 has its outlet leading to an outlet pipe 15, on which a laterally pivotal steering means 20 is mounted. The steering means 20 is journalled in vertical spindles 16 and 17 and is laterally pivoted by means of not further shown hydraulic engines. The steering of the ship takes place when the water jet from the pump is diverted to either side of the steering means 20 inner walls.

To reverse the force direction of the assembly for the retardation or backing of the ship, two flaps 18, 19 are adapted to be swung into the water jet way, so that the jet way is gradually diverted from full speed ahead, the jet being directed straight rearwards, to full speed rearwards, the jet being directed obliquely downwards/forwards. Between the two extreme positions, intermediate positions can, if so desired, be set. The jet will then be partially diverted forwards and partially be projecting rearwards. The upper flap 18 also has the function to act as a splash shield during the above diversion. The upper flap 18 will thereby overlap the rear ends and sides of the lower flap 19. Through the described

reversing device, steering can also be obtained during a ship's backing up operation by diverting the jet in the intended direction which can be done by said steering means 20.

In the shown embodiment the hub 10 is journalled in the hub casing 8 by means of oil- or grease-lubricated roller bearings 25, 26, which provide a very precise bearing of both the hub 10 and the pump wheel 11 mounted to the hub flange. Ball bearings and slide bearings are in certain cases also possible to use as well as different combinations of bearing types. Possible errors of the alignment of the drive shaft 12 are carried by the torsion resistant but flexible coupling 13, which is provided between the hub 10 and shaft 12. This coupling 13 makes possible a very precise positioning of the pump wheel 11 vanes relative to the pump housing 6 inner wall, without the vanes being affected by a possible angular deflection of the drive shaft.

The hub 10 is mounted so that its flange rotates at a relatively small distance from the flange of the bearing holder 21. On the outside of the hub 10 towards the bearing holder 21, there is mounted a suitable amount of radial vanes 22, the function of which is to reduce the pressure against the sealing 23 and that you counteract an accretion of debris and similar in the gap between the bearing holder 21 and hub 10. To further decrease the risk for accretion of debris, the wheel hub 11a of the pump wheel rotates at a very little distance from the hub casing 8 and is, along its outer circumference, equipped with a number of milled-out radial grooves adapted to cut apart possible cords and algae, which could accompany the flowing water and stick to the articulated vanes 9.

The pump wheel 11 being steadily and separately journalled for rotation and flexibly coupled to the drive shaft 12, there will be no significant bending moment nor other negative

forces between the shaft and pump wheel. Therefore, the drive shaft 12 can be made relatively small, since it needs to be dimensioned only for the transmission of rotary forces. Thereby, less flow disturbances are received, which would negatively affect the pump wheel. Thus, the initially mentioned purpose has been attained by the present invention.

The claims defining the invention are as follows:

1. A jet propulsion assembly for ships, comprising:

a drive unit;

a drive shaft attached to said drive unit for rotation

5 by said drive unit;

a pump housing having an inlet side connected to a water inlet canal, an opposite outlet side, and a water passageway extending therebetween; and

10 a propeller pump housed within said pump housing, said propeller pump including:

a hub casing fixedly attached within said pump housing and positioned within said water passageway;

a pump wheel having a bowl-shaped portion and being rotatably journalled within said hub casing; and

15 means coupling said pump wheel to said drive shaft for causing rotation of said pump wheel by said drive shaft, providing torsional resistance and permitting angular deflection of said drive shaft, said means including a flexible coupling disposed within said bowl-shaped portion.

2. The jet propulsion assembly of claim 1, wherein said propeller pump further includes a hub journalled for rotation within said hub casing by roller bearings, said hub being secured to said pump wheel and to said flexible
25 coupling.

3. The jet propulsion assembly of claim 1, substantially as herein described with reference to the accompanying drawings.

30 DATED: 26 August, 1992

MJP MARINE JET POWER AB

By their Patent Attorneys:

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35 PHILLIPS ORMONDE & FITZPATRICK



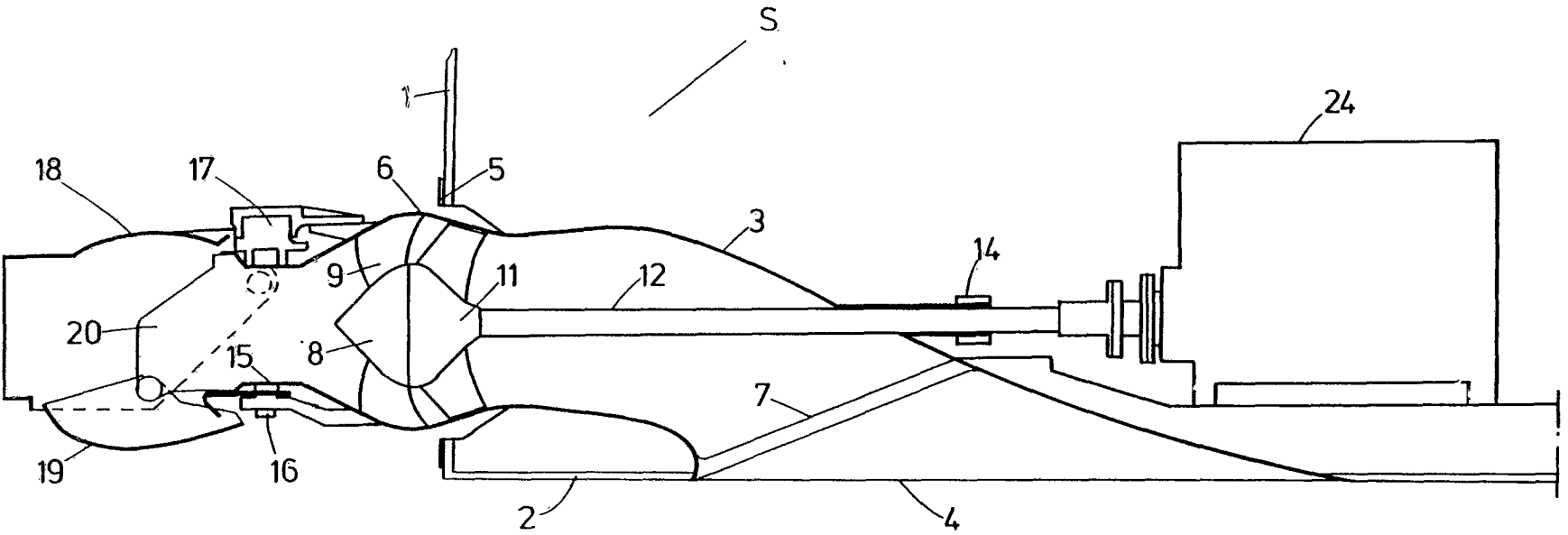
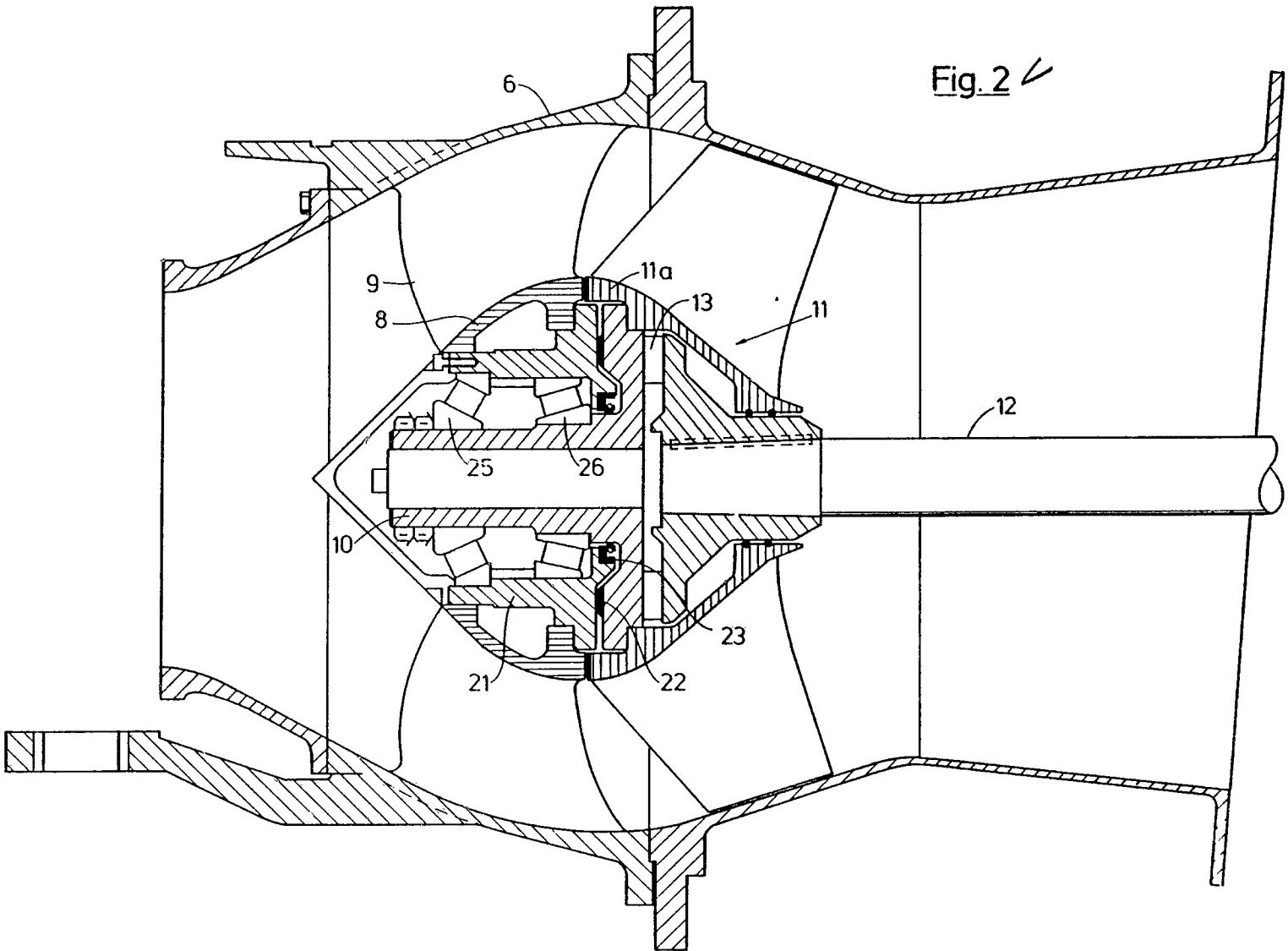


Fig. 1



INTERNATIONAL SEARCH REPORT

International Application No PCT/SE88/00269

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶

According to International Patent Classification (IPC) or to both National Classification and IPC ⁴

B 63 H 11/08

II. FIELDS SEARCHED

Minimum Documentation Searched ⁷

Classification System	Classification Symbols
IPC 4	B 63 H 11/08, 23/34
Nat cl	65f ³ :21
US Cl	115:11, 14, 16; 440:38

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched ⁸

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹

Category ⁹	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	SE, B, 424 845 (KAMEWA AB) 16 August 1982	

⁹ Special categories of cited documents: ¹⁰

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1988-06-28	1988 -07- 07
International Searching Authority	Signature of Authorized Officer
Swedish Patent Office	Björn Salén <i>Björn Salén</i>

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

V. OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE ¹

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. Claim numbers _____ because they relate to subject matter not required to be searched by this Authority, namely:
2. Claim numbers _____ because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. Claim numbers _____, because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING ²

This International Searching Authority found multiple inventions in this international application as follows:

- 1) Claims 1, 2, 4 relate to a jet propulsion with flexible connection.
- 2) Claim 3 relates to a pressure reducing mean.

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:
4. As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- The additional search fees were accompanied by applicant's protest.
- No protest accompanied the payment of additional search fees.