

TILTING SAIL SYSTEM

DESCRIPTION

5 **Object of the invention**

The present invention relates to a tilting sail system, preferably to a tilting suction sail system for vessels, which can be placed in an operating position and in a tilted position.

10 **Background of the invention**

Sails are used on vessels to propel the vessel using the forces generated by the wind.

15 Traditional sails are made of a flexible material and are attached to a high-altitude mast in order to have the largest possible dimensions to harness the wind's thrust on the sails.

Suction sails are also known, which are rigid and also of great height and, when not in use, can be placed in a tilted position.

20 For example, it is necessary to place these suction sails in this position to comply with height restrictions in ports due to bridges and similar elements.

Without this tilting capability, it would not be possible for a vessel to have these suction sails.

25 Furthermore, it must also be avoided that the vessel's loading and unloading system in a port impacts the suction sails if they are not tilted.

30 Consequently, it is necessary for the suction sails to be able to be placed in a tilted position to avoid these inconveniences.

However, tilting systems for suction sails are usually complex and expensive.

Description of the invention

Therefore, an objective of the present invention is to provide a tilting sail system, which can be placed in an operating position and in a tilted position, allowing the position of the sail to be varied in a simple and safe manner.

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With the tilting sail system of the invention, the aforementioned drawbacks are resolved, presenting other advantages that will be described below.

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The tilting sail system according to the present invention is described in claim 1, and the dependent claims include additional features that are optional.

In particular, the tilting sail system comprises:

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- a base that supports a sail, said base being rotatable between the operating position and the tilted position;
- a support, which supports said base in an articulated manner; and
- a rack attached to the base, which engages with a pinion, the pinion driving the movement of said base from the operating position to the tilted position, or vice versa.

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Preferably, the tilting sail system also comprises a plurality of locking elements that lock the base in the operating position.

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According to a preferred embodiment, each locking element comprises a locking axis that is displaceable between a locking position, in which the locking axis is located inside a hole of the base, and a release position in which the locking axis is located outside the hole of the base.

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Preferably, the tilting sail system according to the present invention also comprises a rotation element located between the base and the sail.

In particular, the tilting sail system according to the present invention provides, among others, the following advantages:

- The time required to tilt the sail is short enough so as not to affect the operation of the vessel and/or the port;
- It guarantees the perfect fixation of the sail in the working position so as not to lose

performance;

- It guarantees that the sail never becomes stuck in an intermediate position, considering completely vertical and completely horizontal as the correct positions;

- Access to the sail is carried out from inside the tilting system;

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- In the event of a power supply failure, the sail is braked in that position and slowly descends to the horizontal position;

- The system is operated in calm waters and withstands inclement weather in either vertical or horizontal positions;

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- In the event of a controlled failure, it allows the movement to be completed, both for raising and lowering the sail, in maintenance mode;

- It allows the tilting system to be operated in calm waters and/or moored in a port;

- It guarantees the fixation of the sail to the vessel without losing the sail's contribution to the vessel.

15 **Brief description of the drawings**

For a better understanding of what has been stated, some drawings are attached in which, schematically and only by way of non-limiting example, a practical case of embodiment is represented.

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Figure 1 is a front elevation view of the lower part of the tilting sail system according to the present invention, in its operating position;

25 Figure 2 is a front elevation view of the lower part of the tilting sail system according to the present invention, in its tilted position; and

Figure 3 is a sectional view of a locking element that locks the sail in its operating position.

30 **Description of a preferred embodiment**

Figures 1 and 2 show the tilting sail system according to the present invention, which comprises a sail (2) that can be placed in an operating position, shown in Figure 1, or in a tilted position, shown in Figure 2.

In the operating position, the sail (2) is in a vertical position relative to the vessel's deck, and in the tilted position, the sail (2) is in a horizontal position relative to the vessel's deck.

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To allow this displacement from the operating position to the tilted position, the tilting sail system according to the present invention comprises a base (1), on which the sail (2) is supported.

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Preferably, a rotation element (11), for example, a bearing, is located between the base (1) and the sail (2).

It should be noted that in the present description and in the claims, "sail" refers to any type of sail or similar, such as a Flettner rotor, a suction sail, a rigid sail, etc.

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This base (1) is supported in an articulated manner at one end by means of a support (3) and is also displaceable between the operating position and the tilted position, i.e., it is rotatable by 90°, as can be seen in Figures 1 and 2, through the use of a rack (4), attached to the base (1), which engages with a pinion (5).

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The pinion (5) can be driven in any suitable manner, for example, by a motor or similar.

In this way, to change the position of the sail (2), the rotation of the pinion (5) is actuated in one direction or the other, rotating the base (1) via the rack (4), as can be seen in Figures 2 and 3.

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The tilting sail system according to the present invention also comprises locking elements (7), for example, pneumatic or hydraulic cylinders, which lock the base (1) in its operating position.

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As can be seen in Figure 3, each locking element (7) comprises a locking axis (8), which is displaceable between a locking position and a release position.

In the locking position, the locking axis (8) is housed inside a hole (9) of the base (1),

shown in Figure 3, while in the release position, the locking axis (8) is located outside said hole (9) of the base (1), allowing the rotation of the same for its placement into the tilted position.

5 In this way, a simple and easy-to-operate suction sail tilting system is achieved, simply by means of the rack (4) and the pinion (5), also using the locking elements (7) as a safety system to prevent the accidental displacement of the sail (2) from the operating position to the tilted position.

10 Although reference has been made to a specific embodiment of the invention, it is obvious to an expert in the field that the described tilting sail system is susceptible to numerous variations and modifications, and that all mentioned details may be replaced by others that are technically equivalent, without departing from the scope of protection defined by the attached claims.

CLAIMS

1. Tilting sail system, comprising a sail (2) which is displaceable between an operating position and a tilted position, characterized in that it comprises:
- 5 - a base (1) supporting the sail (2), said base (1) being rotatable between the operating position and the tilted position;
- a support (3), which supports said base (1) in an articulated manner; and
- a rack (4) attached to the base (1), which engages with a pinion (5), the pinion (5) driving the movement of said base (1) from the operating position to the tilted position,
- 10 or vice versa.
2. Tilting sail system according to claim 1, which also comprises a plurality of locking elements (7) that lock the base (1) in the operating position.
- 15 3. Tilting sail system according to claim 2, in which each locking element (7) comprises a locking axis (8) which is displaceable between a locking position, in which the locking axis (8) is located inside a hole (9) of the base (1), and a release position in which the locking axis (8) is located outside the hole (9) of the base (1).
- 20 4. Tilting sail system according to any one of the preceding claims, in which the sail (2) is a Flettner rotor, a suction sail, or a rigid sail.
5. Tilting sail system according to any one of the preceding claims, which also comprises a rotation element (11) located between the base (1) and the sail (2).