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(54) Ship propulsion arrangement

(57) A ship propulsion arrangement, comprising a propeller hub (202), and to the propeller hub detachably attachable blade flanges (204, 206, 208) each carrying an integral blade. At least one of the blade flanges carries at least two, to the blade flange, integrally formed blades (204A, 204B).

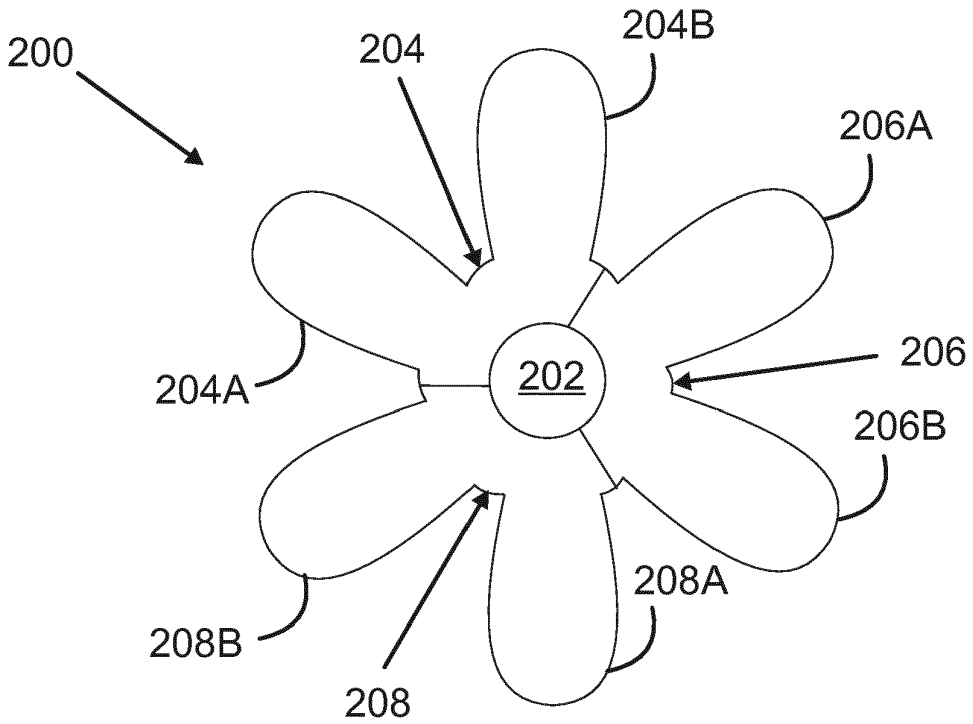

Fig. 2

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Description

FIELD

[0001] The present invention relates to a ship propulsion arrangement.

BACKGROUND

[0002] Propellers of certain ships, such as ice-going vessels, need to withstand very high loads whereby the blades are typically very thick. Often it is required by flag authorities, for example, by the means of ship classification rules for ice-going vessels, that propulsion drive train including, e.g., propeller shaft, bearings and housing, needs to withstand a breakage load of one propeller blade. One option to reduce blade breakage load is to increase the number of blades, which results narrower and possibly thinner individual blades.

[0003] Often it is desired, or required by flag authorities, that the blades shall be replaceable. The blades are attached to a propeller hub by means of a so called blade flange. The attachment of a greater number of blade flanges to a propeller hub to meet the replaceability and reduction of blade thickness requirements is strengthwise often not possible.

[0004] An improved solution is thus called for.

SUMMARY

[0005] An object of the present invention is to provide a propulsion arrangement so as to alleviate the above disadvantages. The object of the invention is achieved with a propulsion arrangement which is defined in the independent claim. Some embodiments are disclosed in the dependent claims.

[0006] In an aspect there is provided a ship propulsion arrangement, comprising a propeller hub, and to the propeller hub detachably attachable blade flanges each carrying an integral blade. At least one of the blade flanges carries at least two, to the blade flange, integrally formed blades. When the number of blades on a blade flange and the propeller is increased, the dimensions and blade breakage load of each single blade are reduced, without compromising the fastening of blade flanges to a propeller hub.

[0007] In the embodiments, number of blade flanges is two, three or four, preferably two or three, whereby each blade flange covers a great portion of the hub circumference.

[0008] In an embodiment, each blade flange carries two blades. In an embodiment, the propulsion arrangement comprises three blade flanges, whereby the number of blades is six. In another embodiment, the number of blade flanges is four.

[0009] In an embodiment, the blades of the same blade flange are arranged overlappingly when seen from an end of the propeller hub. In this way the efficiency or the strength of the propeller hub may be increased.

[0010] In an embodiment, the propeller is attached to an azimuthing propulsion unit.

[0011] In an embodiment, the propeller is attached to an azimuthing podded propulsion unit.

[0012] In an embodiment, the propeller is attached to a pulling propulsion unit.

DRAWINGS

[0013] In the following, the invention will be described in greater detail by means of some embodiments with reference to the accompanying drawings, in which

Figure 1 shows a prior art propeller;
Figure 2 shows an embodiment of a propeller according to the invention.

DETAILED DESCRIPTION

[0014] The embodiments relate to a propeller arrangement of a ship. In some embodiments, the ship is an ice-going vessel such as an ice-breaker.

[0015] Figure 1 shows a prior art propeller arrangement seen from the end that is along the rotation axis of the propeller. In the middle of the propeller arrangement there is a hub 102 to which the blade flanges are attached to.

[0016] In Figure 1 there are four blade flanges 104 to 110 each carrying a respective blade 104A to 110A. The blades are integrally formed to the blade flange by casting so that they form an integral inseparable blade flange unit. As there are four blade flanges, each flange covers about 90 degrees of a circumference of the hub. The problem with using more flanges, eg. six flanges each covering about 60 degrees of the circumference, would be that the flanges cannot adequately and sufficiently be attached to the hub, for example, with bolts, to withstand the high loads caused by, for example, ice blocks hitting the blades.

[0017] Figure 2 shows an embodiment of the invention. In this embodiment, there are only three blade flanges 204 to 208, and each of the flanges carries two blades. For example, the blade flange 204 carries two blades 204A, 204B.

[0018] In this way, multiple goals are achieved. The blade flanges can be attached to the hub very well. That is, there is sufficiently space on the blade flange to receive a plurality of bolts for fastening the flange to the hub. Also the share of the blade flange of the circumference of the hub is so great that the bolt openings can be distributed over the flange area to obtain maximal fastening of the flange to the hub. The number of blades can be increased compared to prior solutions, whereby their dimensions, for example blade root section thickness and chord length, can also be reduced and therefore the blade breakage load is decreased. This can lead to lower dimensioning load of the whole propulsion drive

train and therefore possible more cost and/or efficiency optimised propulsion. The replaceability requirements of blades are met also by this solution of the invention.

[0019] If desired, for example, from the efficiency or strength point of view in such case that the power density of the propeller is high and thus large blade area ratio is required, those blades that share same flange may be manufactured to overlap each other, when looking from behind of the propeller and/or from the blade root sections.

[0020] In another embodiment, the blades are at the same position along the rotation axis of the propeller unit. That is, the blades are in the same plane with each other. The blades may then be arranged non-overlappingly to each other.

[0021] Figure 2 shows one embodiment of the invention, where the propeller has altogether six blades in three blade flanges. Other embodiments are also possible. There may, for instance, be eight blades in four flanges or four blades in two flanges. The number of blades in flanges can also vary, such that there may be five blades in three flanges where the flanges are of equal size. In a still further embodiment, at least one of the blade flanges may carry three blades.

[0022] The most optimal solution is, however, the one shown in Figure 2, because six blades in three flanges optimises the strength requirements of fastening the flanges to the hub. The number of blades being six is also sufficient for it being possible to reduce the size of the blades still meeting the strength requirements of the blades.

[0023] It will be obvious to a person skilled in the art that, as the technology advances, the inventive concept can be implemented in various ways. The invention and its embodiments are not limited to the examples described above but may vary within the scope of the claims.

Claims

1. A ship propulsion arrangement, comprising a propeller hub (202), and to the propeller hub detachably attachable blade flanges (204, 206, 208) each carrying an integral blade, **characterized in that** at least one of the blade flanges (204) carries at least two, to the blade flange, integrally formed blades (204A, 204B).

2. A ship propulsion arrangement according to claim 1, **character-i z e d** in that the ship is an ice-going vessel.

3. A ship propulsion arrangement according to any preceding claim, **characterized in that** each of the blade flanges (204, 206, 208) carries two integral blades (204A, 204B, 206A, 206B, 208A, 208B).

4. A ship propulsion arrangement according to any preceding claim, **characterized in that** the blades (204A, 204B) are formed integrally to the blade flange (204) by casting.

5. A ship propulsion arrangement according to any preceding claim, **characterized in that** the propulsion arrangement comprises three blade flanges (204, 206, 208).

6. A ship propulsion arrangement according to any preceding claim, **characterized in that** the propulsion arrangement comprises four blade flanges.

7. A ship propulsion arrangement according to any preceding claim, **characterized in that** the blade flanges (204, 206, 208) are attachable to the propeller hub (202) by bolting.

8. A ship propulsion arrangement according to any preceding claim, **characterized in that** the blades of the same blade flange are arranged overlappingly when seen from an end of the propeller hub.

10. A ship propulsion arrangement according to any preceding claim, **characterized in that** the propeller hub (202) is attached to an azimuthing propulsion unit.

11. A ship propulsion arrangement according to any preceding claim, **characterized in that** the propeller hub (202) is attached to an azimuthing podded propulsion unit.

12. A ship propulsion arrangement according to any preceding claim, **characterized in that** the propeller hub (202) is attached to a pulling propulsion unit.

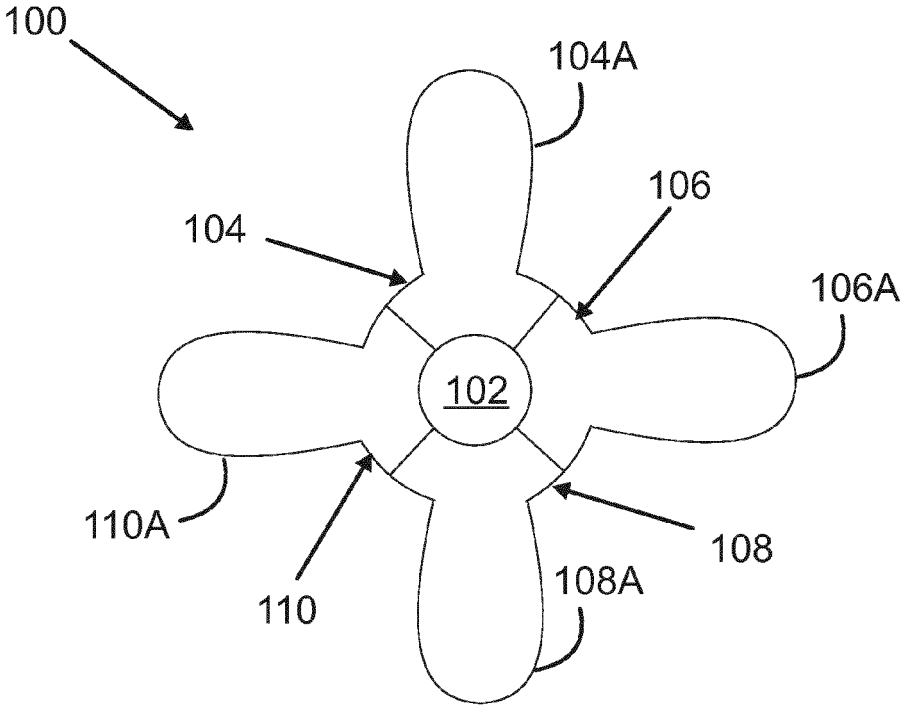
100
104A
106
104
106A
102
110A
108
110
108A

Fig. 1

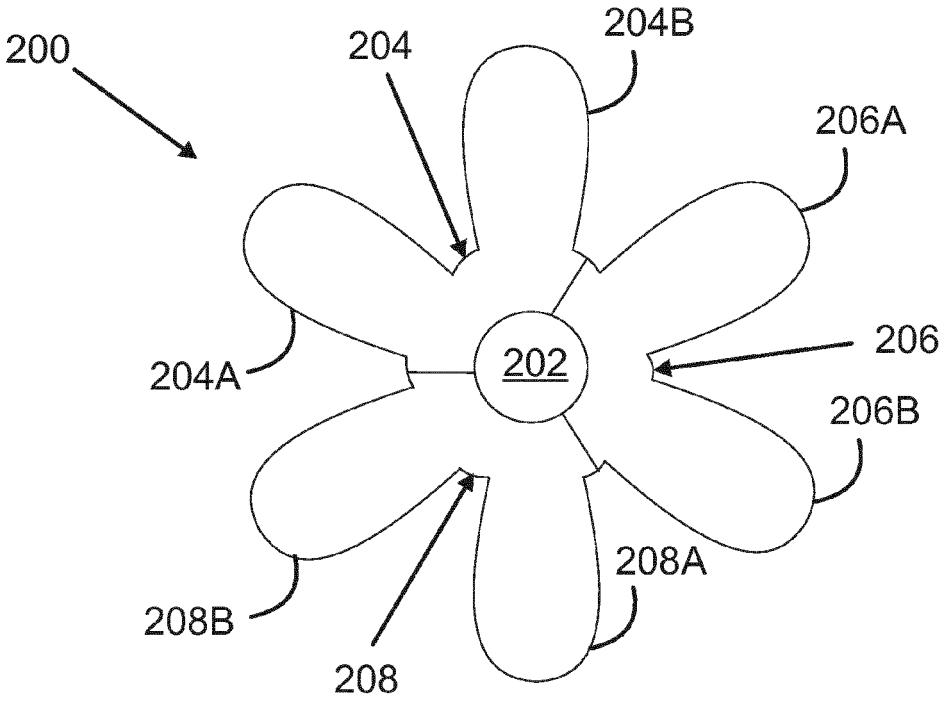
200
204
204B
206A
206
204A
202
206B
208A
208B
208

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 14 18 3406

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

B63H
B63B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	23 February 2015	Székely, Zsolt

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
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 14 18 3406

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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23-02-2015

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82