Title: LOCKING MECHANISM FOR CARGO SHIP HATCH COVER STOWING DEVICE

Abstract: The present invention relates to a locking mechanism for the stowing device of a cargo ship hatch cover, the mechanism comprising at least one actuator cylinder (2) connected to the ship’s hull by its one end with the other end of the cylinder being connected to a stowing device adapted to move the hatch cover sections (13, 13’), the stowing device being such as a toothed wheel sector (1) that in turn cooperates via its toothed perimeter with another toothed wheel sector, whereby one of the toothed wheel sectors is connected to one hatch cover section while the other one of the toothed wheel sectors is connected to an adjacent hatch cover section so that both ones of the hatch cover sections are moved upon the operation of the actuator cylinder (2). The invention is implemented by way of connecting to the actuator cylinder (2) and the toothed wheel sector (1) a locking mechanism which is pivotally connected to the ship’s hull and, under the actuation of cylinder (2), is capable of locking the hatch cover sections (13, 13’) into their closed position and, respectively, under reverse actuation of the cylinder, is capable of disengaging the locking of the hatch cover sections.
Locking mechanism for cargo ship hatch cover stowing device

The present invention relates to a locking mechanism for the stowing device of a cargo ship hatch cover, the mechanism comprising at least one actuator cylinder connected to the ship's hull by its one end while the other end of the cylinder being connected to a stowing device adapted to move the hatch cover sections, the stowing device being such as a toothed wheel sector that in turn cooperates via its toothed perimeter with another toothed wheel sector, whereby one of the toothed wheel sectors is connected to one hatch cover section while the other one of the toothed wheel sectors is connected to an adjacent hatch cover section so that both ones of the hatch cover sections are moved upon the operation of the actuator cylinder.

The cargo ship stowing device has conventionally been implemented so that the movement of the toothed wheel sectors elevating the hatch cover sections is actuated by a hydraulic cylinder connected to both or only one of the toothed wheel sectors. The locking of the toothed wheel sectors into their lower position (closed position of hatch cover section) takes place by a separate, manually insertable locking pin. In lieu of toothed wheel sectors, also different kinds of articulated mechanisms are used, whereby their operating principle is equivalent including the manual locking arrangement.

These prior-art locking systems have been hampered by the locking technique of the toothed wheel section constituting a separate work phase by manual means. Moreover, locking as such a separate step may even be neglected resulting in unexpected opening of the hatch cover at high sea and thereby damage to cargo due to loss of weatherproofness. In the worst case, detachment of hatch cover sections can jeopardize the entire ship's safety. Furthermore, the wear of the stowing mechanism components (such as pivot pins,
contact surfaces of toothed wheel sectors, etc.) cause a need for readjustment which is a clumsy operation (e.g., by way of replacing pivot pins and adding material by welding to the toothed wheel surfaces making a contact to the hatch cover sections).

It is an object of the invention to provide a locking mechanism for a hatch cover stowing device, by means of which mechanism the hatch cover locking and disengagement of locking take place automatically without the need for a separate operation. The goal of the invention is attained by virtue of the present invention characterized by having the actuator cylinder and the toothed wheel sector connected to a locking mechanism that is pivotally connected to the ship's hull and, under the actuation of the cylinder, is capable of locking the hatch cover sections into their closed position and, respectively, under reverse actuation of the cylinder, is capable of disengaging the locking of the hatch cover sections.

An embodiment of the locking mechanism according to the invention is characterized in that the locking mechanism comprises a triangular plate adapted between the actuator cylinder and the toothed wheel sector, whereby one corner of the plate is pivotally connected to the actuator cylinder, while the second corner is pivotally connected to the toothed wheel sector and the third corner is pivotally connected to a lever plate that further is pivotally connected to a hinge eyelet mounted on the ship's hull.

Another embodiment of the locking mechanism according to the invention is characterized in that, in the locked position of the locking mechanism, the pivot point between the triangular plate and the lever plate is located below a hypothetical line drawn via the pivot point between the triangular plate and the toothed wheel sector and the pivot point between the hinge eyelet and the lever plate, at a point called bottom dead center. Further in the locked position of the locking mechanism, the pivot point between the triangular plate and the lever
plate is located above a hypothetical line drawn via the pivot point between the triangular plate and the actuator cylinder and the pivot point between the hinge eyelet and the lever plate.

A still another embodiment of the locking mechanism according to the invention is characterized in that to the lever plate is formed or fixed a stop against which the end of the triangular plate which is pivotally connected to the lever plate can rest in the locking position of the mechanism thus preventing the pivot point between the triangular plate and the lever plate from falling below the hypothetical line defined in claim 3.

Accordingly, the benefits of the invention include a fully automation function, wherein hatch cover locking/unlocking does not any more require a separate work phase that could be neglected by a worker. The vertical/horizontal adjustment facility of the locking mechanism hinge eyelet offers an uncomplicated way of fine-tuning the operation of the hatch cover stowing device during its installation and compensation for normal wear of the stowing device components. Moreover, the locking mechanism according to the invention can be retrofitted with minimal changes on stowing devices already in use. The construction of the locking mechanism is extremely simple and reliable in operation.

In the following, the invention is examined in greater detail with the help of a preferred exemplary embodiment by making reference to the appended drawings, in which:

FIG. 1 shows a conventional cargo ship hatch cover stowing device; and

FIGS. 2-4 show the different operating phases of a hatch cover stowing device according to the invention.
Referring to FIG. 1, therein is shown a conventional hatch cover stowing device and its locking mechanism. Herein, a single actuator cylinder 2, 2' is connected both ones of the meshing toothed wheel sectors 1, 1'. The movement of the toothed wheel sectors is thus accomplished by means of the actuator cylinders connected to the toothed wheel sectors. This arrangement, however, needs a separate locking pin 12 for securing the toothed wheel sectors into their lower position (that is, the closed position of the hatch cover sections). Accordingly, the locking pin serves to prevent the hatch cover sections from opening at sea.

In FIG. 2 is shown a hatch cover stowing device according to the invention implemented by adding between the toothed wheel sector 1 and the actuator cylinder 2 a triangular plate 3 which is additionally connected via a lever plate 4 to a hinge eyelet 6 mounted on the ship's hull 5. Thus, the triangular plate 3 has three support/pivot points 7, 8, 11, of which pivot point 7 is the pivot point between the triangular plate 3 and the toothed wheel sector 1, pivot point 8 is the pivot point between the triangular plate 3 and the lever plate 4, and pivot point 11 is the pivot point between the triangular plate 3 and the actuator cylinder 2. The pivot point between the lever plate 4 and the hinge eyelet 6 is denoted by reference numeral 9.

The function of the stowing device and its integral locking mechanism is based on the location of the pivot points and the geometry of the system components. In the situation shown in FIG. 2, the hatch cover sections 13, 13' are sealed against each other. Herein, actuator cylinder 2 is in its retracted position. Then, the locking function is accomplished by having the pivot point 8 between the triangular plate 3 and the lever plate 4 located below a hypothetical line drawn via the pivot point 7 between the triangular plate 3 and the toothed wheel sector 1 and the pivot point 9 between the hinge eyelet 6 and the lever plate 4, at a point called bottom dead center. Simultaneously, in the locked position of the locking mechanism, the pivot point 8 between the triangular plate 3 and the lever plate 4 is located above a hypothetical line drawn via the pivot point 11.
between the triangular plate 3 and the actuator cylinder 2 and the pivot point 9 between the hinge eyelet 6 and the lever plate 4. To open the hatch cover sections 13, 13', the piston of the actuator cylinder begins to push the triangular plate about the pivot point 7, thus forcing pivot point 8 to move upward, whereby the locking of hatch cover sections is disengaged. Subsequently, actuator cylinder 2 pushes via triangular plate 3 the toothed wheel sector 1, thus actuating the opening of the hatch cover sections 13, 13' (FIGS. 2 and 3). The closing of the hatch cover sections occurs in a reverse order.

A stop 10 on the lever plate 4 prevents triangular plate 3 from rotating into a position wherein pivot point 8 would reach a position earlier called the bottom dead center point below the hypothetical line drawn through pivot points 9 and 11.

By moving the location of the hinge eyelet 6 closer to the actuator cylinder, the play caused by wear of the hatch cover stowing device may be compensated for, whereby function of the hatch cover sections is readily rectified. Respectively, the adjustment facility of the hinge eyelet 6 permits easy installation of hatch cover sections thereby making it possible to correct the effects of other incorrectly mounted components on the function of the stowing device by way of a proper location of the hinge eyelet 6. The hinge eyelet 6 can be provided with separate mounting spacers of different sizes to facilitate an uncomplicated change of the location of pivot point 9.

To a person skilled in the art it is obvious that the invention is not limited to the exemplary embodiments described above, but rather may be varied within the scope and spirit of the appended claims. Accordingly, the locking mechanism of a hatch cover stowing device can be implemented using a system geometry and construction different from those illustrated in the drawings. Also the location of pivot points and the relative dimensions of the locking mechanism may be modified.
What is claimed is:

1. A locking mechanism for the stowing device of a cargo ship hatch cover, the mechanism comprising at least one actuator cylinder (2, 2') connected to the ship's hull by its one end with the other end of the cylinder being connected to a stowing device adapted to move the hatch cover sections (13, 13'), the stowing device being such as a toothed wheel sector (1) that in turn cooperates via its toothed perimeter with another toothed wheel sector (1'), whereby one of the toothed wheel sectors is connected to one hatch cover section (13) while the other one of the toothed wheel sectors is connected to an adjacent hatch cover section (13') so that both ones of the hatch cover sections are moved upon the operation of the actuator cylinder (2), characterized in that to the actuator cylinder (2) and the toothed wheel sector (1) is connected a locking mechanism which is pivotally connected to the ship's hull and, under the actuation of the cylinder (2), is capable of locking the hatch cover sections (13, 13') into their closed position and, respectively, under reverse actuation of the cylinder, is capable of disengaging the locking of the hatch cover sections.

2. The locking mechanism of claim 1, characterized in that the locking mechanism comprises a triangular plate (3) adapted between the actuator cylinder (2) and the toothed wheel sector (1), whereby one corner of the plate is pivotally (11) connected to the actuator cylinder (2), while the second corner is pivotally (7) connected to the toothed wheel sector (1) and the third corner is pivotally (8) connected to a lever plate (4) that further is pivotally (9) connected to a hinge eyelet (6) mounted on the ship's hull.

3. The locking mechanism of claim 1 or 2, characterized in that, in the locked position of the locking mechanism, the pivot point (8) between the triangular plate (3) and the lever plate (4) is located below a hypothetical
line drawn via the pivot point (7) between the triangular plate (3) and the toothed wheel sector (1) and the pivot point (9) between the hinge eyelet (6) and the lever plate (4), at a point called bottom dead center.

4. The locking mechanism of claim 3, characterized in that, in the locked position of the locking mechanism, the pivot point (8) between the triangular plate (3) and the lever plate (4) is located above a hypothetical line drawn via the pivot point (11) between the triangular plate (3) and the actuator cylinder (2) and the pivot point (9) between the hinge eyelet (6) and the lever plate (4).

5. The locking mechanism of claim 4, characterized in that to the lever plate (4) is formed or fixed a stop (10) against which the end of the triangular plate (3) which is pivotally connected to the lever plate (4) can rest in the locking position of the mechanism thus preventing the pivot point (8) between the triangular plate (3) and the lever plate (4) from falling below said hypothetical line of claim 3.

6. The locking mechanism of any one of claims 1-5, characterized in that the location of the hinge eyelet (6) on the ship's hull (5) is made adjustable for compensation of play occurring due to wear in the hatch cover stowing device.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B63B 19/24
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>A</td>
<td>US 3294154 A (J. JEROME), 27 December 1966 (27.12.66)</td>
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Further documents are listed in the continuation of Box C.

See patent family annex.

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## INTERNATIONAL SEARCH REPORT

**Information on patent family members**

### 01/05/02

**International application No.**

**PCT/FI 02/00267**

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<td>US 3294154 A</td>
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