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(54) Anti-tilting system for sailing boats, by automatic adjustments on the basis of the heeling moment

(57) The finding consists in a sheet (1) release system for a sailing boat (2) on the basis of the stress measured by suitable transducers (3) on the fixed rigging (shrouds) and/or on the basis of further information, by a suitable station (4) that, received the signals from the transducers, sends a suitable control signal to the actuators (5) on which the sheets have been connected and/or on the rudder, also by the conventional automatic pilot, to bring the boat toward the wind direction.

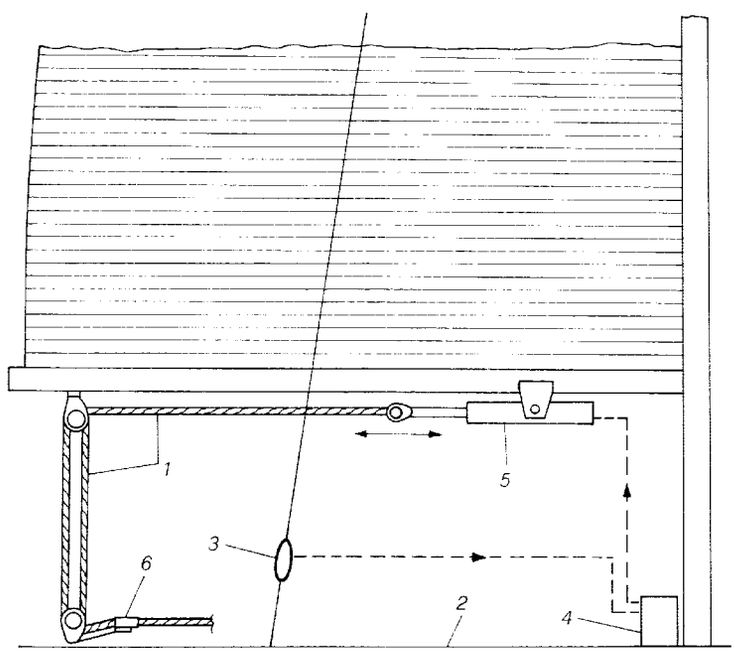

FIG. 2

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Description

INTRODUCTION

As it is well known, the sudden increase of the tilting moment on a sailing boat due to an increase of the wind intensity ("squall") acting on the sails, or to a change of the direction of the wind ("wind stage") can bring to anomalous heeling angles. To the opportune action of the crew is usually remitted the duty of obviating to this occurrence by a suitable slackening of the sheets and/or correction of the course, to bring the boat toward the wind.

However, particularly in case of very difficult weather conditions, all the above, besides requiring a high attention level, with the consequent stress for the crew, cannot be sufficient in view of the amount and rapidity of the occurring of the heeling.

If in case of ballast monohull, it can bring in the most serious cases to the damaging of the equipment (boom entering within the water and its consequent breaking, etc.), in the multi-hulls it can even induce the irreversible tilting of the boat, with the very serious consequences.

SPECIFICATION OF THE INVENTION

In view of the above, and making reference to figures 1 and 2, the present finding aims to solve the problem automating the release action of the sheets 1 of a boat 2 in case of sudden increase of the wind action.

The above object is obtained on the basis of the constant monitoring of the stresses on the shrouds and/or sheets carried out by suitable transducers 3, possibly integrating the signals with further information such as the heeling angle, the wind intensity or any other information that could constitute the element for the individuation of the heeling moment acting on the boat.

These signals suitably processed by a suitable station 4 comprised of electric/electronic circuits or computer provided with dedicated software, will produce the control signal that will be send to the sheet holding system.

Holding systems, such as sheet clamping devices can be provided opening when receiving the control signal, or hydraulic or pneumatic or electro-mechanical pistons 5, upon which the sheets can be transmitted, thus allowing the release of the sheets and the following recovery when the heeling moment acting on the sailing boat reached again the normal value, on the basis of the processed control signal.

In figure 1, it is shown the application on a catamaran (seen from the stern) by the use of a piston 5 on which the boom sheet 1 has been transmitted.

In figure 2, the transmission is shown in detail. It is possible to see that the manoeuvring of the sheet 1 by the crew usually can occur by the spanker hoist with the traditional sheet clamping device 6, while the automatic release would occur by the piston 5, fixed to the boom, to which the end of the sheet is connected.

A similar connection to a (hydraulic, pneumatic or electro-mechanical) piston, for example vertically fixed in front of the mast would occur for the sheets of the forward sail (jib, Genoa).

Simply for illustrative purposes, in figure 3 a possible completely passive hydraulic scheme is shown, i.e. without active elements such as hydraulic pumps, suitable to perform the functions of the present finding for the part concerning the sheets operation.

In fact, until the station does not send the processing electric signal to the coil of the electrovalve 7, said electrovalve is blocked and the piston 6 is consequently blocked in the shown position.

As soon as the electronic station, due to the reaching of the established emergency conditions (excessive stress on the shrouds, excessive heeling angle, or an adequate combination of these and/or analogous parameters), the electronic station generates the electric signal exiting the electrovalve 7, said electrovalve blocks, letting the oil passing toward the accumulator 8, pretensioned and sized in such a way to allow the adequate acceptation of the oil amount present within the cylinder 5, with a stress remarkably lower with respect to the one causing the release of the electrovalve 7.

The motion of the cylinder thus determines the spilling of the sail and therefore (in case the above mentioned emergency conditions do no more occur) said electrovalve closes (lacking the electric signal) and therefore, in case the stress on the sail diminished consequently, the compressed oil within the accumulator (acting as a hydro-pneumatic spring) flows back within the cylinder through the check valve 9, thus restoring the original conditions.

In more sophisticated "active" systems, representing a modification of the present finding, either said recovery phase and said release phase can be carried out using active components (hydraulic pumps) to obtain a faster, wider and different use field of the same apparatus.

A particular embodiment of the finding could integrate the sheet release with the contemporaneous automatic operation of the rudder, for example demanded to a conventional automatic pilot interfaced with the electronic station, to bring the boat toward the wind.

Claims

1. Release automatic system for sheets comprised of:

   a) transducers measuring stresses acting on the shrouds and/or on the sheets, and/or the heeling angle of the boat, and/or the wind intensity, and/or measuring any other value or parameter suitable to define the heeling moment acting on the boat, such as the stress on the trimaran arms;

b) suitable electric and/or electronic circuits, or an electronic computer, generating a control signal on the basis of the above signals;
c) sheet clamping systems allowing their release on the basis of the processed control signal, such as controlled opening sheet clamping devices, sheet transmission on one or more hydraulic, electro-mechanical or pneumatic pistons, lengthening and releasing the sheets following the control signal.

2. System according to claim 1, wherein besides the release action also the sheet recovery action occurs, when the heeling moment acting on boat sails reached again the normal values, said action being typically carried out when the sheet clamping system under point 1 c) is made up of hydraulic piston (s) and suitable hydraulic circuits.

3. System according to claim 1) and 2) wherein the release action occurs in a passive mode on the basis of the pressure within the hydraulic circuit without the processing according to point 1 b).

4. System according to claim 1) and 2), wherein the recovery action occurs without the use of power active systems (such as hydraulic pumps, electric motors, etc.), but employing recovery springs, or pressure accumulators provided within the hydraulic or pneumatic circuit and charged by the stress due to the wind during the preceding release phase.

5. Anti-tilting system which on the basis of the information processed by components of claim 1, points 1a and 1b, process a signal controlling a flexion of the rudder, fro example by suitable interface with the automatic pilot, making the boat directing toward the wind, at the same time or not of the contemporaneous release of the sheet as described in the preceding claims.

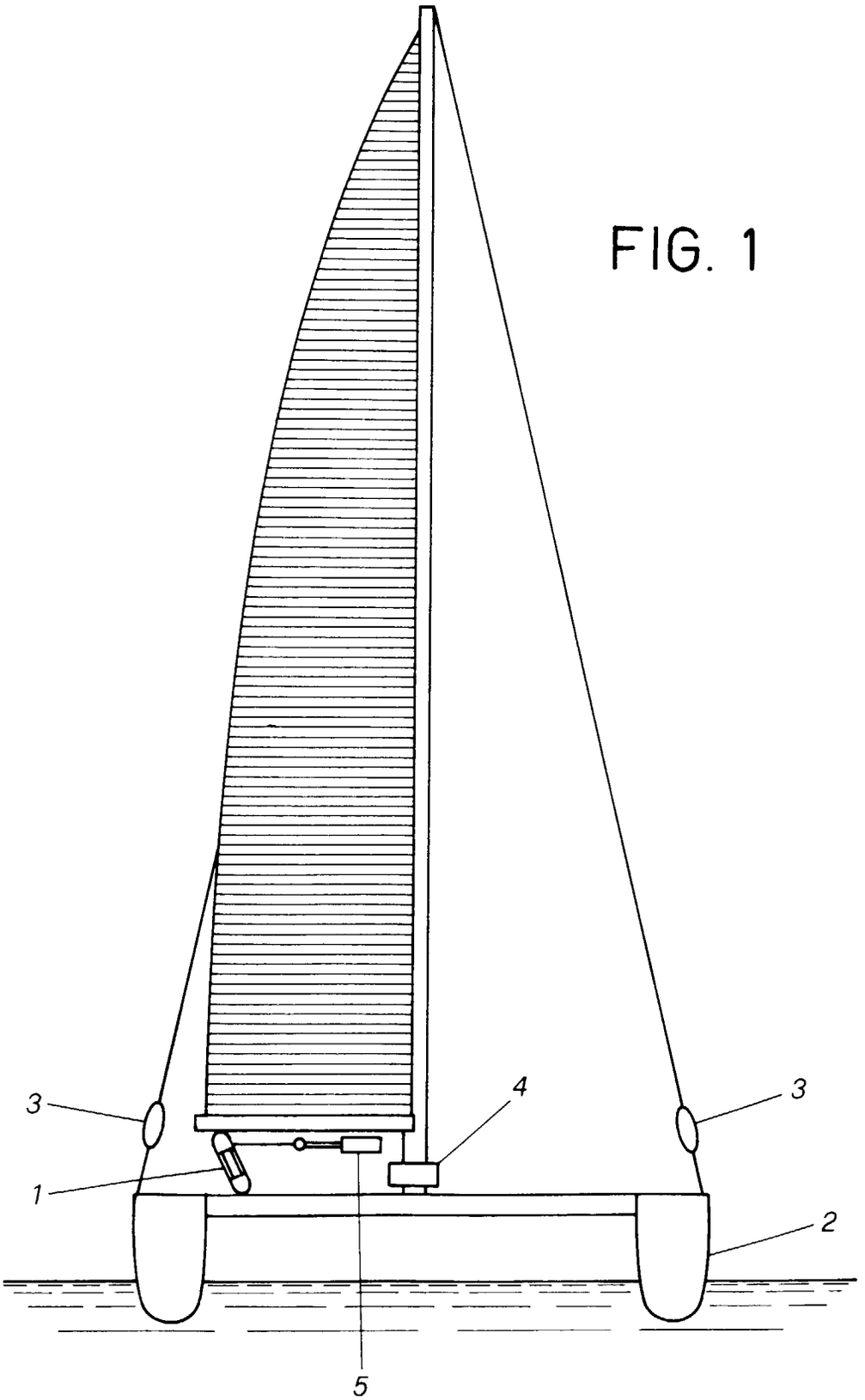

FIG. 1

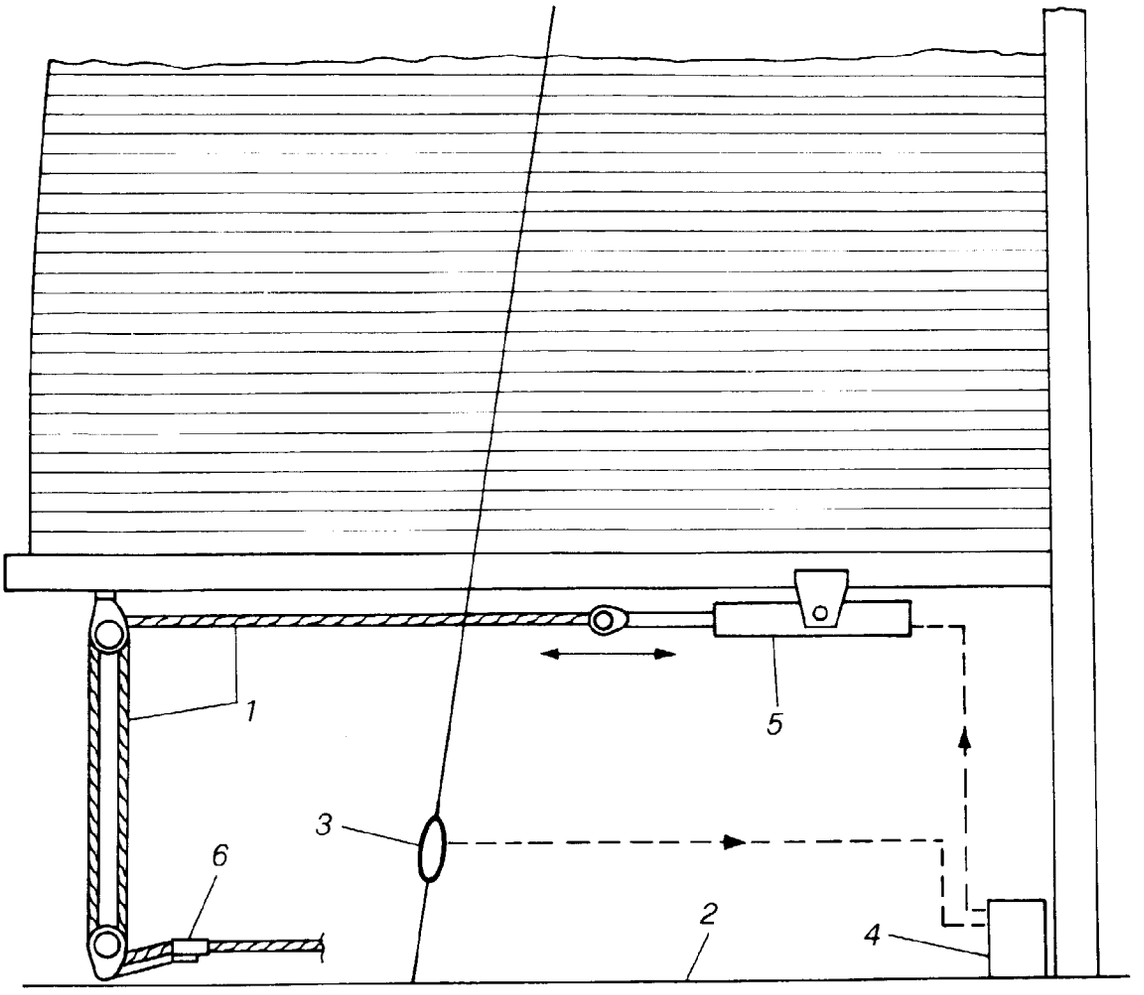

FIG. 2

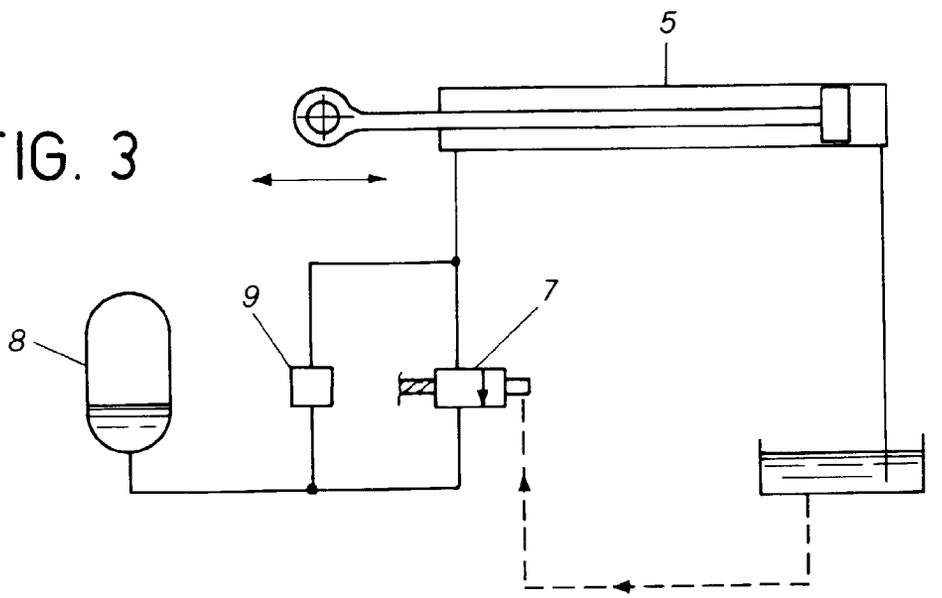

FIG. 3