Title: Tugboat having azimuthal propelling units

The invention relates to a tugboat having azimuthal propelling units.

Within the framework of the present invention, by the expression "azimuthal propelling unit" is meant a propelling unit whose propelling direction in horizontal direction can be varied through 360°. Such azimuthal propelling units are already known per se, for instance in the form of a nozzle having a propeller arranged therein.

Specific requirements are imposed on a tugboat with regard to thrust and maneuverability. For instance, it is desired that a tugboat cannot only produce hauling power in forward direction, but also in rearward direction, and even in lateral direction, although the hauling power producible in lateral direction will be less than the hauling power producible in longitudinal direction.

For instance from the article "Schottel tugs" in Small Ships, Vol.99, No.1204, December 1976, page 95, it is already known to fit a tugboat with azimuthal propelling units because of the maneuverability provided thereby. Such tugboats, also known by the name of "tractor tug", have two azimuthal propelling units which are juxtaposed in transverse direction and, viewed in the longitudinal direction of the tugboat, in a central position. However, some drawbacks are attached to this. For instance, it is not properly possible to continue using the tugboat if one of the propelling units has been damaged.

From WO1997020730 a tug boat is known having three azimuthal propelling units. Two azimuthal propelling units are provided at a first longitudinal position, on opposite sides of a mid sectional plane of the tugboat. A third azimuthal propelling unit is positioned at a longitudinal position different from the longitudinal positions of said two azimuthal propelling units. In this known tugboat, which is known in the field as Rotor

tug®, each propelling unit has a propeller shaft and a main shaft. The propeller can be rotated around the main shaft over at least 360 degrees and the main shafts extend parallel to each other, in a vertical direction when the tug boat is level.

For tug boats, especially for use in harbors and waterways with draft limitations and/or harbors and waterways featuring tug pens with draft restrictions, it is important to provide sufficient towing force, for pulling and/or pushing assisted vessels. There is therefore a desire to alternative tug boats having optimal power and draft, while remaining agile and reliable.

Generally, the object of the invention is to provide a tugboat which, in respect of the above-mentioned aspects, performs better than the tugs known thus far.

An object of the invention is to provide a tugboat which can produce more power than the rotor tug type tugs known thus far, without the draft being increased. An object of the invention is to provide a tugboat which can produce similar power as the rotor tug type tugs known thus far, with the draft being decreased. In known tugs, an increase of the power producible can be realized by using two stronger propelling units, but a consequence thereof is that the dimensions of the propelling units are increased as well, which has an adverse effect on the draft of the ship.

In order to realize the above objectives, a tugboat according to the present invention may have three azimuthal propelling units viewed from the top, lie in a triangular pattern, wherein of at least the main axis of two such propelling units on opposite sides of a mid sectional plane of the tug boat extend at an angle relative to a vertical line when the tug boat is in a level position. Such angle preferably is formed by or includes an angle with the mid sectional plane of the tug boat. Such angle may be formed by or include an angle in a plane parallel to said mid sectional plane.

Thus, it is possible to produce a greater thrust which is distributed over the tugboat in a better manner and/or a similar thrust with a reduced draft. In comparison with the known rotor tugs for example the same thrust can be obtained with similar propelling units, but with a smaller draft, or an increased thrust can be obtained with the same draft using larger propelling units. Moreover in embodiments an improved towing behavior can be obtained by the improved arrangement of the thrusters in relation to the towing points.

These and other aspects, characteristics and advantages of the present invention will be specified by the following description of a preferred embodiment of a tugboat according to the invention, with reference to the accompanying drawings, wherein:

Fig. 1 schematically shows a side view of a tug boat according to the prior art;

Fig. 2 schematically shows an azimuthal propelling unit;

Fig 3 schematically shows in top plan view a tugboat according to the present invention, to illustrate the positions of the three propelling units;

Fig. 4 is a schematic longitudinal section taken on the line II-II in Fig. 3;

Fig. 5 is a schematic cross section taken on the line V-V in Fig. 3

Fig. 5A shows in a view according to fig. 5 part of a tug boat with two juxtaposed propelling units with sideways thrust, showing their main direction of thrust and general wake;

Fig. 6 shows in front view a tugboat according to the prior art;

Fig. 7 shows in front view a tugboat according to the present invention;

Fig. 8 shows in side view a tugboat according to fig 7 in a first embodiment;

Fig. 9 shows in side view a tug boat according to fig. 7 in a second embodiment;

Fig. 10 shows in side view a tug boat according to fig. 7 in a third embodiment; and

Fig. 11 shows in side view a tug boat according to fig. 7 in a fourth embodiment.

Fig. 1 schematically shows in side view a tugboat 1. Hereinafter, it is assumed that the tugboat 1 is afloat in approximately even keel, or – zero trim condition, and the expression 'horizontal' and 'vertical' are meant relative to the water surface. Fig 3 schematically shows the contour of a tug boat 1 seen from above, showing the position of propelling units 10, 20, 30. They are shown as positioned at the corners of a triangle, by way of example. A tug boat according to the disclosure can for example be but is not limited to a tug boat designed for harbor assistance to vessels, for near shore assistance to vessels and/or for open water assistance to vessels. Additionally or alternatively a tug boat according to the present disclosure can be a boat for assistance in fire fighting, such as a fire boat, or for other assistance in harbors, near shore, or off-shore such as ice-breaking, anchor-handling, hose-handling, supply, in-field support, dive support, ROV support and/or other offshore support. In this description juxtaposed should, in relation to propelling units as will be described, be understood as meaning at least that at least two units are positioned at opposite sides of an intermediate plane, especially an intermediate vertical plane, extending in a longitudinal direction of the tug boat. Such units can be referred to as juxtaposed propelling units.

Viewed in the transverse direction, the tugboat l is substantially symmetric relative to a vertical main plane of symmetry 2 (II – II in fig. 3), extending in the longitudinal direction of the tugboat 1. The tugboat 1 has a front extreme point 3 located in the main plane of symmetry 2, and a rear extreme point 4 also located in the main plane of symmetry 2. The

horizontal distance between the front and rear extreme points 3 and 4 is indicated as the length L of the tugboat 1. Herein below, horizontal length positions will be indicated as measured relative to the rear extreme point 4.

By reference numeral 5, a vertical plane is indicated in the figures which is perpendicular to the main plane of symmetry 2, and which intersects that main plane of symmetry 2 according to a vertical line precisely halfway the front and rear extreme points 3 and 4. That vertical line M will be referred to as the center of the tugboat 1, and the vertical plane 5 will be referred to as the transverse center plane of the tugboat 1. Herein below, horizontal width positions will be indicated as measured relative to the main plane of symmetry 2.

The body portion of the tugboat 1 located behind the transverse center plane 5 will be referred to as the stern 6 or stern side, and the body portion of the tugboat 1 located before the transverse center plane 5 will be referred to as the bow 7 or bow side.

By a reference sign L_8, the horizontal position is indicated of a towing point 8 provided on the stern 6, i.e. a point intended for securing a towing cable or the like thereto, or for guiding, via that point, a towing cable or the like to a towing winch, or towing hook. The tugboat 1 can have several towing points; for instance, a towing point 8A can be provided on the bow 7 and a towing point 8B can be provided on the stern 6. If the tugboat 1 has several towing points on the bow 7 and/or stern 6, the towing point 8 is meant to be the last point of physical contact between towing line 100 and tugboat 1. Herein a contact point is to be understood as also including a line contact or relatively small area of contact. Similarly the length position of any towing point 8, 8A can be indicated by reference sign L with an indicator, such as 8 or 8A. Towing points 8, 8A can for example comprise a winch 101, such as but not limited to a render recovery winch, for winching a towing line 100. The tug boat can further be provided with a fendering system, for

allowing pushing as well as pulling of a vessel to be assisted, or for operating in close proximity to other vessels and/or structures.

The tugboat 1 comprises three azimuthal propelling units 10, 20 and 30, whose propelling direction in horizontal direction can be varied through 360° relative to the respective main axis 11, 21, 31 associated with the propelling units 10, 20 and 30. Each propelling unit may be driven by a separate driving engine or different propelling units can be driven by the same motor, for example through appropriate gear boxes, or engine-driven generators in combination with electric-driven propelling units, not shown for simplicity's sake. Such azimuthal propelling units are known per se, for instance in the form of a screw, a nozzle having a propeller arranged therein, or a so-called Voith Schneider unit. An example of such propelling unit is shown in fig. 2, by way of example only, not limiting the scope of this disclosure in any way. As the nature and construction of such azimuthal propelling units do not constitute a subject of the present invention, and a skilled person need not have specific knowledge thereof for a proper understanding of the present invention, they will not be further described further than necessary for the disclosure.

As can for example be seen in fig. 2 a propelling unit has a propeller 12 mounted on a propeller shaft 13. The propeller shaft 13 extends at an astute, for example substantially right angle (90 degrees) to a main axis or main shaft 14, traditionally referred to as a vertical axis 11, 21, 31, though in the present invention for at least one of the propelling units 10, 20, 30 the main shaft 14 may extend non-vertical and may enclose an angle relative to the planes 2 and/or 5. The propeller 12 will normally be enclosed by a nozzle 15 extending around it. The propeller shaft 13 is driven by the main shaft 14, and can rotate around the main axis 11, 21, 31 over an angle of 360 degrees or more in order to direct the thrust of the propelling unit 10, 20, 30 in any desired direction. As can be seen in fig. 2 the main shaft 14 extends through a thruster well 17, which can also be referred to as well 17,

which will be fixed in and/or formed by the hull of the tug boat 1, such that connections to the propelling unit 10, 20 , 30, such as to a motor or electrics, controls and the like can be achieved inside said hull 18.. Furthermore it shall be clear that the forces acting on the propelling unit 10, 20, 30, for example by the thrust generated by the propeller 12, or forces between the hull 18 and the propelling unit 10, 20, 30 will have to be transferred to the hull 18 and vice versa through the thruster well 17. This means that the thruster well 17 will have to be sufficiently strong, for example reinforced by ribs, beams, brackets or the like, again requiring space. Thus building the propelling units 10, 20, 30 into a tug boat hull 18 requires space inside the hull 18, limiting the possible arrangements for positioning the propelling units 10, 20, 30 in a tug boat 1 according to the prior art.

Viewed in horizontal direction, the three azimuthal propelling units 10, 20 and 30 can be arranged according to an isosceles triangle, the triangle being placed symmetrically relative to the main plane of symmetry 2. It is preferred that two azimuthal propelling units 10 and 20 be located on one side of the transverse center plane 5, and that the third azimuthal propelling unit 30 be located on the other side of the transverse center plane 5, seen in said longitudinal direction L of the boat 1.

In preferred embodiments illustrated, a first azimuthal propelling unit 10 and a second azimuthal propelling unit 20 may be located below the bow 7, symmetrically on both sides of the transverse center plane 5. By this it is meant that the length position L_{10} of the main shaft 14 of the first azimuthal propelling unit 10 is equal to the length position L_{20} of the main shaft 14 of the second azimuthal propelling unit 20. These positions are greater than 0.5 L, while the width position B10 of the main axis 14 of the first azimuthal propelling unit 10 is equal (but opposite) to the width position B20 of the main axis 14 of the second azimuthal propelling unit 20. As regards the length positions L_{10} and L_{20}, they may be greater than 0.65L and preferably greater than 0.7 L. In combination with geometry of hull 18

this further restricts available space, further limiting possible arrangements. If a towing point is provided on the bow 7, the length position thereof is preferably greater than or equal to L_{10} and L_{20}. If a towing point is provided on the stern 6, the length position thereof is preferably greater than or equal to L_{30}.

The main axis 14 of the third azimuthal propelling unit 30 preferably lies in the main plane of symmetry 2, and has a length position L_{30} smaller than 0.5 , and may be greater than or equal to 0.15 L or less.L_{30} may be smaller than or equal to 0.4 L, for example smaller than or equal to 0.25 . L_{30} may be greater than or equal to L_8 or smaller than L_8 for the towing point 8 at the stern.

The position and especially the length position L or B is defined by the position P in which the main shaft 14 of a propelling unit crosses the hull 18 or an imaginary plane of the hull 18 as a continuation of the hull 18 over the relevant thruster well 17 or opening in which the thruster well 17 is mounted in the hull 18. As will be discussed for at least one of the propelling units 10, 20, 30 in the present invention the main shaft 14 extends non-vertical, such that the lower end 14A of the main shaft is not directly below the said position P, contrary to the tug boat according to the prior art, in which the said lower end 14A of each of the main shafts 14 is indeed directly below said position P since the main shaft 14 of each propelling unit 10, 20, 30 extends vertically, said shafts 14 in the prior art hence extending parallel to each other and parallel to the main planes 2 and 5.

In the present invention for at least one and preferably at least two of the propeller units 10, 20, 30, the main shaft 14 or at least the axis 11, 21 and/or extends non vertical, such that it encloses an angle with a vertical line through the relevant point P. In fig. 5 schematically a vertical cross sectional view is shown through the axis 11, 21 of the main shafts 14 of the first and second propeller units 10, 20. These axis 11, 21 in this

embodiment lie in a plane V- V parallel to the plane 5, as indicated in fig. 3. As can be seen in this view each of the axis 11, 21 includes an angle α with the mid-sectional plane 2, in fig. 5 represented by the vertical line between the two units 10, 20. The angle α can for example be between 1 and 15 degrees, such as for example between 1 and 10 degrees, for example between 2 and 10 degrees, such as but not limited to between 2 and 8 degrees.

Fig. 6 shows in front view the position of especially the first and second propelling units 10, 20 of a tug boat of the prior art, having the main axis 11, 21 extending vertically, parallel to each other. In contract fig. 7 shows a tug boat according to the invention, which is shown as substantially identical to that of fig. 6 but having the main axis 11, 21 of the first and second propeller units 10, 20 angled relative to each other and to the plane 2, as shown in fig. 5. As can be seen the horizontal distance D_{prop} between the centers of the propellers 12 when the propeller shafts 12 extend parallel to each other, perpendicular to the plane V – V, in the prior art tug boat can be smaller than the said distance D_{prop} in a tug boat according to the invention when the distance D_p between the points P where said axis 11 and 21 cross the actual or imaginary surface of the hull 18 is the same. This can have the advantage that the moment that each of the propellers can exert by thrust relative to the center M of the tug boat 1 can exert can be larger, with the same propeller 12 or could be the same with a smaller propeller 12.

In embodiments each propelling unit 10, 20, 30 has a main direction of thrust Dt, preferably directed perpendicular to the main axis 11, 21, 31. The main direction of thrust Dt should be understood as meaning a center line extending from the center of the propeller 12 in a direction parallel to and preferably coinciding with an axis 12A of the propeller shaft 12. This line or main direction of thrust Dt extends as a center line of the substantially cone shaped wake W of water displaced by the relevant propeller. As can be seen in fig. 5A the juxtaposed propelling units 10, 20

can be mounted such that when their main directions of thrust Dt seen in top view are directed in the same direction and in said top view parallel to each other or even coinciding, the main direction of thrust Dt of a first 10 of the two juxtaposed propelling units is directed below the main direction of thrust Dt of the second 20 of the two juxtaposed propelling units 10, 20 or vice versa, depending on the said direction of thrust. Thus they do not interfere or at least to a lesser extend than in the prior art tug boat. Moreover, as can be seen the hull 18 interferes less or not with the wake W of the propellers 12 than in the tug boat according to the prior art.

As can be seen in a comparing of fig. 6 and fig. 7, when using the same size propeller 12 the distance T between the lowest points of the nozzles and the water line WL of the tug boat 1 can be reduced by inclining the axis 11, 21. This can reduce the draft. Or the same distance T can be maintained while a larger propeller 12 can be used, increasing propeller efficiency and power.

As can be seen in fig. 7 the hull 18 can have an inclined surface area 18A at and near the respective points P as discussed. By inclination of the axis 11, 21 of the respective propelling units 10, 20 the nozzle 15 can be brought closer to the said surface, i.e. the distance c between the said area 18A and the nozzle 15 measured at the axis 11, 21 can be shorter than in the prior art, again resulting in a smaller distance T when using the same size propeller 12 or with the same distance T a larger propeller can be used. The nozzle 15 can be brought closer to the hull 18 at least since by inclination of the axis 11, 21 said axis 11, 21 will be closer to or form a normal to said inclined surface area 18A, meaning that during rotation of the propeller 12 with the nozzle 15 around the main shaft 14 or axis 11, 21 the nozzle will stay substantially at the same distance from the hull surface 18A, whereas in the prior art when rotating the propeller and nozzle around said vertical axis, it would run into the hull when rotated towards the center

plane 2 if the same limited distance C were chosen when the propeller is facing to the bow or stern.

By inclination of the axis 11, 21 of the respective propelling units 10, 20 the position of the thruster well 17 of each of the propelling units 10, 20 will be tilted too, allowing a repositioning thereof slightly outward along the surface 18A of the hull 18 when compared to the same hull of the prior art, bringing the propellers 12 even further outward, increasing the distance D_{prop} even further. Moreover, design and construction of the thruster well 17 can be easier and more effective since the angle between the said surface area 18A and the relevant bottom side of the thruster well 17 is reduced.

In embodiments the inclination of the axis 11, 21 of the respective propelling units 10, 20 can have the advantage that they can be placed further from the plane 5 in the tug boat 1, for example closer to the stem or bow 7, at a length position $L10^{+}$, $L20^{+}$, increasing the distance between the center C of the boat and the respective propellers 12 compared to the prior art tug boat, as can be seen in a comparison between figs. 8 and 9, wherein in fig. 8 a side view is shown with the units 10, 20 in a conventional length position L_{10}, L_{20}, which may or may not be according to the invention, and in fig. 9 a side view is given in an embodiment of the invention having the units 10, 20 further forward, at length position L10+, L20+. Thus the moment that can be exerted through the thrust of each propeller 12 relative to said center C can be increased, when using the same propeller or the same moment when using a smaller propeller. Smaller can in this respect be understood as smaller in size and/or in thrust.

As can be seen in the front views of fig. 6 and 7, by bringing the propellers 12 of the first and second units 10, 20 further apart, their wake will interfere less with the propeller 12 of the third unit 30 when they have a thrust straight backward and vice versa. Moreover the wake of the propellers 12 and thus their thrust will be less obstructed by or interfere with the hull 18 of the tug boat 1 due to the inclination of the axis 11, 21.

Fig. 10 shows an alternative embodiment of the present invention, in which the main shafts 14, or at least the main axis 11, 21 of the first and second propeller units 10, 20 are inclined, that is include an angle ß with a vertical plane V – V parallel to the plane 5. In this embodiment the axis 11, 21 are inclined such that the lower ends 14A of the shafts 14 are brought forward relative to the points P. This can in embodiments be combined with the angular position as disclosed here before in relation to i.a. fig. 5 and 7, or seen in front view the axis 11, 21 can be parallel to each other and extend vertical. As can be seen in fig. 10 this can bring the propellers 12 of the units 10, 21 further forward, increasing the moment that can be exerted relative to the center C. Moreover, the distance T can be reduced when using the same size propeller or the same distance T can be maintained as in the prior art tug boat when using a larger propeller 12. Furthermore the nozzle and thus the propeller can be positioned closed to the hull 18. In embodiments the wake of the propellers 12 and thus the thrust may interfere less with the hull 18, increasing efficiency.

Fig. 11 shows a further alternative embodiment, in which the third propelling unit 30 has a main shaft 14 with a main axis 11 extending at an angle γ in the mid sectional plane 2 or a plane parallel to that plane 2, which angle γ can for example be such that the lower end 14A is located behind the relevant point P i.e. behind the upper end 14B of said shaft 14. The angle γ can for example be between 1 and 15 degrees, such as for example between 1 and 10 degrees, for example between 2 and 10 degrees, such as but not limited to between 2 and 8 degrees. In the drawings the angles α, ß and γ may not be to scale and can be represented larger for clarity.

In Fig. 11 both the first and second propelling units 10, 20 and the third propelling unit 30 have main axis 11, 21, 31 which are inclined relative to a vertical plane, seen in side view. It shall be clear that also only the third propelling unit 30 can have such inclination. The inclinations of

the axis 11 and 21 may differ from that of the third axis 31. In embodiments the axis 11, 21 may be inclined in two directions, i.e. angles α, ß may both differ from 0 or 180 degrees and may both for example be between 1 and 15 degrees, such as for example between 1 and 10 degrees, for example between 2 and 10 degrees, such as but not limited to between 2 and 8 degrees, wherein the angles α, ß may be the same or different for the respective axis 11, 21.

The three azimuthal propelling units 10, 20 and 30 can be mounted entirely below the bottom 9 of the tugboat 1. However, it is also possible that the azimuthal propelling units 10, 20 and 30 are partly recessed in the bottom 9 of the tugboat 1, so that the tugboat 1 will have a less great draft. This applies in particular to the third azimuthal propelling unit 30, located at the center of the tugboat l, because, viewed in cross section, the bottom 9 of the tugboat l is generally more or less V-shaped, so that in fact, the lowermost point of the third azimuthal propelling unit 30 may determine the draft of the tugboat l if propellers of the same size are used. When such recesses 9A are used the inclination of the axis 11, 21, 31 may be further beneficial since the thrust of the propellers will be less influenced by the sides and edges of such recess, increasing the effective thrust that can be achieved for these units 10, 20, 30.

In conventional "tractor" tugboats, the propelling units are disposed at equal length positions. A consequence thereof is that when the boat is moved truly transversely to the longitudinal direction, and, moreover, a pulling or pushing force is to be exerted in that direction, a fairly large part of the installed power is lost: this loss can be about 50%, or higher depending on the arrangement and type of the propelling units installed. In conventional tugboats with the screws mounted at the rear of the boat, that loss may even be 70%. Owing to the presence of a third propelling unit 30 at a length position different from that of the other two propelling units, as known in the prior art, the maneuverability in lateral

direction is improved, and the maximally producible pulling or pushing force transverse to the longitudinal direction is increased considerably. By repositioning of the main axis 11, 21 of the two propelling units which are side by side at a same side of the transverse plane 5, the thrust side ways can even further be increased since part of the thrust of a first of the two propelling units 10, 20 which seen in direction of thrust is in front of the second of the two propelling units 20, 10 will pass below said second propelling unit. Whereas that thrust, i.e. the water displaced by the propeller 12 of said second propelling unit will pass below the hull 18 to a greater extend than when the axis 11, 21 would be vertical, further increasing efficiency.

Since the third azimuthal propelling unit 30 is located in the main plane of symmetry 2, it is possible in an easy manner to travel straight on utilizing only one or two propelling units, viz. the third propelling unit 30 or propelling units 10 and 20. This possibility, which can for instance be used when the tugboat 1 travels in even keel or zero trimcondition, provides a saving of fuel and a reduced wear.

The three propelling units can jointly develop a thrust greater than the thrust that can be produced by two propelling units at an equal draft. It is even possible to realize a greater total thrust while the three propelling units are individually chosen to be smaller than the individual propelling units of the conventional tugboat, whereby the draft of the tugboat can be reduced as well.

It will be understood by anyone skilled in the art that changes and modifications of the embodiment described are possible, which fall within the framework of the present invention and within the protective scope of the claims. For instance, incorporation tug boat according to the present invention can be provided with another number of propelling units, for example two or four. It is also possible that one or several, for instance the third one, of the propelling units are retractably mounted, enabling a

propelling unit that is not being used to be retracted to a position within the profile of the bottom of the boat. As a result, the resistance during travelling will be reduced, which means a saving of fuel.

The position of the propelling units can be reversed, i.e. one unit at the front and two units at the rear irrespective of the towing points 8 on bow 7 and stern 6.

The embodiments have been described by way of example only and modifications are possible within the scope of the invention disclosed. The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgement or admission or any form of suggestion that that prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavor to which this specification relates.

Claims

1. A tugboat comprising a total of three azimuthal propelling units of which two azimuthal propelling units of the three azimuthal propelling units are juxtaposed propelling units, wherein each of the juxtaposed propelling units has a first main shaft with a first main axis extending at a first angle relative to a longitudinal main plane of symmetry of the tugboat

2. The tugboat according to claim 1, wherein each first main axis of each first main shaft of the two juxtaposed propelling units has an inclination defined by said first angle of each first main axis mirrored relative to the longitudinal main plane of symmetry of the tugboat.

3. The tugboat according to claim 1 or 2, wherein each first main axis of each first main shaft of the two juxtaposed propelling units is inclined and substantially lies in a plane parallel to a transverse center plane of the tugboat.

4. The tugboat according to any one of the preceding claims, wherein each first main axis of each first main shaft of the two juxtaposed propelling units is inclined relative to a transverse center plane and to the longitudinal main plane of symmetry of the tugboat.

5. The tugboat according to any one of the previous claims, wherein the two juxtaposed azimuthal propelling units have a first length position, and wherein a third azimuthal propelling unit of the at three azimuthal propelling units is at a second length position different from the first length position of said two juxtaposed azimuthal propelling units.

6. The tugboat according to claim 5 , wherein the third azimuthal propelling unit is disposed at the second length position which is located before or is equal to a third length position of a towing point or a rearmost towing point respectively of the tugboat.

7. The tugboat according to claim 5 or 6, wherein the third azimuthal propelling unit has a third main shaft with a third main axis extending at a third angle relative to the longitudinal plane of symmetry, wherein the third angle is between 1 degree and 15 degrees.

8. The tugboat according to any one of the preceding claims, wherein the two juxtaposed propelling units each have the first main shaft with the first main axis extending at, at least one of:

- the first angle relative to the longitudinal main plane of symmetry of the tugboat, wherein the first angle is between 1 degree and 15 degrees.

9. The tugboat according to any preceding claims, wherein each of the three azimuthal propelling unit has a main direction of thrust, wherein the two juxtaposed azimuthal propelling units are mounted such that when the main direction of thrust of the two juxtaposed azimuthal propelling units in a top view are directed in a same direction and substantially intersecting, the main direction of thrust of a first of the two juxtaposed azimuthal propelling azimuthal units is directed below the main direction of thrust of a second of the two juxtaposed propelling units.

10. The tugboat according any one of the preceding claims, wherein at least for the two juxtaposed azimuthal propelling units each main axis of each juxtaposed azimuthal propelling units crosses a hull of the tugboat, seen in a front or a rear view, at substantially right angle.

11. The tugboat according to claim 9, wherein the main direction of thrust is directed perpendicular to each main axis of each of the three azimuthal propelling units.

12. A tugboat comprising a total of three azimuthal propelling units of which two azimuthal propelling units of the three azimuthal propelling units are juxtaposed propelling units, wherein each of the juxtaposed propelling units has a first main shaft with a first main axis extending at a first angle relative to at least one of a longitudinal main plane of symmetry

of the tugboat, wherein the two juxtaposed azimuthal propelling units have a first length position, wherein a third azimuthal propelling unit is at a second length position different from the first length position of said two juxtaposed azimuthal propelling units, and wherein the tugboat has at least one towing point positioned at a third length position, and wherein the third length position is equal to or before the second length position.

13. A tugboat comprising a total of three azimuthal propelling units of which two azimuthal propelling units of the three azimuthal propelling units are juxtaposed propelling units, wherein each of the juxtaposed propelling units has a first main shaft with a first main axis extending at an angle relative to a longitudinal main plane of symmetry of the tugboat, wherein a third propelling unit different from the two juxtaposed propelling units of the three azimuthal propelling units has a second main axis, wherein the two juxtaposed azimuthal propelling units are positioned at a first distance from a stern of the tugboat and the third azimuthal propelling unit is positioned at a second distance from the stern of the tugboat, and wherein the tugboat comprises a towing point which is positioned above the third azimuthal propelling unit, at a position spaced apart from the stern of the tugboat over a distance equal to the second distance.