

Device for reducing the drive power requirement of a ship

FIELD OF APPLICATION

This invention relates to a device for reducing the drive power requirement of a single or multiple propeller ship.

The aim of this invention is to create a device which serves for reducing the drive power requirement of a ship.

This aim is achieved by a device with the characteristics of claim 1.

Aim, solution, advantages

Accordingly, the device according to the invention for reducing the drive power requirement of a single or multiple propeller ship is configured in such a manner that the device which is fixedly installed on the hull in front of the propeller consists of a front nozzle and fins or hydrofoils placed inside the front nozzle.

With such a configured device, it is possible to reduce the drive power requirement of a ship. The possible gain is increasing with an increasing thrust loading factor of the propeller. The device is appropriate in particular for slow full-built ships such as tankers, bulkers and tugboats and even for not very quick ships of all types. The device itself is fixedly installed on the hull in front of the propeller of the ship and consists of the two functional elements front nozzle and fins or hydrofoils.

This being, the working principle of the front nozzle consists in the increase of the propeller velocity in the blower stream in areas with very high co-current and in the reduction of the

propeller velocity in blower stream in areas of low co-current and that of the fins or hydrofoils placed within the front nozzle in producing a pretwist, whereby both functional elements aim at different sources of losses, namely the front nozzle at a reduction of the effective thrust load and the fins or hydrofoils at a reduction of the twist losses in the propeller jet. Due to both effects, the efficiency of the propulsion system is increased.

Further advantageous configurations are the subject of the subclaims.

Thus, the front nozzle is placed with a symmetrical rotation with the upwards offset axle, preferably above the propeller axle, whereby the inner diameter of the front nozzle is maximally 90% of the propeller diameter.

Preferably, four fins or hydrofoils are placed asymmetrically inside the front nozzle and radially to the propeller axle, whereby the fins or hydrofoils connect the hull with the front nozzle and are placed at the rear end of the front nozzle, whereby the vaulted side of the hydrofoil-shaped and also lentiform cross-sectional profile of the fin or of the hydrofoil is orientated upwards on the upwards striking side of the propeller and downwards on the downwards striking side of the propeller. The arrangement of four fins or hydrofoils in the inner space of the front nozzle does not constitute any limitation, all the more since a lower or higher number of fins or hydrofoils can also be provided.

Short description of the drawings

An embodiment for a ship with an upwards starboard rotating propeller of the device according to the invention is represented

on the enclosed drawings.

Fig. 1 shows a starboard side view of the device according to the invention consisting of a front nozzle with fins or hydrofoils placed in the inner space thereof.

Fig. 2 shows a rear view of the device, whereby the fins or hydrofoils are represented being not adjusted.

Fig. 4 shows an enlarged cross-section through the profile of a fin or of an hydrofoil.

Fig. 4 shows a side view of the stern contour.

Fig. 5 shows a body plan of the after-body.

Fig. 6 shows the front nozzle with fins or hydrofoils placed in the inner space thereof according to fig. 1 with position arrangements of the fins.

Detailed description of the invention and best way for carrying out the invention

According to fig. 1, the device 10 for reducing the drive power requirement of a ship consists in that a front nozzle 20 with a cylindrical configuration or a differently configured shape or cross-sectional form is provided directly in front of the propeller (which is not represented on the drawing) of a ship 100, this nozzle being fixedly installed on the hull. Fins or hydrofoils 30 are placed in the inner space 20a of the front nozzle 20. The front nozzle 20 is placed on the hull so as to have a symmetrical rotation with an upwards offset axle 21.

For the embodiment represented in fig. 2, four fins or hydrofoils 30a, 30b, 30c, 30d are placed star-shaped with different fin or hydrofoil lengths in the inner space 20a of the front nozzle 20. These four fins or hydrofoils are placed asymmetrically inside the front nozzle and radially to the propeller axle PA. This being, the fins or hydrofoils 30a, 30b, 30c, 30d connect the front nozzle 20 with the hull 100 and are placed at the rear end of the front nozzle 20 which is turned to the propeller, whereby the vaulted side 32 of the hydrofoil-shaped or lentiform cross-sectional profile 31 of the fins or hydrofoils 30, 30a, 30b, 30c, 30c is orientated upwards on the aport side of the ship or on the upwards striking side of the propeller and downwards on the starboard side of the ship or on the downwards striking side of the propeller. Moreover, the fins or hydrofoils 30a, 30b, 30c, 30d are orientated at the front upwards on the aport side and at the front downwards on the starboard side (fig. 2 and 3). The sense of rotation of the propeller is in direction of the arrow X (fig. 1). The fins or hydrofoils 30 or 30a, 30b, 30c, 30d placed in the inner space 20a of the front nozzle 20 are adjustable in their angular positions and lockable in the angular positions which have been set.

According to an embodiment with a propeller rotating upwards to the starboard side, the fins or hydrofoils 30a, 30b, 30c, 30d take on the following preferred radial angular positions and initial angular positions:

		<u>Fin angle</u>	<u>Angle of attack</u>
Aport (BB)	lower fin (30a)	247,5°	14°
Aport (BB)	middle fin (30b)	292,5°	12°
Aport (BB)	upper fin (30c)	337,5°	8°
Starboard (SB)	fin (30d)	90,0°	10°

namely for a fin angle definition: seen from behind: 12 o' clock = 0° , increasing clockwise, whereby the fin angles and the angles of attack can differ from the indicated values.

According to the embodiment represented in fig. 1, 3 and 6, the fins or hydrofoils have a lentiform cross-sectional profile 31 with a vaulted side wall 32 and with a straight base surface 33. The arrangement and the position, for example, of both fins 30 to the propeller axle PA is such that the upper fin is with its base surface 33 approximately parallel to the propeller axle PA, whereas the lower fin takes on a position for which its base surface 33 is in an angle α of at least 5° , preferably of 10° to the propeller axle PA. Other angular positions of the fins are possible. On the whole, the fins 30a, 30b, 30c, 30d have preferably the positions shown in fig. 2.

The front nozzle 20 according to fig. 1 and 6 is formed by a moulded body 25 with a cross-sectional profile 26 with an outside situated wall section 2a which is oblique with an angle to the propeller axle PA and with an inside situated straight wall section which is parallel to the propeller axle PA, this wall section having an arc-shaped wall section 26c in the area turned away from the propeller, this wall section being converted into the outside wall section 26a. The outside situated wall section 26a can also be configured arc-shaped. The propeller side is indicated by PS in fig. 6.

The device according to the invention is characterized by the characteristics indicated in the claims and by the configurations represented in the fig. 1 to 6 of the drawings.

List of reference numerals

10	Device
20	Front nozzle
20a	Inner space
21	Axle of the front nozzle
25	Moulded body
26	Cross-sectional profile
26a	Wall section
26a	Wall section
26b	Wall section
26c	Wall section
30	Fin/hydrofoil
30a	Fin/hydrofoil
30b	Fin/hydrofoil
30c	Fin/hydrofoil
30d	Fin/hydrofoil
31	Cross-sectional profile
32	Vaulted side wall
33	Base surface
100	Hull
BB	Aport
SB	Starboard
PA	Propeller axle
PS	Propeller side
X	Sense of rotation of the propeller
α	Angle

Claims

1. A ship with at least one propeller arranged on a propeller axis (PA) and with a device (10) for reducing the drive power required by the ship, which is rigidly secured to the ship body in front of the propeller, and consists of a preliminary nozzle (20) with fins or hydrofoils (30; 30a, 30b, 30c, 30d) arranged inside the preliminary nozzle, wherein the preliminary nozzle (20) exhibits an inner diameter smaller than 90% of the diameter of the propeller, characterized in that the inner diameter of the preliminary nozzle (20) is arranged rotationally symmetrical with an upwardly shifted axis (21) lying above the propeller axis (PA).
2. The ship according to claim 1, characterized in that four fins or hydrofoils (30; 30a, 30b, 30c, 30d) are arranged non-symmetrically in the interior (20a) of the preliminary nozzle (20) and radially to the propeller axis (PA), wherein the fins or hydrofoils join the ship body with the preliminary nozzle (20), and are arranged at the rear end of the preliminary nozzle (20), wherein the curved side (32) of the lens-shaped cross sectional profile (31) of the fin or hydrofoil (30; 30a, 30b, 30c, 30d) is directed toward the top on the upwardly running side of the propeller, and toward the bottom on the downwardly running side of the propeller.
3. The ship according to one of the preceding claims 1 to 2, characterized in that the fins or hydrofoils (30; 30a, 30b, 30c, 30d) assume the following angular settings and initial angular settings:

		Fin angle	Incidence angle
Port (BB)	Lower fin (30a)	247,5°	14°
Port (BB)	Middle fin (30b)	292,5°	12°
Port (BB)	Upper fin (30c)	337,5°	8°
Starboard (SB)	Fin (30d)	90,0°	10°

4. The ship according to one of the preceding claims 1 to 3, characterized in that the fins or hydrofoils (30) arranged in the interior (20a) of the preliminary nozzle (20) have variable or adjustable angular settings
5. Application of a device (10) for reducing the drive power required by a ship, in particular for slow, broad-built ships, such as tankers, bulk cargo ships and tugboats, and also for rather slow ships of all types, with the features in claims 1 to 4, for improving the flow against the propeller, as well as generating a preliminary rotation.