

NOZZLE PROPELLER FOR SHIPS

The invention relates to a nozzle propeller for ships, in particular for offshore craft, tugs and inland navigation vessels, or ships having a fixed, non-rotatable nozzle enclosing the propeller and a fin system. Nozzle propellers of this type further comprise a fixed propeller encased by the nozzle, also called "screw propeller" in everyday language.

Drive units of watercraft, in particular of ships, which comprise a propeller surrounded or encased by a nozzle configured as a nozzle ring are designated as nozzle propellers. Nozzle rings of this type are also called "Kort nozzles". The propeller disposed in the interior of the nozzle is configured to be fixed in this case. In principle, in the prior art there are nozzle propellers in which the nozzle surrounding the propeller is configured to be fixed. In nozzle propellers of this type having a fixed nozzle, an additional manoeuvring arrangement, in particular a rudder, must be provided in the propeller backwash, i.e. behind the nozzle propeller when viewed in the direction of travel of the ship. In addition, nozzle propellers are known in the prior art in which the nozzle is rotatable about the fixed propeller disposed in the interior. Such rotatable nozzle propellers can be used to control the watercraft so that additional manoeuvring systems such as rudders can optionally be omitted.

The present invention relates exclusively to nozzle propellers having a fixed nozzle and not to those having a rotatable nozzle.

The nozzle or the nozzle ring has the function of increasing the thrust of the drive. In this respect, such nozzle propellers are frequently used in tugs, supply ships and the like which must each deliver a high thrust. The nozzle configured as a nozzle ring is in this case normally a conically tapering tube which forms the wall of the nozzle. Due to the tapering of the tube towards the stern of the ship, the nozzle propellers can transfer an

additional thrust to the watercraft without the engine performance needing to be increased. In addition to the propulsion-enhancing properties, pitching during the sea crossing is furthermore reduced by this means with the result that in heavy seas the losses of speed are reduced and the bearing stability can be increased. Since the intrinsic resistance of the nozzle propeller or a Kort nozzle increases approximately quadratically with increasing ship's velocity, their advantages are particularly effective in slow ships which must produce a large propeller thrust (tugs, fishing vessels etc.).

A nozzle propeller for ships is known from US 2,139,594. This system is provided with a so-called Kort nozzle. However, in contrast to the generic nozzle propeller, the Kort nozzle is not fixed but is configured to be pivotable about a propeller by means of a rudder post. In order to increase the rudder action, horizontally and vertically aligned fins are disposed behind the propeller when viewed in the main direction of flow of the Kort nozzle. In order to likewise intensify the rudder action of the rotatable or pivotable Kort nozzle when reversing, two fins are provided in front of the propeller, which fins are attached to the nozzle and project into the nozzle interior, and lie oppositely and in each case on a vertical central axis of the nozzle propeller when seen in a cross-sectional view.

Known from DD 267 383 A3 is a guide device for influencing the afflux in single-screw and multi-screw inland navigation vessels. Disclosed is an arrangement comprising a single, relatively large pre-swirl fin or guide fin located vertically underneath the propeller axis, and two existing propeller bracket arms. An angle of inclination of an inlet edge of the tail surface of at least 20° with respect to the clamping plane is described. In substantial regions of the propeller circular surface in the afflux the single tail surface produces a circumferential component opposite to its direction of rotation as pre-swirl ahead of the propeller, with the result that the propeller

operates energetically more favourably and is more uniformly loaded during its rotation.

It is the object of the invention to provide a nozzle propeller of the type specified initially which, compared to the known nozzle propellers, allows increased velocities or increased tow-rope pulls at the same engine power. It should further be achieved that more water is guided fluidically more favourably onto the entire screw propeller with the result that fuel can be saved at the same engine power.

This object is achieved by the fin system comprising one or a plurality of (pre-swirl) guide fins which are disposed ahead of the propeller in the direction of the propeller flow and in such a manner that more guide fins are disposed on the propeller upturning side of the nozzle propeller than on the propeller downturning side of the nozzle propeller.

The invention is based on the finding that a "pre-swirl" fin system for nozzle propellers, in particular for Kort nozzles, is particularly favourable for increasing the tow-rope pull and specifically in the aforesaid arrangement of the guide fins. As a result of this arrangement of the guide fins of the fin system, an increase in the tow-rope pull by 10% or a power saving of up to 10% is achieved.

The term "propeller upturning side of the nozzle propeller" is understood as that side of the nozzle propeller in which, in a cross-sectional view, the propeller turns from bottom to top when travelling forwards. Accordingly the propeller turns from top to bottom on the propeller downturning side. The propeller upturning and downturning sides are thereby separated by an imaginary, internal vertical central line when seen in a cross-sectional view. In the present context, the guide fins forming the fin system are flow guide surfaces in the sense of stators which are disposed on the nozzle propeller and influence the propeller afflux. The guide fins are normally

disposed fixedly on the nozzle propeller. The arrangement of a guide fin on the propeller upturning side should be understood in such a manner that in a cross-sectional view, the guide fin or at least a substantial part of the guide fin is disposed on the propeller upturning side of the nozzle propeller. The same applies analogously to the downtuning side.

The afflux to the propeller is perturbed by the hull of the ship. Accordingly, a swirl is produced by the guide fins disposed ahead of the propeller which is aligned in such a manner that a smaller twisting of the flow is established behind the propeller in the propeller backwash zone compared to a propeller without forwardly positioned guide fins. Surprisingly it has now been shown that the twisting in the propeller backwash is particularly small if at least one more guide fin is disposed on the propeller upturning side of the nozzle propeller compared with that on the propeller downturning side. Since the fin system according to the present invention comprises one or more guide fins, a minimal fin system arrangement according to the present invention would consist in arranging one guide fin on the propeller upturning side and no guide fins on the propeller downturning side. In this minimal fin system, the one guide fin should be arranged entirely on the propeller upturning side. Guide fins arranged between the propeller upturning and propeller downturning side, i.e. on the vertical central line of the nozzle propeller with regard to its longitudinal axis, are in this case counted according to the invention as either on none of the two sides (propeller upturning and propeller downturning side) or as on both sides. If one guide fin is optionally disposed such that it is not completely disposed on one side but with a predominant partial region on one side, it is ascribed to this side for the purposes of the present invention.

The guide fins or fins should at the same time be distinguished from pure nozzle propeller protective devices such as protective grids or the like which are merely intended to prevent objects entering the nozzle propeller.

Unlike pure protective grids, guide fins or fins are flow guide surfaces which significantly influence the flow.

The guide fins forming the fin system are disposed in the region of the nozzle propeller. Expediently the guide fins are disposed at least partially inside the nozzle of the nozzle propeller.

The invention has the advantage that increased velocities or tow-rope pulls are possible at the same engine power. As a result, an increased efficiency is obtained.

A possible reduction of the required engine power at the same speeds and tow-rope pulls is also relevant. As a result a saving on fuel and purchasing costs of the engine is possible.

In addition, as a result of the generation of pre-swirl by the fin system, a higher overall efficiency of the propeller-nozzle-guide fin system is achieved.

Since more water is guided in a fluidically more favourable manner to the entire screw propeller or the entire propeller, up to 10% fuel can be saved with the same engine power.

The invention can also be used in shallow water and additionally offers protection of the propeller from damage by foreign bodies.

Alternatively or additionally to the distribution of the guide fins on the propeller upturning and propeller downturning side, the guide fins of the fin system can also be arranged in such a manner that said guide fins form an asymmetric fin system. In this case, an asymmetry relates to an angular arrangement of the guide fins directed in relation to the propeller shaft axis and/or their dimensioning such as profile length, profile cross-

section or another quantity. In the case of asymmetry in relation to the angular arrangement directed onto the propeller shaft axis, a non-uniform angular division is established between the axes of the individual guide fins when viewed in the radial direction from the propeller axis. An asymmetric arrangement can also exist if the vertical central axis of the nozzle propeller is taken as the axis of symmetry in a cross-sectional view of the nozzle propeller. This axis of symmetry at the same time separates the upturning and downturning side of the nozzle propeller. This results in a particularly effective fin system in a manner which is easy to configure and arrange. In most cases a fin system in which more guide fins are disposed on the propeller upturning side than on the propeller downturning side will also be asymmetric.

In an advantageous further development of the invention it is provided that each guide fin forms a stator which is fastened at one end thereof on an inner wall surface of the nozzle and with the other end thereof on the stern tube or the shaft bearing. The shaft bearing is configured for mounting the propeller shaft and is expediently disposed in the vicinity of the propeller. The shaft bearing can be formed, for example by a so-called "stern tube". In the present embodiment the guide fins are each configured as a fixed stator which lies between shaft bearing and nozzle inner wall. The connection with the shaft bearing or with the nozzle can be made by any suitable joining technique known from the prior art, in particular by means of welding. Alternatively or additionally to the fastening on the nozzle inner wall, a fastening can also be provided on the nozzle front side.

It is furthermore advantageous if the guide fins are disposed entirely in an interior space of the nozzle propeller or the nozzle. In principle, a section of the guide fin can be disposed outside the interior space of the nozzle. However, experiments conducted by the applicant have shown that in most application situations an arrangement of the guide fins completely inside the space encased by the nozzle is fluidically to be preferred.

As has already been noted, in principle the fin system can comprise a minimum of only one guide fin which is then disposed entirely on the propeller upturning side. Expediently, however, each system should have at least three guide fins. Of these advantageously at least two guide fins are then disposed in the propeller upturning side.

A preferred embodiment of the invention consists in that the fin system has three to seven guide fins, wherein two to four guide fins can be disposed on the propeller upturning side and one to three guide fins can be disposed on the propeller downturning side.

Fluidically it is very favourable if each guide fin has an outwardly curved suction side and a pressure side which is flat over wide areas. This results in a classical uplift profile such as is used in aerofoils of aircraft.

The use of a plurality of guide fins also allows different cross-sectional shapes of the guide fins. By this means the flow inside the nozzle can be further optimised.

It is also advantageous if the guide fins are disposed with a different attack angle to the propeller axis. An optimisation of a pre-swirl is also possible here.

The invention is applicable to single-propeller systems. However, the application in multi-propeller systems is particularly advantageous. Frequently, such multi-propeller systems comprise two adjacently disposed nozzle propellers having an opposite direction of rotation. Accordingly, the fin systems of the two nozzle propellers can be arranged in mirror symmetry to one another.

In a further particularly advantageous embodiment of the invention, propeller bracket arms are provided which are designed so that they are used for producing pre-swirl. A further improvement in propulsion is achieved by this means. Propeller bracket arms are normally configured for holding the stern tube or the nozzle propeller and are firmly connected to the hull. In the present embodiment, at least a partial region of the propeller bracket arm, in particular a partial region such as is disposed inside the nozzle when viewed in the direction of flow, can be configured as guide fin in the sense of the present invention. The remaining partial region of the propeller bracket arm can be configured differently and can also, for example, have a different profile. In principle, however the propeller bracket arm can be profiled to be the same throughout and be provided with the same attack angle in relation to the propeller axis. By this means the structure of the present invention is further simplified since the propeller bracket arms provided anyway for holding the nozzle propeller are used as guide fins.

It is particularly favourable to use the nozzle propeller according to the invention for offshore craft, tugs or inland navigation vessels. In these ships preferably two adjacent nozzles are disposed in the stern area. Nozzle propellers are used predominantly in inland navigation vessels so that the invention is also suitable for these.

Exemplary embodiments of the invention are explained in detail with reference to the drawings, wherein advantageous further developments of the invention and advantages of the same are described. In the figures, schematically:

- Fig. 1 shows a sectional view of a nozzle propeller,
- Fig. 2 shows a multi-propeller arrangement with three guide fins per nozzle propeller,

- Fig. 3 shows a view of an outwardly acting multi-propeller arrangement with seven guide fins per nozzle propeller,
 Fig. 4 shows a sectional view of a guide fin and
 Fig. 5 shows a sectional view of another nozzle propeller with indicated cross-section of a guide fin.

Fig. 1 shows a nozzle propeller 100 for ships, in particular for an inland navigation vessel or a tug. The nozzle propeller 100 is provided with a fin system which will be explained in detail hereinafter, and a fixed nozzle 10, the nozzle being designed as a so-called Kort nozzle to increase the tow-rope pull. A Kort nozzle is known per se, for example from US 2,139,594 and is therefore not explained in detail. The diagram from Fig. 1 shows a sectional view through the nozzle propeller 100 in the longitudinal direction (longitudinal section). For the sake of clarity only the upper half of the nozzle propeller arrangement is shown.

The nozzle propeller 100 comprises a screw or a propeller 12 and is mounted with its propeller shaft 11 on a shaft bearing 13 which is configured as a stern tube. A guide fin 14 is shown in Fig. 1. Said guide fin is designed to produce a pre-swirl at the propeller 12 so that it is designated as a (pre-swirl) guide fin 14 or fin. The designation "guide fin" or "guide surface" is also used for "fin". A designation as "nozzle pre-swirl fin" is also possible. The propeller 12 can also be designated as "screw propeller". The (pre-swirl) guide fins 4 are arranged ahead of the propeller 12 in the direction of flow. The (pre-swirl) guide fin 14 is fastened with its one end 15 on the inner wall surface of the nozzle 10 and with its other end 16 on the shaft bearing 13, as illustrated in Fig. 1.

Fig. 1 also shows how the (pre-swirl) guide fin 14 extends with a first section 14a in an interior space of the nozzle and projects outside the nozzle 10 with a second section 14b. In the longitudinal sectional view of Fig. 1, the guide fin 14 has a substantially vertically running interior edge

which terminates the interior section 14a and an outer edge running obliquely outwards from top to bottom, which terminates the outer section 14b, i.e. located outside the nozzle 10, and comes to abut against the front face of the nozzle 10 in its upper region.

The guide fin 14 is aligned in such a manner that its broad side runs approximately in the propeller flow direction or in the direction of the propeller axis so that substantially the front narrow side of the guide fin 14 is placed in the flow. Depending on what the attack angle of the guide fin 14 with respect to the propeller axis 11 is, the two flat sides of the guide fin 14 are more or less placed in the flow.

Fig. 2 shows a hull 20 of a ship in which a nozzle propeller 100 is provided with a fin system having a plurality of and specifically three (pre-swirl) guide fins 17a, 18a, 19a for a side A of the hull 20. On a side B of the hull 20, three (pre-swirl) guide fins 17b, 18b, 19b are likewise provided in another nozzle propeller 100. The system is designed as a two-propeller system and therefore belongs to the group of multi-propeller systems.

The three guide fins 17a, 18a, 19a are disposed in such a manner that two guide fins 17a, 18a are disposed on the propeller upturning side 28 and one guide fin 19a is disposed on the propeller downturning side 29. Both in the propeller on side A and in that on side B, there is provided an arrow provided with the reference number 33 which indicates the respective direction of rotation of the nozzle propeller or the propeller 12 during forward travel of the ship 20. Both propellers 12 rotate from inside to outside, i.e. the propeller 12 of side A rotates anticlockwise whilst the propeller 12 of side B rotates clockwise. Further, a vertical central axis 34 is indicated in each nozzle propeller 100, which axis runs centrally through the nozzle propeller 100 and divides the nozzle propeller 100 into the propeller upturning side 28 and the propeller downturning side 29. Since the direction of rotation 33 of the two nozzle propellers 100 is opposite, the

propeller upturning sides 28 are each disposed towards the centre whilst the propeller downturning sides 29 are each located on the outside. Accordingly, both the propeller upturning and also the propeller downturning sides 28, 29 are each formed by a half of the nozzle propeller 100. The individual guide fins 17a, 18a, 19a or 17b, 18b, 19b each run from the outer side of the shaft bearing 13 to the inner side or inner wall surface of the nozzle 10. In the diagram shown in Fig. 2, respectively two guide fins are disposed in each nozzle propeller 100 in such a manner that they are completely disposed in the propeller upturning side 28. Likewise, the third guide fin is in each case completely disposed in the propeller downturning side 29. This arrangement of the guide fins 17a, 18a, 19a or 17b, 18b, 19b results in a favoured production of swirl in the propeller preflow which in turn leads to little twisting of the propeller backwash. The guide fins 17a, 18a, 19a or 17b, 18b, 19b are arranged in such a manner that their narrow sides can be seen in the cross-sectional view of Fig. 2, i.e. that their broad sides are aligned substantially in the propeller flow direction, i.e. in the longitudinal direction of the nozzle propeller. All the guide fins shown (17a, 18a, 19a, 17b, 18b, 19b) are approximately the same length.

The (pre-swirl) guide fins 17a, 18a, 19a or 17b, 18b, 19b, i.e. both those of side A and those of side B, are furthermore arranged in such a manner that they form an asymmetric fin system. The asymmetry is obtained through the arrangement of an unequal number of guide fins on the propeller upturning side 28 and the propeller downturning side 29 when the vertical central axis 34 is used as the axis of symmetry. Furthermore, the angular division between the guide fins 17a to 19a and 17b to 19b is unequal. Thus, for example, in the nozzle propeller 100 on side A the angle between the guide fins 17a and 18a in relation to their point of intersection in the propeller axis is significantly smaller than the angle between the guide fins 17a and 19a and 18a and 19b. A similar situation obtains in the nozzle propeller 100 of side B.

Fig. 3 shows another example of a two-propeller system with seven guide fins 21 to 28, wherein for the sake of simplicity these are only provided with reference numbers on side A. The structure of the nozzle propeller 100 of side B behaves accordingly to that of side A. The two guide fins 21, 22 are disposed on the propeller downturning side whilst the three guide fins 24, 25, 27 are disposed on the propeller upturning side. The guide fins 23, 26 are furthermore aligned substantially along the vertical central axis 34, i.e. the guide fin 26 runs from the shaft bearing 13 vertically upwards as far as the nozzle wall and the guide fin 23 runs from the shaft bearing 13 vertically downwards as far as the nozzle wall. Accordingly, respectively one of the two fins 23, 26 is assigned to the propeller upturning side 28 and one to the propeller downturning side 29 so that a total of four guide fins are disposed on the propeller upturning side 28 and a total of three guide fins are disposed on the propeller downturning side 29. In principle, the guide fins 23, 26 could also be assigned to none of the two sides so that three guide fins are disposed on the propeller upturning side 28 and two on the propeller downturning side 29. The only important thing here is that in each case at least one more guide fin is disposed on the propeller upturning side 28. The guide fins 26, 27 additionally take on the function as propeller bracket arms which connect the shaft bearing 13 to the hull 20. Outside the nozzle 10 the propeller bracket arms 26, 27 are not necessarily provided with a guide fin profile. Inside the nozzle 10 however the guide fin profile is formed over the entire length. It can be identified in Figs. 2 and 3 that all the guide fins are each disposed ahead of the propeller 12 in the direction of flow.

The guide fins 14, 17a, 18a, 19a or 17b, 18b, 19b, 21 to 24 and 26, 27 shown in Figs. 1 to 3 can have different cross-sectional profiles.

Each pre-swirl guide fin usually has different attack angles to the propeller longitudinal axis.

The systems described operate according to the principle that in substantial regions of the propeller circular area in the afflux a circumferential component is produced as pre-swirl ahead of the propeller in the direction opposite to its direction of rotation with the result that the propeller operates energetically more favourable and is approached more uniformly during its rotation.

The system is not restricted to the examples shown so that another system for generating pre-swirl ahead of fixed nozzles of tugs and offshore vessels to increase the tow-rope pull and the speed is also possible.

It is also possible to combine one feature of an example which has been shown or described with another feature of another example which has been shown or described. This applies in particular to an arrangement of the propeller bracket arms according to Fig. 3.

Asymmetric can mean that in the case of three fins, these are not arranged in a uniform angular division of 120° . In the case of four fins the angular division deviates from 90° and so on.

Fig. 4 shows a cross-sectional view of an example of a guide fin 32 which can be used for a fin system in a nozzle propeller according to the invention. The fin 32 has a curved suction side 32a arranged at the top in the drawing of Fig. 4 and an oppositely disposed, substantially flat pressure side 32b. The rounded face 32a would be placed in the flow in an installed state in the nozzle propeller, i.e. it would be disposed upstream whilst the approximately pointed face 32d would be disposed downstream of the propeller.

Fig. 5 shows a sectional view of another exemplary embodiment of a nozzle propeller which substantially corresponds to the embodiment

shown in Fig. 1. Unlike the illustration in Fig. 1, the guide fin 14 in the exemplary embodiment in Fig. 5 is configured in such a manner that it is disposed completely in the space encased by the nozzle 10 or the nozzle ring or in the interior space of the nozzle 10 and has no section projecting out from the nozzle 10 or protruding beyond this. In this respect the front and rear edge of the guide fin 14 in the side view of Fig. 5 are arranged parallel to one another, the front edge terminating approximately flush with the front edge of the nozzle 10. Furthermore, Fig. 5 shows schematically a cross-sectional view of another guide fin 14a which likewise lies inside the interior space of the nozzle 10 and in the diagram of Fig. 5 is intersected by the propeller shaft longitudinal axis 18. It can be seen that the cross-sectional profile of the guide fin 14a is located obliquely to the propeller shaft axis. In order to illustrate this circumstance, the cross-sectional profile of the guide fin 14a is again shown separately on the right of the nozzle propeller 100 and specifically in the same position with respect to the propeller shaft axis 18. Furthermore, a central line 19 which intersects the propeller shaft axis at an attack angle α is passed through the cross-sectional profile of the guide fin 14a shown separately. In a preferred embodiment of the invention, these attack angles α vary for the different guide fins of a nozzle propeller 100 so that the optimal attack angle α can be set according to the respective position of the guide fin.

Reference list

100	Nozzle propeller
10	Nozzle
11	Propeller shaft
12	Propeller
13	Shaft bearing
14, 14a	Pre-swirl guide fin
15	Outer end of pre-swirl guide fin
16	Inner end of pre-swirl guide fin
17a, 18a, 19a	Pre-swirl guide fins on side A
17b, 18b, 19b	Pre-swirl guide fins on side B
18	Propeller shaft axis
19	Guide fin central line
20	Hull
21 to 25	Guide fins
26	First propeller bracket arm
27	Second propeller bracket arm
28	Propeller upturning side
29	Propeller downturning side
30	Guide fin
32a	Suction side
32b	Pressure side
32c	Upstream face
32d	Downstream face
33	Direction of rotation
34	Vertical central axis

CLAIMS

1. A nozzle propeller for watercraft (100), in particular for offshore craft, tugs and inland navigation vessels, comprising a fin system, a fixed nozzle (10) and a propeller (12), wherein the propeller (12) is disposed inside the nozzle (10), wherein the fin system comprises one or more guide fins (14, 17, 18 19, 21, 22, 23, 24, 25, 26, 27) which are disposed in the flow direction ahead of the propeller (12), and wherein the guide fins (14, 17, 18 19, 21, 22, 23, 24, 25, 26, 27) are disposed in such a manner that more guide fins (14, 17, 18 19, 21, 22, 23, 24, 25, 26, 27) are disposed on the propeller upturning side (28) of the nozzle propeller (100) than on the propeller downturning side (29) of the nozzle propeller (100) and/or wherein the guide fins (14, 17, 18 19, 21, 22, 23, 24, 25, 26, 27) are disposed in such a manner that said guide fins form an asymmetric fin system.
2. The nozzle propeller according to claim 1, characterised in that each guide fin (14, 17, 18 19, 21, 22, 23, 24, 25, 26, 27) forms a stator which is fastened at one end thereof on an inner wall surface of the nozzle (10) and with the other end thereof on a shaft bearing (13), in particular a stern tube, which is configured for mounting a propeller shaft (11) of the propeller (12).
3. The nozzle propeller according to claim 2, characterised in that the guide fins (14, 17, 18 19, 21, 22, 23, 24, 25, 26, 27) are disposed entirely in an interior space of the nozzle (10).
4. The nozzle propeller according to any one of the preceding claims, characterised in that the nozzle propeller (100) comprises at least three, preferably three to seven, guide fins (17, 18, 19).

5. The nozzle propeller according to claim 4, characterised in that two to four guide fins (14, 17, 18 19, 21, 22, 23, 24, 25, 26, 27) are disposed on the propeller upturning side (29) and one to three guide fins are disposed on the propeller downturning side (29).
6. The nozzle propeller according to any one of the preceding claims, characterised in that the fin system comprises an odd number of guide fins (14, 17, 18 19, 21, 22, 23, 24, 25, 26, 27).
7. The nozzle propeller according to any one of the preceding claims, characterised in that the propeller (100) comprises three guide fins (17, 18, 19), wherein a first and a second guide fin (17, 18) are disposed at an angle of 50° to 110° , preferably 60° to 100° , particularly preferably 70° to 90° , with respect to one another and the first and the second guide fin (17, 18) each have an angular distance of 125° to 155° , preferably 130° to 150° , particularly preferably 135° - 145° , to a third guide fin (19).
8. The nozzle propeller according to any one of claims 1 to 6, characterised in that the nozzle propeller (100) comprises four guide fins (21, 22, 23, 24) which are all disposed within an angular range of about 180° , in particular all on the propeller upturning side (28) of the nozzle propeller (100).
9. The nozzle propeller according to any one of the preceding claims, characterised in that each guide fin (14, 17, 18 19, 21, 22, 23, 24, 25, 26, 27) has an outwardly curved, in particular circular-arc-shaped, suction side (30) and a substantially flat pressure side (31).
10. The nozzle propeller according to any one of the preceding claims, characterised in that the guide fins (14, 17, 18 19, 21, 22, 23, 24, 25, 26, 27) have different cross-sectional shapes.

11. The nozzle propeller according to any one of the preceding claims, characterised in that the guide fins (14, 17, 18 19, 21, 22, 23, 24, 25, 26, 27) are disposed at different attack angles (α) radially to the propeller axis.
12. The nozzle propeller according to any one of the preceding claims, characterised by a design as a multi-propeller system.
13. The nozzle propeller according to any one of the preceding claims, characterised in that the nozzle (10) is designed as a Kort nozzle.
14. The nozzle propeller according to any one of the preceding claims, characterised in that one or more propeller bracket arms (26, 27) are provided of which at least respectively one partial region is configured as a guide fin.
15. A watercraft, in particular offshore craft, tug or inland navigation vessel, having one or more nozzle propellers according to any one of the preceding claims.