

TILTING SAIL SYSTEM

DESCRIPTION

5 **Object of the invention**

The present invention relates to a tilting sail system, in particular, a tilting suction sail system for vessels, which can be placed in an in-use 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 take advantage of the wind thrust on the sails.

20 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.

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

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

Furthermore, it must also be prevented 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 drawbacks.

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 in-use position and in a tilted position, allowing the position of the sail to be varied in a simple and safe manner.

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

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

In particular, the tilting sail system comprises:

- a base that supports a sail, said base being rotatable between the in-use position and the tilted position;
- a support, which supports said base in an articulated manner;
- a slider movable along the support between the in-use position and the tilted position; and
- a connecting rod that connects the slider to the base.

Advantageously, the tilting sail system may also comprise a plurality of locking elements that lock the base in the in-use position.

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 in the base, and a release position in which the locking axis is located outside the hole in the base.

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;

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- It ensures 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 the interior of the tilting system;

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

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

- 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 while berthed in a port;

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

Brief description of the drawings

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

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

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

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

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 in-use position, shown in Figure 1, or in a

tilted position, shown in Figure 2.

In the in-use 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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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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To allow this displacement from the in-use position to the tilted position, the suction sail 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), such as a bearing, is located between the base (1) and the sail (2).

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This base (1) is supported in an articulated manner at one of its ends by means of a support (3) and is also displaceable between the in-use position and the tilted position, i.e., it is rotatable by 90°, as can be seen in Figures 1 and 2, by means of a slider (4) and a connecting rod (5).

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The slider (4) is connected to the base (1) by means of the connecting rod (5) and is displaceable along the support (3), moving toward and away from the articulated end of the base (1), as can be seen in Figures 1 and 2.

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The movement of the slider (4) can be driven by any suitable means, for example, by a motor, an actuating cylinder, gears, etc.

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

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 5, while in the release position, the locking axis (8) is located outside said hole (9) of the base (1), allowing the rotation of the base for placement in the tilted position.

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

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

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CLAIMS

1. Tilting sail system, comprising a sail (2) that is displaceable between an in-use position and a tilted position, characterized in that it comprises:
 - 5 - a base (1) that supports the sail (2), said base (1) being rotatable between the in-use position and the tilted position;
 - a support (3), which supports said base (1) in an articulated manner;
 - a slider (4) displaceable along the support (3) between the in-use position and the tilted position; and
 - 10 - a connecting rod (5) that connects the slider (4) to the base (1).
2. Tilting sail system according to claim 1, wherein the suction sail also comprises a plurality of locking elements (7) that lock the base (1) in the in-use position.
- 15 3. Tilting sail system according to claim 2, wherein each locking element (7) comprises a locking axis (8) that is displaceable between a locking position, in which the locking axis (8) is located inside a hole (9) in 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, wherein 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).