

TILTABLE SAIL SYSTEM

DESCRIPTION

5 **Object of the invention**

The present invention relates to a tiltable sail system, in particular, a tiltable suction sail system for vessels, which can be placed in a position of use and in a tilted position.

10 **Background of the invention**

In vessels, sails are used 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-height mast, in order to have the maximum possible dimensions to take advantage of the wind's thrust on the sails.

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

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

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

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, it is common for the tilting systems of suction sails to be complex and expensive.

Description of the invention

Therefore, an objective of the present invention is to provide a tiltable sail system, which
5 can be placed in a position of use and in a tilted position, which allows varying the position of the sail in a simple and safe manner.

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

The tiltable 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 tiltable sail system comprises:

- 15 - a base that supports a sail, said base being rotatable between the position of use and the tilted position;
- a support, which supports said base in an articulated manner; and
- a plurality of actuating cylinders that actuate the movement of said base from the position of use to the tilted position, or vice versa.

Preferably, each actuating cylinder comprises a first joint and a second joint at its ends.

Furthermore, the tiltable sail system according to the present invention also preferably comprises a plurality of locking elements that lock the base in the position of use.

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

Preferably, the base comprises stops, which hit the support in the tilted position.

Furthermore, the tiltable sail system according to the present invention also preferably comprises a rotation element, for example, a bearing, located between the base and the

sail.

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

- 5 - The time required to tilt the sail is small enough not to affect the operations 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 remains blocked in an intermediate position, considering as correct positions completely vertical and completely horizontal;
- 10 - Access to the sail is carried out from the interior of the tilting system;
- In case of power supply failure, the sail remains braked in that position and descends slowly to the horizontal position;
- The system is operated in calm waters and withstands inclement weather in either vertical or horizontal positions;
- 15 - In case 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 docked in a port;
- It guarantees the fixation of the sail to the vessel, without losing the contribution of the sail to the vessel.
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Brief description of the drawings

25 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 embodiment is represented.

 Figure 1 is a perspective view of the lower part of the tiltable sail system according to the present invention, in its position of use;

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 Figure 2 is a front elevation view of the lower part of the tiltable sail system according to the present invention, in its position of use;

 Figure 3 is a front elevation view of the lower part of the tiltable sail system according to

the present invention, in its tilted position; and

Figure 4 is a sectional view of a locking element that locks the sail in its position of use.

5 **Description of a preferred embodiment**

Figures 1 to 3 show the tiltable sail system according to the present invention, which comprises a sail (2) that can be placed in a position of use, shown in Figure 2, or in a tilted position, shown in Figure 3.

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In the position of use, 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 position of use to the tilted position, the tiltable 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).

This base (1) is supported in an articulated manner by means of a support (3) and is also displaceable between the position of use and the tilted position, that is, it is rotatable by 90°, as can be seen in Figures 2 and 3, through the use of a plurality of actuating cylinders (4).

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The actuating cylinders (4), which in the embodiment represented in Figure 1 are four, although there could be more or fewer, are located side by side and inclined with respect to the base (1). Furthermore, each actuating cylinder (4) comprises a first joint and a second joint (5, 6) located at each end of the actuating cylinder (4).

In this way, to change the position of the sail (2), the actuating cylinders (4) are actuated,

extending or retracting their rods, as can be seen in Figures 2 and 3.

Furthermore, as can be seen in Figures 1 to 3, the base (1) comprises stops (10), which in the tilted position are in contact with the support (3), as shown in Figure 3.

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

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As can be seen in Figure 4, each locking element (7) comprises a locking shaft (8), which is displaceable between a locking position and a release position.

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In the locking position, the locking shaft (8) is housed inside a hole (9) of the base (1), shown in Figure 5, while in the release position, the locking shaft (8) is located outside said hole (9) of the base (1), allowing the rotation thereof for its placement in the tilted position.

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In this way, a simple and easy-to-actuate tilting system for the suction sail is achieved, simply by means of the actuating cylinders (4), also using the locking elements (7) as a safety system to prevent the accidental displacement of the sail (2) from the position of use to the tilted position.

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

CLAIMS

1. Tilttable sail system, comprising a sail (2) displaceable between a position of use 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 position of use and the tilted position;
- a support (3), which supports said base (1) in an articulated manner; and
- a plurality of actuating cylinders (4) that actuate the movement of said base (1) from the position of use to the tilted position, or vice versa.
- 10 2. Tilttable sail system according to claim 1, in which each actuating cylinder (4) comprises a first joint and a second joint (5, 6) at its ends.
3. Tilttable sail system according to claim 1 or 2, which also comprises a plurality of
- 15 locking elements (7) that lock the base (1) in the position of use.
4. Tilttable sail system according to claim 3, in which each locking element (7) comprises a locking shaft (8) that is displaceable between a locking position, in which the locking shaft (8) is located inside a hole (9) of the base (1), and a release position in which the
- 20 locking shaft (8) is located outside the hole (9) of the base (1).
5. Tilttable sail system according to any one of the preceding claims, in which the base (1) comprises stops (10), which hit the support (3) in the tilted position.
- 25 6. Tilttable 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.
7. Tilttable 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).