(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 514 123 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **92304251.9**

(22) Date of filing : **12.05.92**

(51) Int. Cl.[5] : **B63H 11/04,** B63H 21/30

(30) Priority : **14.05.91 NO 911875**

(43) Date of publication of application :
19.11.92 Bulletin 92/47

(84) Designated Contracting States :
AT BE CH DE DK ES FR GB GR IT LI LU MC NL PT SE

(71) Applicant : **ULSTEIN PROPELLER A/S**
N-6065 Ulsteinvik (NO)

(72) Inventor : **Royset, Norvald**
N-6060 Hareid (NO)

(74) Representative : **Valentine, Francis Anthony Brinsley**
REDDIE & GROSE 16 Theobalds Road
London WC1X 8PL (GB)

(54) Jet propulsion unit.

(57) A jet propulsion unit for a watercraft, comprises a water pump (30) with a rotor (33) provided in a pump housing (31) and the pump is arranged to connect with the vessel's hull at its stern in such a manner that the water inlet opening (30) of the pump communicates with the outlet opening of a water supply channel (10) in the hull.

The pump housing (31) has an outer, convex surface which has spherical portions (40) with the same radius, the centre of the spherical portions lying on the axis of rotation (41) of the pump rotor (3).

Furthermore, at the vessel's transom stern (1) there is installed a tubular element (20) whose inner surface has concave spherical portions (24) which mate with the pump housing's spherical surface sections (40) and which act as a sliding bearing for this, thus enabling the pump housing to be positioned correctly in relation to the driving mechanism for the pump rotor before the pump housing is attached to the tubular element.

EP 0 514 123 A1

Improvement in jet propulsion units for watercraft, where the unit comprises a water pump with a rotor provided in a pump housing and the pump is arranged to connect with the vessel's hull at its stern in such a manner that the pump's water inlet opening communicates with an outlet opening of a water supply channel in the hull.

From prior art it is known that a flange of the pump housing can be attached to a flange of the transom stern after the latter flange has been aligned in advance so that, e.g., the plane in which it extends is perpendicular to a straight line between a central point for the flange in this plane and a central point of the motor flywheel.

A known method for aligning the above-mentioned flange of the transom stern has involved a build-up of the flange surface, e.g., by means of an alignment jig and a laser. This is a complicated, laborious and extremely time-consuming process.

The object of the improvement according to the invention is to provide a device which is encumbered to a lesser extent by the above-mentioned disadvantages.

In the following section the invention will be described in more detail with reference to the drawing which illustrates schematically a vertical longitudinal section through an embodiment of a jet propulsion unit according to the invention in which sections are cut away.

In the following description the terms forwards and backwards should be understood to mean forwards and backwards on board the vessel, and in front of and behind should be understood to mean the relative positions for objects on board the vessel, based on these directions.

In the transom stern 1 of a vessel there is provided a circular opening 2. Around the opening is provided a circular flange 3, in which there are arranged a number of through going holes 4. In front of the holes 4 there can be attached to this a number of nuts 5 into which can be screwed respective screws 6, which are inserted in the holes from the back of the flange.

From a front section of the hull there extends backwards a water supply channel 10 whose rear section is terminated by a flange 11. As with the flange 3, in this flange there is arranged a number of holes 12 for screws 13, which can be inserted from the back into the holes 12 and screwed into the nuts 14 which are attached to the flange in front.

Between the flange 3 of the transom stern 1 and the flange 11 of the water supply channel 10 there extends a tubular or annular element 20 with a rear flange 21 and a front flange 22. In these flanges 21, 22 there are arranged holes corresponding to the respective holes 4, 12 in the flange 3 of the transom stern and the flange 11 of the water supply channel 10 in order to connect the element 20 to the transom stern 1 and the water supply channel 10 by means of the screws 6 and 13 and the nuts 5 and 14.

On the radially inward facing side of the annular element 20 there is arranged an inwardly concave ball or spherical zone section 24 with radius R, which extends in a circle along the element, the rear zone section of the ball zone section being further from the element's longitudinal axis than sections located at the front, i.e. the ball centre 48 is located behind a transverse plane which extends through the rearmost section of the ball zone section.

To the transom stern there is also attached a water pump 30 with a front and a rear pump housing part 31 and 32 in which a rotor 33 is rotatably provided.

The front housing part 31 is provided with a rear flange 35 and the rear housing part 32 is provided with a front flange 36. In these flanges there are arranged in pairs aligned, through going holes. Through the holes there are led screws 37 which connect these flanges and the housing parts with one another, the screws being screwed on to nuts (not shown) which are arranged in front of the rear flange 35.

Alternatively, the holes in the rear flange 35 can be provided with threads corresponding to the threads of the screws 37, thus rendering the nuts for these superfluous.

Moreover, in the rear flange 35 of the front pump housing 31 there are provided further holes 34 which are adapted to fit the screws 6, these being arranged to extend through this flange 35, the rear flange 21 of the element 20 and the flange 3 of the transom stern for the interconnection of these parts. The holes 34 are counterbored so that they can accommodate the heads of the screws 6 completely.

On the radially outer side of the front pump housing 31 there is provided a circular, convex ball or spherical zone section 40 whose ball radius is equal to the ball radius R of the inward facing, concave ball zone section 24 of the annular element 20, the centres 48 of these ball sections coinciding and lying on the axis of rotation 41 of the pump rotor 33.

The front pump housing 31 and the element 20 preferably define between them a rear and a front annular space 42 and 43 which are arranged to be filled with a liquid, hardenable material 44 via filler openings, which can be closed with threaded plugs 45, circular bands (not shown) or the like. This material can, e.g., be a plastic which easily adheres to the sides of the spaces 42, 43 and which does not shrink during hardening, thus ensuring that the front pump housing is firmly attached to the element after the material has hardened.

In order to prevent the liquid material 44 from penetrating the space between the ball surfaces, annular seals 46, 47 can be provided between these.

The method for assembly of the unit is as follows.

First of all, the annular element 20 is connected with the water supply channel 10 so as to form a seal, their flanges 22 and 11 being arranged so as to abut

each other and the screws 13 inserted in the holes 12 and connected to the nuts 14.

Thereafter, the ball zone section 40 and the front pump housing 31 are arranged so as to abut the ball zone section 24 of the annular element 20, and the front pump housing 31 is attached to the annular element 20 with some of the screws 6.

An assembly jig with a centrally arranged laser is then arranged so as to abut the rear flange 35 of the front pump housing 31. After carefully loosening the screws 6 to enable the front pump housing 31 to be moved in relation to its annular element, this pump housing is rotated while sliding the ball zone sections on each other, until the laser's light strikes a central point of the motor's flywheel, of the flange of an axle which is connected to this or the like.

Thereafter the screws 6 are tightened carefully, and while the pump housing is secured by means of these screws in this position in relation to the annular element, the hardenable material is poured into the spaces 42, 43 between the element and the pump housing.

After this material has hardened, the remaining connecting screws 6 are inserted and tightened.

Finally the pump's rotor 33 and rear housing 32 are installed.

It is stated above that the ball surfaces of the annular element 20 and the front pump housing 31 respectively are continous and form a ball zone section. It should, however, be understood that the ball surfaces can be divided into ball surface sections, e.g. ball calottes, which work together in pairs, and that it is sufficient to provide two pairs of synergic ball surface sections located diametrically opposite each other. These must, of course, be large enough to ensure that the ball surface sections of the annular element are not prevented from engaging with the ball surface sections of the front.pump housing during the above-mentioned relative adjustment.

Claims

1. Improvement in jet propulsion units for watercraft, where the unit comprises a water pump (30) with a rotor (33) provided in a pump housing (31, 32) and the pump is arranged so as to connect with the vessel's hull at its stern in such a manner that the pump's (30) water inlet opening communicates with an outlet opening of a water supply channel (10) in the hull, characterized in that
   - the pump housing (31) comprises at least two radially outward facing convex ball surface sections (40) located principally diametrically opposite each other, with equal radius R, and whose common centre (48) lies on the rotor's (33) axis of rotation (41),
   - the device comprises an element (20) which is arranged to be attached to the hull, and which has radially inward facing, concave ball surface sections (24) which are complementarily adapted in shape to fit the respective ball surface sections (40) of the pump housing (31), and
   - the respective inward and outward facing ball surface sections (24, 40) are arranged to abut each other when the element (20) is attached to the hull, the pump housing (31) in such an abutment being rotatable about transversal axes in relation to the element (20) for adjustment of the element's (20) and the pump housing's (31) relative position, in that the ball surface sections (24, 40) thereby slide against each other and the pump housing is arranged to be attached to the element (20) after the relative adjustment.

2. A device according to claim 1, characterized in that the element's (20) ball surface sections together constitute a ball zone section (24).

3. A device according to claim 1 or 2, characterized in that the pump housing's (31) ball surface sections together constitute a ball or spherical zone section (40).

4. A device according to one of the preceding claims, characterized in that the element (20) and the pump housing (31) define between them spaces (42, 43) into which can be poured a hardenable material, which after hardening prevents relative movement of these parts.

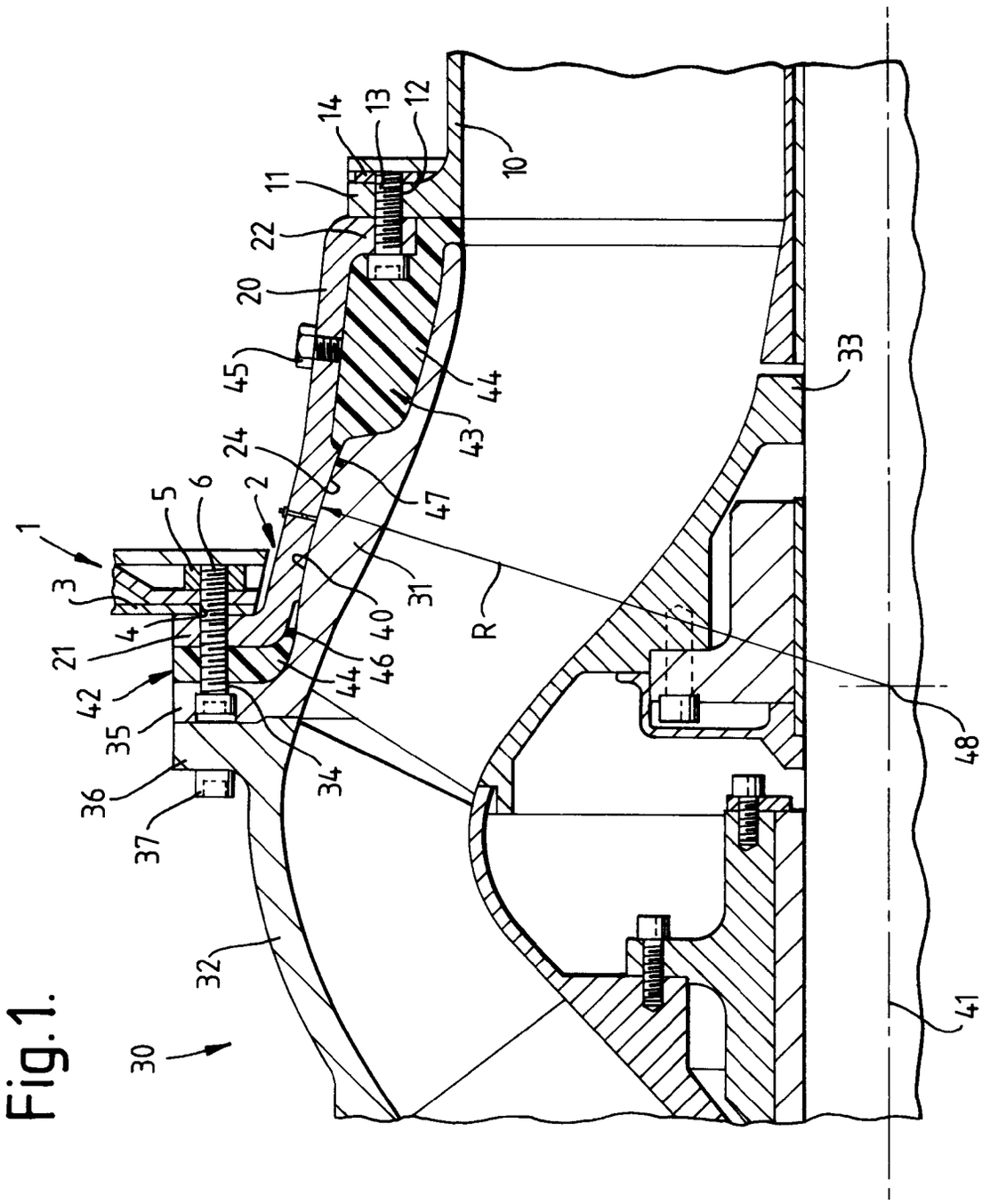
1
2
3
4
5
6
10
11
12
13
14
20
21
22
24
30
31
32
33
34
35
36
37
40
41
42
43
44
45
46
47
48
R

Fig.1.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 30 4251

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	DE-A-2 363 318 (BRUNSWICK CORP.) * claims 1,4,5; figures * ---	1	B63H11/04 B63H21/30
A	GB-A-567 082 (G.MICUTA) * page 2, line 56 - line 63; figures * -----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B63H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 AUGUST 1992	STIERMAN E.J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)