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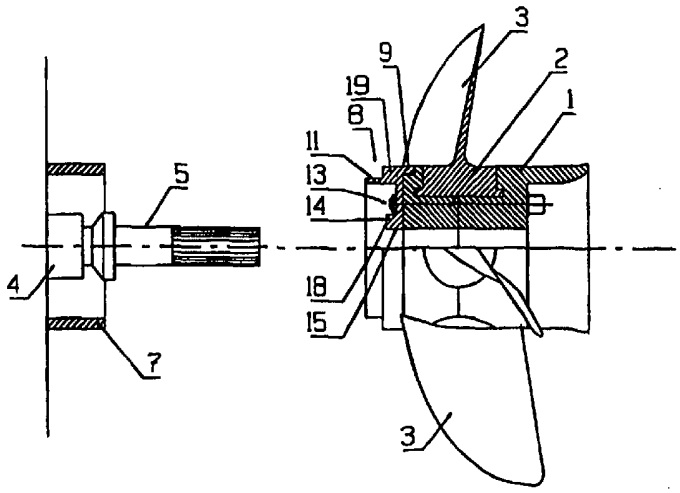

(57) Abstract

The invention relates to a marine propeller having a drive-source connecting means. According to the invention, the connecting means is included by a separate adapter element (8) detachably fastened to the propeller hub (1, 2). The invention also relates to a propeller system which includes a series of such adapter elements (8), and an adapter element (8) as such, and a set of adapter elements, in accordance with the aspects of the invention. The invention also relates to a method of fitting a propeller to a drive source with the aid of a separate adapter element (8), said method constituting a further aspect of the invention.

A MARINE PROPELLER, PROPELLER SYSTEM AND COMPONENTS BELONGING THERETO, AND A METHOD OF CONNECTING A PROPELLER

FIELD OF INVENTION

According to a first aspect, the present invention relates to a marine propeller of the type defined in the preamble of Claim 1. According to a second aspect, the invention relates to propeller system of the kind defined in the preamble of Claim 5. According to a third aspect, the invention relates to an adapter means of the kind defined in the preamble of Claim 7. According to a fourth aspect, the invention relates to a set of adapter means of the kind defined in the preamble of Claim 1. According to a fifth aspect, the invention relates to a method of the kind defined in the preamble of Claim 11.

BACKGROUND OF THE INVENTION

Marine propellers are normally driven by a motor, or an engine, to which the propeller is connected through the medium of an output shaft from a gearbox coupled to the motor. Such motors are manufactured and supplied by a large number of manufacturers, wherewith each manufacturer gives the motor and associated gear housing his/her particular design. This normally results in that a certain propeller will only fit the motor of a particular manufacturer. The decisive factor as to whether or not the propeller can be connected to a given motor is whether or not the output shaft from the motor gearbox can be coupled to the propeller hub, which is normally effected with the aid of a spline coupling. Another deciding factor is whether or not the propeller hub is configured so as to enable it to be fitted in the gearbox opening through which the drive shaft extends. The first aspect will not normally constitute a problem, since the

propeller hub is standard for a given power class and the splines identical. On the other hand, the connecting flange on the gearbox may have a different configuration and the output shaft a different length. This is the primary cause of the problem that resides in the propeller hub not being adapted to the connecting flange of the gearbox and/or that the shaft extends too far or not far enough at the point where the hub shall be connected to the gearbox.

An adaptor can be provided between the hub splines and the shaft splines in respect of small-craft motors that have different spline dimensions because of different drive powers, for instance, so as to enable one and the same propeller to be connected to drive shafts of mutually different spline dimensions by appropriate adapter selection. However, the solution does not solve the problem of adapting the hub to suit the flange of the gearbox and to the length of the drive shaft.

The above discussion of documents, acts, materials, devices, articles and the like is included in this specification solely for the purpose of providing a context for the present invention. It is not suggested or represented that any of these matters formed part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed in Australia before the priority date of each claim of this application.

It would be desirable to enable one and the same propeller to be used with different types of motors with regard to connecting such motors to the propeller, particular the design of the gearbox connecting flange, and with regard to the length of shaft extending from the gearbox.

SUMMARY OF THE INVENTION

The object with respect to the first aspect has been achieved in accordance with the invention by means of a marine propeller of the kind defined in the preamble of Claim 1 and having particular features set forth in the characterising clause of said Claim. With respect to the second, third and fourth aspects of the invention, the object has been achieved with a propeller system, an adapter means,

and a set of adapter means of the kind defined in the respective preambles of Claims 5, 7 and 9 and having the particular features set forth in the characterising clauses of said respective Claims. With respect to the fifth aspect, the object is achieved with a method of the kind defined in the preamble of Claim 1 and comprising the special steps and measures set forth in the characterising clause of said claim.

Because the propeller is provided with a separate adapter element that is fastened detachably to the hub and has a side adapted to the gearbox flange and the shaft length, one and the same propeller can be connected to any one of several different types of motor by appropriate selection of an adapter element. This obviates the need for a propeller manufacturer or supplier to maintain a large assortment of propellers in order to be able to supply a particular propeller for a particular motor. In principle, it will suffice to have one propeller in each size class and a set of adapter elements that suit different types of motor. This rationalises both manufacture and storage and makes manufacture and storage less expensive.

Because that part of the drive source housing to which the propeller shall be connected is normally comprised of a circular flange positioned about a shaft exit opening in the gearbox, it is suitable to provide the housing-adapting side with an axially directed circular flange. This can then be inserted into the gearbox flange with a small clearance and co-act with said flange to form a sealing casing around the drive shaft. An adapter element of this design thus constitutes a preferred embodiment of the invention.

According to a further preferred embodiment of the invention, the propeller is adjustable so as to enable the propeller blades to be adjusted to other settings in distinct steps and

in unison. This widens the field of use in respect of each type of propeller and therewith further contributes towards achieving the object of the invention, to-wit of reducing the number of propellers necessary in one assortment.

These embodiments and other advantageous embodiments of the invention are set forth in the Claims dependent on Claim 1.

The propeller system set forth in Claims 5 and 6 constitutes an important aspect of implementing the inventive concept, in that the system includes a series of adapter elements from which an appropriate adapter can be chosen.

The adapter arrangement defined in Claims 7 and 8 and the set of adapter elements defined in Claims 9 and 10 constitute further implementations of the inventive concept of enabling one type of propeller to be connected to a given type of motor through the medium of separate adapter elements.

The method defined in Claims 11 and 12 utilises the possibility of rationalisation afforded by the inventive arrangements.

The invention will now be described in more detail with reference to exemplifying embodiments thereof and also with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 illustrates partly in section and partly in side view a propeller according to a first embodiment of the invention.

Fig. 2 is a sectional view of an adapter element according to the invention, said element being one of a set of such elements.

Fig. 3 illustrates partly in side view and partly in section a propeller according to a second embodiment of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

Fig. 1 illustrates an inventive propeller that includes a plurality of propeller blades 3 fastened radially to a hub that consists of a front hub-half 2 and a rear hub-half 1. The rear hub-half 2 is adapted for connection with a gearbox 4 which, in turn, is connected to a drive motor (not shown). The gearbox includes an output shaft 5 that has splines which connect drivingly with corresponding splines inside the hub. An axially facing ? circular flange 7 is mounted on the shaft 5.

The propeller is connected to the gearbox with the aid of an adapter element 8 in the form of a circular ring that has a rearwardly facing axial flange for connection with the hub, and a forwardly facing axial flange 11 for co-action with the gearbox flange 7. The adapter element 8 has a central part 14 which includes a central opening 15 through which the shaft extends to the hub. After having fitted the propeller to the gearbox, the adapter element is fastened to the front part 2 of the hub by means of bolts 13 or the like, so that the adapter will rotate together with the hub 1, 2 in operation. The flange 11 extending towards the gearbox projects into the flange 7 on said gearbox and rotates in said gearbox with a small amount of play. Naturally, the adapter element may be fastened to the hub in some way other than through the medium of the bolts 13 that hold the hub together.

Fig. 2 illustrates the adapter element 8 in more detail and shows how a series or set of such elements can be built-up. Shown in that part of the adapter element which connects the

outer part 19 and the inner part 14 together, is one of the bolt holes 16 by means of which the adapter element is fastened to the hub, and one of several exhaust passages 17 through which motor exhaust gases can pass.

The flange 11 on the outer ring 19 facing towards the gearbox can have different outer diameters in respect of different adapter elements, as indicated by the broken line 11b. The axial length of the inner part 14 of the adapter element may vary in respect of different elements by virtue of extending through respective different distances towards the gearbox, therewith adapting the abutment surface 18, 18a of said central part of the element to the length of the drive shaft in question. The axial extension of the outer ring 19 and/or of the flange 11 may also be varied.

Fig. 3 illustrates another embodiment of the invention as applied to a propeller whose blade settings can be adjusted incrementally and in unison, said propeller being the subject of Patent Application SE 9703466-4 filed on the same day as the present Application. The root-part 24 of each propeller blade 3 is mounted between the hub-parts 1 and 2 for rotation or angular movement about an axis that extends perpendicular to the centre axis of the propeller. Each root-part 24 is provided with a blade setting adjustment arm 20 which extends rearwardly in the axial direction of the propeller and received in a recess 21 in an adjusting ring 22. The ring 22 can be loosened from the hub-part 1 so as to enable the ring to be moved axially away from said hub-part therewith enabling it to be rotated. This rotation is transmitted to the blades 3 via the recesses 21 and the arms 20, so that said blades can be rotated in unison. The ring 22 can be locked to the hub-part 1 in any one of a number of distinct positions that correspond to a plurality of distinct blade setting positions. The construction of this blade setting

adjustment arrangement is described in more detail in the Swedish Patent Application referred to above.

The adapter element 8 is secured to the front hub-half 2 at the forward end of the hub by means of bolts 13. The adapter element 8 comprises an annular outer part 19, an annular inner part 14 and connecting parts that connect the outer part to the inner part. The inner part has a central opening 15 for transit of the drive motor shaft. When the propeller is fitted to the propeller shaft, the shaft extends through the opening 15 and through the hub-half 2 and into the hub-half 1 and there engages splines (not shown) on the inner surface 23 of the hub-part 1.

A circular flange 11 extends forwardly and axially from the outer annular part 19 towards the gearbox and lies against a flange of corresponding dimensions on said gearbox. The diameter of the flange 11 is thus chosen to fit against the flange on the gearbox, and the axial length of the inner part 14 is chosen so that the drive shaft will extend sufficiently for its splines to be located opposite the splines provided on the inner surface of the hub-part 1. A flange 11 of correct diameter and a part 14 of the correct length are obtained by choosing the appropriate adapter element 8 from a series or set of such elements as illustrated in Fig. 2, wherein each element is constructed to suit the output shaft of known existing types of motor.

The adapter element also includes a number of axially penetrating openings 16 located between the outer and the inner rings. These openings are intended to enable motor exhaust gases to pass axially through the hub.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A marine propeller that includes a hub and propeller blades attached to the hub, wherein the propeller includes means for connecting the propeller to a drive source, wherein said connecting means includes drive connecting means for drive connection with a drive source output shaft, and adapter means for adaptation to the drive source, wherein the adapter means includes a separate adapter element which has a hub-connecting side and a housing-connecting side and which can be fastened detachably to the hub by means of fastener devices.

2. A propeller according to claim 1, wherein the housing-adapter element includes an outer part that has a circular flange directed axially on the housing-connecting side and that further includes an inner part which is connected to the outer part and which includes a shaft transit hole coaxial with said flange, and wherein the inner part has an abutment surface on the housing-connection side.

3. A propeller according to claim 2, wherein the housing-adapting element includes at least one axially extending through-penetrating opening through which exhaust gases can pass.

4. A propeller according to any one of claims 1 to 3, wherein the settings of the propeller blades is adjustable in distinct increments and in unison.

5. A propeller system including a marine propeller that includes a hub and propeller blades attached to said hub, wherein the propeller is provided with means for connecting the propeller to a drive source, wherein said connecting means includes drive connecting means for drive connection with a drive source output shaft and adapter means for adaptation to the drive source, wherein the adapter means includes a separate adapter element which has a hub-connecting side and a housing-connecting side and which is fastened to the hub with the aid of fastener devices, wherein the system includes a series of said adapter elements where each adapter element in the series differs from the remaining adapter elements with respect to the housing adaptation side.

6. A system according to claim 5, wherein each housing adaptation element includes an outer part having a circular flange directed axially to the housing-connecting side, and further includes an inner part which is connected to said outer part and which includes a shaft transit hole coaxial with said flange, wherein the inner part on the housing-connecting side has an abutment surface and wherein each housing adaptation element differs from remaining elements in said series with respect to the outer diameter of the flange and/or the axial extension of the centre part.

7. An adapter means for adapting a marine propeller to a housing part of a drive source, wherein the adapter means comprises a separate adapter element which has a hub-connecting side and a housing adaptation side and which is provided with means for fastening said element to a propeller hub.

8. An adapter means according to claim 7, wherein the housing adapter element includes an outer part that has a circular flange directed axially on the housing-connecting side, and further includes an inner part which is connected to the outer part and has a shaft transit hole coaxial with the flange, said inner part having an abutment surface on the housing-connecting side.

9. A set of adapter means for adapting a marine propeller to a housing part of a drive source, wherein said set includes a series of separate adapter elements each having a hub connecting side and a housing-connecting side and capable of being fastened to a propeller hub with the aid of fastener devices, wherein each adapter element in said series differs from the remaining elements in said series with respect to the housing-connecting side.

10. A set according to claim 9, wherein each housing adapter element includes an outer part that has a circular flange directed axially on the housing-connecting side, and further includes an inner part which is connected to said outer part and which has a shaft transit hole coaxial with the flange, wherein said inner part has an abutment surface on the housing-connecting side, and wherein each adapter element differs from the remaining elements in said

series with regard to the outer diameter of the flange and/or the axial extension of said inner part.

11. A method of connecting a marine propeller to a drive source, wherein using a separate adapter element which has a side that is adapted for connection with a drive source housing part, and by fastening the adapter element to the propeller hub and thereafter connecting the propeller and adapter element to the drive source.

12. A method according to claim 11, wherein the adapter element used is one chosen from a series of such elements in dependence of the type of drive source concerned, wherein the elements included in said series differ from one another with respect to the side adapted for co-action with the housing part.

13. A marine propeller substantially as herein described with reference to any of the embodiments illustrated in the accompanying drawings.

14. A propeller system substantially as herein described with reference to any of the embodiments illustrated in the accompanying drawings.

15. An adapter means substantially as herein described with reference to any of the embodiments illustrated in the accompanying drawings.

16. A set of adapter means substantially as herein described with reference to any of the embodiments illustrated in the accompanying drawings.

17. A method for connecting a marine propeller to a drive source substantially as herein described with reference to any of the embodiments illustrated in the accompanying drawings.

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PHILLIPS ORMONDE & FITZPATRICK
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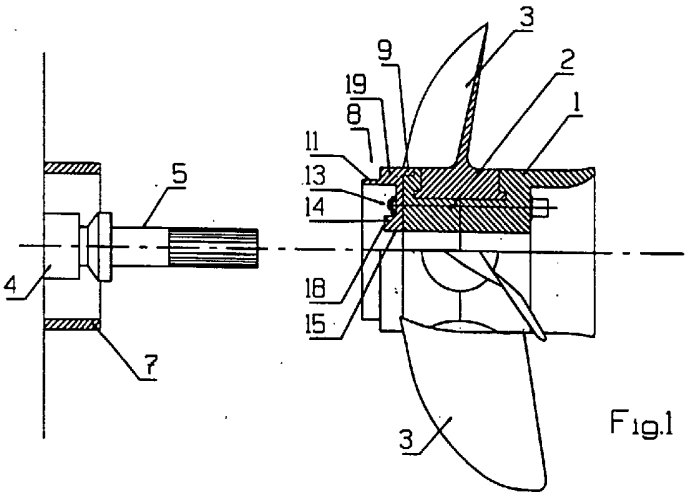

Fig.1

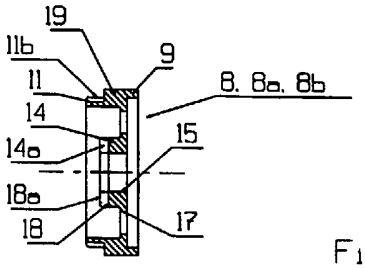

Fig.2

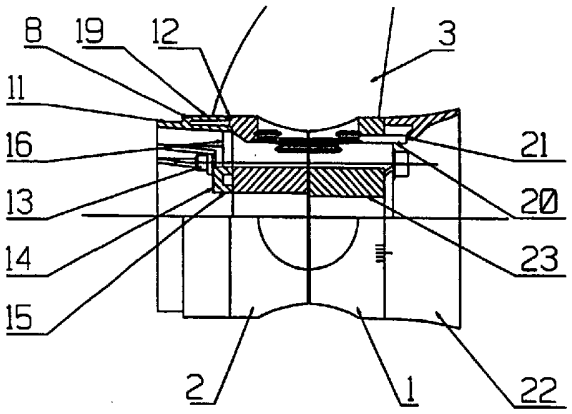

Fig. 3