

Title:

Raising a rudder stock on a ship

Description

The present invention regards a device, and a method for raising a rudder stock on a ship, as an integrated part of the ships steering engine with the purpose of performing maintenance on the internal wearing parts of the steering engine.

Background of the invention and prior art

The purpose of the invention is to do necessary maintenance work on steering engines, more specifically “rotary vane”- steering engine (hereinafter referred to as steering engine), which are considerably easier then current practise. A representative steering engine contains the entire upper radial bearing of the rudder system and rudder radial bearing. A rudder stock on a ship is normally fasted radially at 2, 3 or 4 points and axially at one point, of which the steering engine can be the axial bearing point – also called rudder radial bearing. During maintenance of / or faults on the steering engine it must be feasible to lock the rudder stock both radially and axially, there are available two alternative methods for locking the rudder stock. Method 1, in which the rudder and the rudder stock are secured by chains or cables that normally are fastened to the rudder blade itself; and Method 2, in which the rudder stock is secured by use of equipment mountable directly around the rudder stock during installation of the steering engine at the building yard. Furthermore, there a need in the field to relieve the rudder stock so that it can be replaced.

Of prior art in the field an example is disclosed in NO 302695 B1 that comprises a locking device that may be activated to maintain a rudder stock axially and radially relative to the structure of the ship in connection with replacement or maintenance of a steering engine of a ship.

Other prior arts in the field are GB 1409245 A and JP 58008496 A that discloses other rudder systems compared to the present invention.

The disadvantages with the prior art is that there are no easy solutions to raise the rudder stock for relieving the rudder radial bearing in a steering engine so that it may easily be replaced.

Method 1 requires resource-demanding operations, both cost-wise, time-wise and personnel wise. Furthermore, it is assumed that the ship is situated in port or is located in calm waters.

Method 2 can be split in two different variants 2a and 2b. Method 2a is a solution wherein a locking device is mounted on the deck of the ship. Method 2b is a solution wherein a locking device is mounted on the underside of the steering engine. Method 2 solves many of the disadvantages of method 1. However, method 2 is able to lock only radially and axially. It is not possible to raise the rudder stock so that the rudder radial bearing is relieved and thereby replaceable.

In order to raise rotor, rudder and rudder stock so that the rudder radial bearing and other wearable parts is relieved/unloaded and may be replaced supplementary equipment and extra anchor points for these are required, that again is resource-demanding, time-wise as well as cost-wise.

The object of the present invention is therefore to find a device that ease the work of raising of the rudder stock, rudder and rotor from the rudder radial bearing itself so that the wearable parts can be replaced in an easier way compared to current methods. This object is achieved by the invention as they are defined in the stated features of the claims.

The present invention will further be described in detail in connection with some embodiments and with reference to drawings, wherein figure 1 shows a schematic sketch of a rotary-vane steering engine according to the invention, cross-sectioned and in side view; figure 2 is a section of details A in figure 1, and fig 3 is a section of details B in fig 1.

Detailed description

The device shown in fig 1 is symmetrical around the centre of the rotor. Exceptions are detail A and detail B. Consequently, equal parts are numbered on one of the sides only.

In figs 1 to 3 an arrangement 1 is shown on an upper part of a rudder stock 2, of which the upper part is equipped with a steering engine attached to the hull 3 of the ship. The steering engine comprises a rotor housing 4, a rotor 5 connected to the rudder stock, a top cover 6, a bottom cover 7, a hydraulic nut 8 with removably mounted retaining ring 9, and a hydraulic cylinder 10.

The hydraulic cylinder 10 is attached to the top cover 6 using a fastening- / adjusting device 11. Furthermore, the hydraulic cylinder 10 is equipped with a hydraulic piston 12 receiving a hydraulic pressure on one side through a supply channel 13 connected to a manual pump or a hydraulic system / power source (not shown).

5 The at least one upper radial bearing of the rudder stock 2 is located in the steering engine and is here represented by a radial bearing 14 in the top cover and a radial bearing 15 in the bottom cover. In this embodiment a rudder radial bearing 16 is located in the bottom cover 7.

During normal operation of the steering engine all the weight of the rudder and
10 the rudder stock is resting on the rudder radial bearing 16 since there is not much free space between the retaining ring 9 and the hydraulic cylinder 10. To be able to change the rudder radial bearing 16, radial bearing 15 or other wearing parts in the bottom cover it is necessary to raise the rudder stock so that the force on the bottom cover is removed. If not it will be difficult to loosen the securing screws holding the bottom cover 7 and the
15 rotor housing 4 together due to the large force that the rotor, rudder stock and the rudder exerts.

To relieve the rudder radial bearing 16 the rudderstock and the rudder must be sufficiently lifted so that the force exerted on the rudder radial bearing is removed. Relevant lifting height of the rudder and rudder radial bearing is in this context only a
20 few tenths of a millimetre since the bottom cover 7 and rudder radial bearing 16 will be moved down and away from the contact surface of the rudder stock 2.

The hydraulic nut 8 is mounted on top of the rudder stock 2 and is locked so that there are no relative motions between the nut 8, rotor 4 and rudder stock 2. During normal operation of the rudder there are a small clearance between the retaining ring 9 on
25 the hydraulic nut and the hydraulic cylinder 10. In order to lift the rudder stock 2 it is necessary to lift the hydraulic cylinder, and the fastener- /adjusting devices 11 are loosened to allow for this.

By applying pressure on the hydraulic piston 12 through the supply channel 13 the hydraulic cylinder 10 must be raised and collided with the retaining ring 9 on the
30 hydraulic nut 8. The hydraulic cylinder would then raise rotor 4, rudder and rudder stock 2 to the desired position, about 0,5-1,0 mm. The reactive power from rotor, rudder stuck and rudder is then transferred from the bottom cover 7 to the rotor housing 4 and further to the hull of the ship. The vertical position is maintained by maintaining the pressure in the supply channel 13 until bottom cover 7 is detached from the rotor housing. Afterward

the pressure in the supply channel 13 is reduced, after which the cylinder will be brought down to the top of the top cover 6.

Subsequent to carrying out necessary repairs the supply channel 13 is pressurised so that the rudder stock 2 is raised and the bottom cover 7 can be remounted in place.

- 5 When the pressure finally is released from the supply channel 13 the hydraulic cylinder 10 will once again be brought down on top of the top cover 6, and the weight of the rotor, rudder stock and rudder will again be brought down on the rudder radial bearing. The operation is ended by tightening up the fastening- / adjusting devices so that the hydraulic cylinder 10 is fastened to the cover.

Claims

1. Device for raising a rudder stock (2) on a ship to relieve the rudder radial bearing (16), wherein the rudder stock (2) is equipped with a steering engine fastened to the rudder stock (2) using a hydraulic nut (8), and wherein the steering engine is further connected to the structure of the ship (3), **characterized in** that the device is an integrated part of the steering engine, and that the device further comprises;
- 5 - a top cover (6) for the steering engine having an integrated hydraulic cylinder (10) wherein the hydraulic cylinder comprises;
- a hydraulic piston (12)
- 10 at least one supply channel (13) for hydraulic oil, and
- at least one fastening- / adjusting device (11).
2. Device according to claim 1, **characterized in** that the hydraulic nut (8) is equipped with a retaining ring (9) on which the hydraulic cylinder (10) can be abutted.
- 15 3. Device according to claim 2, **characterized in** that the retaining ring (9) is divided so that it is detachable and easy to remove from the hydraulic nut (8).
- 20 4. Method for using a device according to claims 1-3 for raising a rudder stock (2) on a ship so that the rudder radial bearing (16) is relieved, and wherein the rudder stock (2) is equipped with a steering engine fastened to the rudder stock using a hydraulic nut (8) and further connected to with the structure of the ship (3), **characterized in**
- 25 (a) loosening the at least one fastening- /adjusting device (11),
- (b) connecting / supplying oil to the supply channel (13),
- (c) increasing the pressure so that the hydraulic piston (12) abuts the top cover (6), and continuing until the hydraulic cylinder (10) abuts the retaining ring (9) and raises rotor (5), rudder stock (2) and rudder by around 0.5-1.0 mm.,
- 30 (d) loosening the bottom cover (7),
- (e) reducing the pressure in the supply channel (13) until the hydraulic cylinder (10) again abuts the top cover (7) so that the entire rudder arrangement rest on the top cover (6) via the retaining ring (9),
- (f) executing necessary maintenance of wearing parts in the bottom cover (7),

- (g) repeating point (c),
- (h) fastening the bottom cover (7),
- (i) repeating (e) and removing the connections from the supply channel (13), and
- (j) fastening the at least one fastening- / adjusting device (11)